

Daily light exposure and feelings of alertness and vitality : intermediate results of a longitudinal study

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DAILY LIGHT EXPOSURE AND FEELINGS OF ALERTNESS AND VITALITY: INTERMEDIATE RESULTS OF A LONGITUDINAL STUDY

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Objectives: No two persons have the same daily light exposure. Among many factors, research has shown that light exposure is dependent on whether a person is indoors or outdoors, on time of day, season, and age. Daily light exposure is important for our biological rhythm. In addition, Hubalek and colleagues (Hubalek et al., *Lighting Res. Technol*, 42, 43-50, 2010) showed that daily light exposure had a significant and positive effect on subjective sleep quality, but not on self-reported pleasure and arousal at the end of day. Although these researchers did not find an effect on end of day feelings of pleasure and arousal, other studies suggest that light exposure can have an influence on feelings of alertness, vitality and psychological distress during daytime (Partonen & Lönnqvist, *J Affect Disor*, 57, 55–61, 2000; Phipps-Nelson et al., *Sleep*, 26, 695-700, 2003; Rüger et al., *Am J Physiol Regul Integr Comp Physiol*, 290, 1413-1420, 2005). In addition, research has shown that light treatment can be beneficial for people suffering from mood disorders, such as seasonal affective disorder (SAD), suggesting that light exposure can have an influence on mood. Two experience sampling studies by Ryan and colleagues (Ryan et al., *J. Environ. Psychol.*, 30, 159–168, 2010) showed that being outdoors is related to subjective vitality. Results showed that participants who were outside for more than 20 minutes per day experienced greater vitality for that day, even when controlled for physical activity and social interaction. Presence in nature (partially) mediated the effect of being outdoors on self-reported vitality. Ryan et al. (2010) suggested that, in addition to nature, the presence of sunlight may have also induced experiences of vitality. In the current longitudinal field study, we recorded the amount of light falling on the eye during regular workdays, to gain insight into interpersonal differences and dynamics in light exposure throughout the day. Moreover, we investigated the relationships between light exposure during the day, sleep quality, and subjective alertness, vitality and tension, both on an hourly and daily basis, controlling for activities, contexts and person characteristics.

Method: The method employed in this study was experience sampling, combined with continuous measurement of light exposure during three consecutive days from 8 am to 8 pm. Light exposure was measured continuously with a Daysimeter, worn at eye level. It records both photopic light intensity and intensity in the biologically effective range. Subjective self-reports were administered every hour between 8 am and 8 pm as feelings of alertness and mood seem to show diurnal variations. These measures included subjective feelings of vitality, alertness and tension, and the type of activity and location of the participant. In addition, participants reported their subjective sleep quality every morning and filled in questions concerning duration of being outdoors, duration of physical activity, time spent on social interaction and coffee consumption in a diary every evening before going to sleep.

Results: This study started in October 2010 and will run a full year, until October 2011. At the conference we would present the data collected until the end of May. Up to two persons participate each week, rendering data on a wide range of light exposures, activities, and settings. The results of these participants are analyzed using Hierarchical Linear Models with time of day and light exposure as fixed factors. Data collection and analyses are still ongoing, but the first results (N=29, 15 male and 14 female, at the time of submission of this abstract) indicate that feelings of vitality and alertness are related to time of day. In addition, the preliminary results show a significant positive relation between hourly light exposure, in terms of both photopic intensity and of the intensity in the biological relevant spectrum, and alertness and mood.

Conclusion: The first results suggest that there is a relation between light exposure and feelings of alertness and mood throughout the day. In addition, time of day seems to play an important role. Additional analyses will be performed to control these relations for personal characteristics, activities and contexts. In addition, the relation between light exposure and sleep quality will be assessed. The results of these additional analyses will be presented at the conference.

Keywords: Light exposure, Mood, Alertness, Biological rhythm, Human.