Exposure to Artificial Lighting & Loneliness

Rasvitha Nandru[*,1], Alessia Iancarelli[2]

[1,2] Department of Psychology, Northeastern University

Summary According to the 2018 Nielson total audience report, adults spend over 11+ hours per day on their screens with increased exposure to artificial lighting. The rates of loneliness are increasing during the COVID-19 pandemic, making it pertinent to study the dynamics between exposure to artificial lighting and loneliness. In this proposed study, participants are exposed to varying wavelengths of artificial light and asked to answer questions on their feeling of loneliness.

Keywords ·Artificial-Lighting· Loneliness· Circadian-Rhythm- Disruption· R-UCLA · STAI

✉ Rasvitha Nandru: nandru.r@northeastern.edu

Introduction Daylight plays a role in entraining and regulating the circadian rhythm in order to maintain a 24 hr sleep/wake cycle. Due to electronic devices emitting blue light, alertness is produced by suppressing melatonin and causing a phase shift in biological clocks (Chang, 2015). Day-light LED lighting (a mix of red, green, blue, warm white, and cool white light) plays a role in entraining the circadian rhythm in a closed environment (Nie, 2020). Red light exposure lowers brain activity and sleep onset latency with later screen exposure times and similarly, increased bright white light helps modulate circadian rhythm resulting in a higher sleep quality (Studer, 2019). While research indicates a correlation between circadian rhythm disruption and mood disorders, the effects on loneliness are unclear (Brand, 2011). Potentially, the artificial light changes have a direct effect on our biological clock by releasing hormones that affect mood. This causes individuals to socially withdraw and feel lonely, perpetuating a negative cycle of loneliness.

Aims The emotional responses of individuals who are exposed to combinations and reductions of different artificial light wavelengths will be examined, particularly loneliness. It is predicted that exposure to blue (B) light will cause individuals to feel loneliest compared to red (R), white (W), or mixed (M) light wavelengths exposure.

Methods This experimental study (N=100) will include one online study and one in-person study. The online session will consist of participants answering a survey about mood, screen exposure, sleep schedule, UCLA loneliness scale (R-UCLA) (Russell, 1996) and State-Trait Anxiety Inventory - STAI (Spielberger, 2010). They will keep a daily log of the freq. and duration of daylight and artificial light exposure while wearing a watch that senses their sleep/wake cycle for 2 days. The in-person study will have 2 trials where participants will be exposed to single and multiple combinations and gradual reductions of wavelengths at various intervals. The R-UCLA and STAI questionnaire will be answered after each session.

Planned analysis A multiple linear regression will be performed to predict loneliness based on the diverse wavelengths. An ANOVA of 4 (wavelengths of B, R, W or M) x 2 (conditions: online, in-person) on loneliness will be conducted along with planned contrasts on wavelengths and conditions.

Predicted findings It is predicted that exposure to B light will cause individuals to feel the loneliest due to dysregulation in the circadian rhythm resulting in poor sleep quality and potential dysfunction in daily and social functioning. Exposure to bright W light is predicted to have the least effect on loneliness since it is most similar to daylight, and may possibly lift an individual's mood despite being in a closed environment. R light and M light may still present some mild feelings of loneliness.

Conclusions While there has been prior research on artificial light exposure and disruption of the circadian rhythm, there has been little on its effects on loneliness. Due to the COVID-19 pandemic, many people are viewing screens and remaining indoors for long periods of time. Due to constant exposure to artificial light, a disruption in their biological clock will increase hormones that affect their mood causing them to reject the company of others and socially withdraw leading to feelings of loneliness. This study must be conducted to see the implications on increasing rates of loneliness, and possibly find a solution with the optimal exposure to wavelengths at home and in devices to mitigate these feelings.

References

The Nielsen Total Audience Report: Q1 2018. (2018, July).

Chang, A. ... Czeisler, C. A. (2015). Evening use of light-emitting eReaders negatively affects sleep, circadian timing, and next-morning alertness. Proceedings of the National Acad. of Sciences, 112(4), 1232-1237.

Nie, J.,... Wang, Y. (2020). Investig. on entraining and enhancing human circadian rhythm in closed envirom. using daylight-like LED mixed lighting. Science of The Total Env.

Studer, P. ...Kratz, O. (2019). Effects of blue-and red-enriched light on attention and sleep in adolescents .Physio. & behavior, 199, 11-19.

Campbell, S. ... Anderson, M. W. (1993). Alleviation of sleep maintenance insomnia with timed exposure to bright light. Journal of the American Geriatrics Society, 41(8), 829-836.

Brand, S., & Kirov, R. (2011). Sleep and its imp. in adolescence and in common adolescents somatic and psychiatric conditions. Int. journal of general medicine, 4, 425.

Russell, D. W. (1996). UCLA Loneliness Scale (3). Journal of personality assessment, 66(1), 20-40.

Bieling, P. J. ... Swinson, R. P. (1998, August). STAI: structure and content re- examined. *Behaviour research and therapy*, *36*(7-8).