LUTEIN STUDY 4

IMPROVED SLEEP QUALITY

Macular pigment (MP) is derived from a diet of leafy greens and is concentrated primarily in the central retina. Because MP and melanopsin both preferentially absorb short-wave light, our research sought to address the question of whether increasing participants' MP optical density (MPOD), via macular carotenoid supplementation for 3 months, would affect sleep quality. There were two parts to this study. The first part was a 3-month, double-blind, placebo-controlled trial in which 45 young (aged 18-25 yrs.), healthy individuals participated. Random assignment was used to determine the active supplement group (n = 30) and placebo group (n = 15). Those in the active supplement group ingested daily a pill containing 20mg lutein and 4 mg zeaxanthin isomers, whereas participants in the placebo group took an inert pill. Sleep quality was evaluated with the Pittsburgh Sleep Quality index (PSQI), a

19-item self-rated questionnaire. MPOD was measured with heterochromatic flicker photometry. CFF and CS were also measured. Outdoor and indoor exposure to light (UV) and electronic devices [ScreenT] before and after supplementation were recorded. Measures were conducted at baseline and 3 months; paired-samples t-tests were employed to evaluate changes in both sleep quality and MPOD. Results were that at baseline, sleep quality and MPOD were not found to be significantly related ($p = 0.46$). For the 3-month intervention, the experimental group exhibited significant improvement in overall sleep quality ($p = 0.0063$) and MPOD ($p < 0.001$). The placebo group did not change for either of these variables over the study period ($p > 0.50$ for both). Significant improvements in MPOD, CFF, CS, sleep quality and Screen T were observed after 3 months supplementation. In conclusion, increases in MPOD may serve to absorb more short-wave (blue) light from sources (such as computer screens, tablets, or smartphones) that can be used during nighttime hours, and would otherwise provide a circadian signal to stay awake. Although the lack of a significant correlation between MPOD and sleep quality at baseline is not consistent with this conclusion, it may be that acute, relatively rapid increases in MPOD are not immediately compensated for by the intrinsically photosensitive retinal ganglion cells (ipRGC) circadian rhythm system, and therefore manifest as improvements in sleep quality.

The second part was also a 6-month, double-blind, placebo-controlled trial in which 45 young (aged 18- 25 yrs.), healthy individuals participated. Random assignment was used to determine the active supplement group (n = 30) and placebo group (n = 15). Thirty four subjects completed the study. Those in the active supplement group ingested daily a pill containing 20 mg lutein and 4 mg zeaxanthin isomers, whereas

participants in the placebo group took an inert pill. Sleep quality was evaluated with the Pittsburgh Sleep Quality index (PSQI), a 19-item self-rated questionnaire. MPOD was measured with heterochromatic flicker photometry. CFF and CS were also measured. Outdoor and indoor exposure to light (UV) and electronic devices [ScreenT] before and after supplementation were recorded. Measures were conducted at baseline and 6 months; paired-samples t-tests were employed to evaluate changes in both sleep quality and MPOD. Results were that at 6 months MPOD, CFF, CS, sleep quality improved with L/Zi supplementation. Subjects were categorized based on time of exposure (<4, 4-8 and >8 h). It was observed that supplementation had greater improvements in 4-8 h and >8 h in 6 months supplementation. Significant correlation of MPOD and L/Zi was observed in supplementation and L/Zi reduced ScreenT by increasing MPOD after 6 months supplementation and no significance in placebo.

[9] Sasaki M, Yuki K, Kurihara T, Miyake S, Noda K, Kobayashi S, Ishida S, Tsubota K, Ozawa Y. Biological role of lutein in the light-induced retinal degeneration. *J Nutr Biochem*. 2012 May;23(5):423-9.