(1) AACE 2019 - BY CHARLES J. WOODY
'Effect of Blue Blocking Lenses on Melatonin Levels in Healthy Males exposed to Blue Light in the Evening'

In this study ten healthy males, ages 24-28, tested the effect of wearing proprietary lens technology used by Gamer Advantage on melatonin production when viewing a tablet prior to bedtime.

The study was conducted in a controlled environment and melatonin levels were measured through blood samples.

For many of the subjects, the conclusion is there is a significant effect by using proprietary lens technology used by Gamer Advantage in preventing the suppression of melatonin production when viewing a digital tablet in the evening. Impact occured quickly when measuring melatonin levels between 0 to 3 hours after onset.

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Effect of Blue Blocking Lenses on Melatonin Levels in Healthy Males Exposed to Blue Light in the Evening

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INTRODUCTION

Recent studies have shown that 90% of people in the US view an electronic device prior to bedtime.[1] This has been shown to cause sleep disruption via inhibition of endogenous melatonin production,[1-4] which is most sensitive to light in the 460-480nm range.[5] This effect is not seen when reading a printed book.[2] Commercially available glasses purportedly designed to block this blue light are now available. However, there are currently no evidence-based studies that support these claims.

AIM

This pilot study is designed to test the ability of the best commercially available blue blocking lens, PBLT* [6] on preventing melatonin suppression in healthy adult males exposed to blue light when viewing an electronic device (iPad) prior to bedtime.

METHOD

Participants:

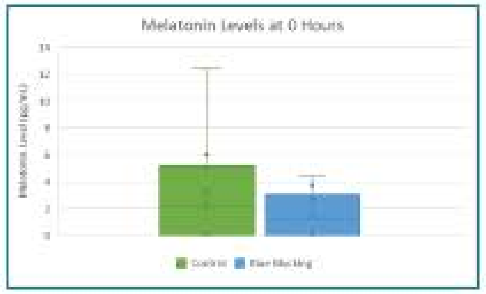
- Ten healthy males, ages 24-28 years.
- All had 20/20 best corrected vision in both eyes and normal color vision.
- None of the participants had any known ocular pathology.

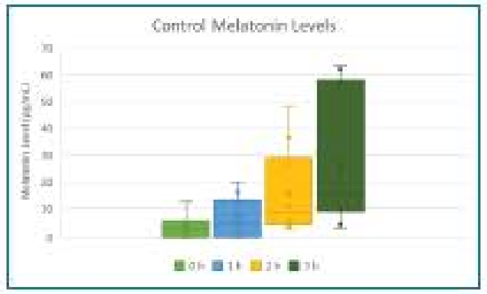
Procedure:

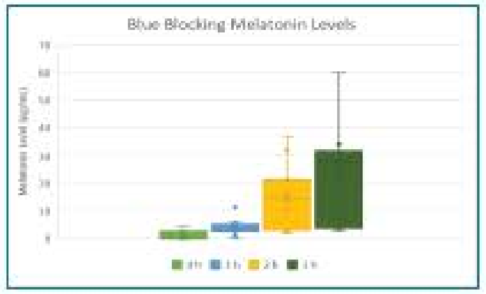
- Each subject was asked to go to bed between 11pm and midnight for the seven days prior to the study to establish a baseline circadian rhythm.
- Subjects were placed in private rooms with internal lighting set to 10 lux at 7pm on day 1 of the study.
- Half the subjects wore PBLT* (blue blocking) glasses and the other half wore clear (control) glasses.
- Subjects began reading their individual iPads after a blood sample was obtained using an IV catheter (time zero).
- Blood samples were collected every hour for three hours after time zero.
- The procedure was repeated the next night (day 2) with each subject wearing the alternate pair of glasses.

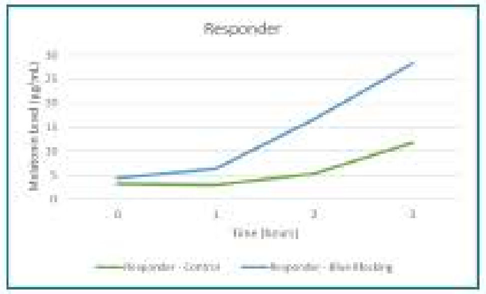
*PBLT = Proprietary Blue Light Technology

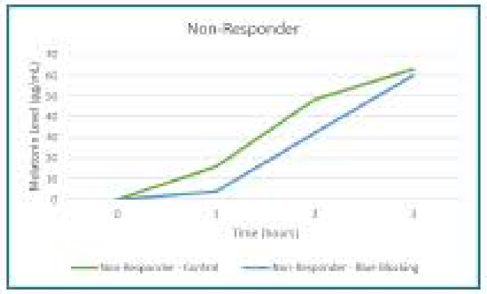
RESULTS

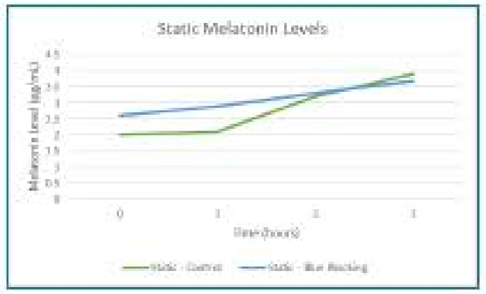


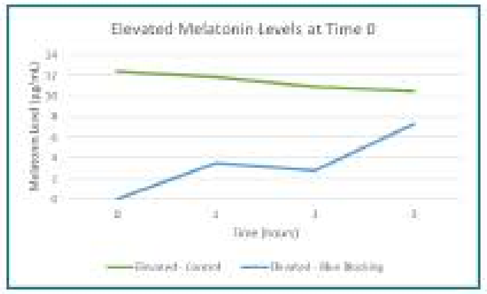












SUMMARY OF DATA

- Half of participants had substantially increased levels of melatonin at 3 hours using blue blocking glasses compared to the control glasses. (Responder)
- Two participants had increased melatonin at 3 hours with the control glasses compared to the blue blocking glasses. (Non-Responder)
- Two participants had similar melatonin levels with both glasses. (Static)
- One participant had elevated melatonin at time zero the day he wore the control glasses. This participant had decreasing melatonin with control glasses and increasing melatonin with blue blocking glasses.

Of Note:

- The median melatonin level (solid line in the box and whisker graphs), which accounts for outliers, is substantially higher at 2 and 3 hours in the blue blocking group.

CONCLUSIONS

Clear inter-subject variations were noted with regards to baseline melatonin level, rate of melatonin level rise during the study, and melatonin level changes in response to wearing blue light blocking glasses.
While most participants had low melatonin levels at the start of the study, there were exceptions. Most participants had rising melatonin levels throughout the evening, which were more pronounced with the blue blocking glasses. However, there was some variation and a causal relationship could not be established.
Further review of the study's results suggests the emergence of four potential profiles or subsets into which participants can be classified.
The "responders" demonstrate strong suppression of melatonin production in response to blue light as well as an increase in melatonin production when the amount of blue light exposure is decreased. The "static melatonin levels" exhibit minimal change in melatonin levels regardless of environmental conditions. The "non-responders" have melatonin level changes that appear to occur independently of blue light exposure. Lastly, a subset shows elevated melatonin levels at time zero; a finding most consistent with participant non-compliance.
In conclusion, the data from this pilot study suggest that blue blocking glasses may be useful in reducing the previously documented suppression of melatonin caused by exposure to blue light during evening hours.
Future studies carried out in a sleep center will allow better control over the subjects sleep-wake schedules and will help reduce the effect of participant non-compliance with study procedures.

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(2) PERELMAN SCHOOL OF MEDICINE - BY H. BARILLA, P. R. GEHRMAN, I. GURUBHAGAVATULA
'Effects of Blue Filtering Lenses on Sleep and Melatonin Production in Good Sleepers'

In this study ten healthy, good sleepers with an average age of 26 years, tested the effect of wearing proprietary lens technology used by Gamer Advantage on melatonin production when exposed to bright light (laptop computer with brightness set to the maximum intensity and a lightbox) prior to bedtime.

The study was conducted in a controlled environment and melatonin levels were measured through saliva samples.

The conclusion the proprietary lens technology used by Gamer Advantage decreased the reduction in melatonin production from blue light:

- up to 300% increase of melatonin levels (sleep quality)
- subjects hit REM sleep state 35% faster
- subjects gained up to 45 minutes more sleep per night (based on 6 hour sleep duration)

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Effects of Blue Filtering Lenses on Sleep and Melatonin Production in Good Sleepers

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INTRODUCTION

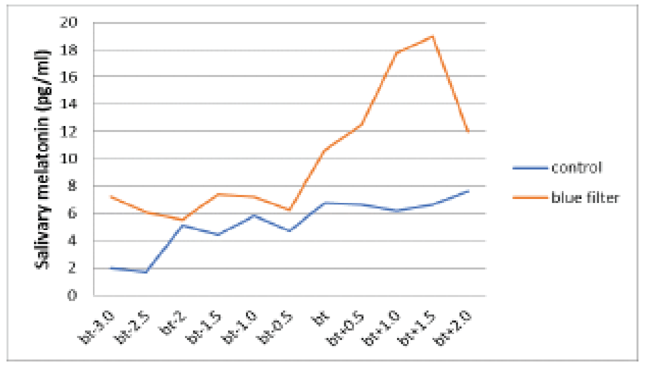
Melatonin is a hormone which regulates endogenous circadian rhythms and plays an important role in sleep and wakefulness. Melatonin is suppressed by bright light exposure, and the increasing use of light-emitting devices at night has been associated with reduced melatonin production and disturbed sleep. Within the visible spectrum, blue light has the most potent impact on melatonin production and hence on circadian rhythms. Thus, use of eyewear that blocks this wavelength could reduce the negative impact of bright light exposure. The goal of this project was to determine whether novel blue filtering eyewear reduces the impact of bright light exposure on melatonin production.

METHODS

Ten healthy, good sleepers participated in the study (Table 1). Enrolled subjects were scheduled for two nights in the sleep laboratory. Subjects were placed in conditions of high full-spectrum lighting for the 5 hour span (3 hours before and 2 hour after habitual bedtime) and given either blue filtering or regular eyewear, in counterbalanced order, to wear. They were seated in front of a laptop computer with brightness set to the maximum intensity and a lightbox placed next to the computer. Subjects provided saliva samples every 30 minutes for a total of 11 samples. After the final sample, subjects were permitted to go to sleep and completed a sleep diary in the morning. Subjects wore an actigraph for the duration of each stay in the lab. Melatonin levels and sleep at night was compared for both subjective (sleep diary) and objective (actigraphy) measures (Table 2).

Table 1. Demographic and Clinical Characteristics

Age (M,SD)	26.1 (4.98)
Gender (m, %)	5(50)
Race (Caucasian, %)	9 (90)
ISI Score (M, SD)	4 (2.71)



RESULTS

In a mixed model analysis, there was a significant effect of condition for the melatonin profiles (F(1, 171=12.6, p=0.0005), but not for time (F(10, 171=1.78, p=0.068) or the condition*time interaction (F(10, 171=0.77, p=0.657). Melatonin levels were significantly higher on the night with blue filtering eyewear for all timepoints expect the first two (all p=0.02 or lower).There were no significant differences on any sleep diary variables between the nights. Three actigraphy files were unusable due to equipment malfunction or subject error. The only actigraphic sleep variable that was significantly different between nights was sleep latency (t(7)=2.4, p=0.047).

Table 2. Sleep characteristics on sleep diary and actigraphy

	Blue-light-filtering eyewear	Regular eyewear
Sleep Diary		
Sleep Latency (minutes)	15.4 (16.95)	20.8 (25.73)
Number of awakenings	0.8 (1.32)	1.0 (1.41)
Wake after sleep onset (minutes)	3 (4.22)	4.8 (9.43)
Total sleep time (minutes)	368.6 (55.04)	324.4 (84.10)
Sleep efficiency (%)	91.8 (9.09)	90 (7.59)
Actigraphy		
Sleep Latency (minutes) *	21.6 (17.3)	14.8 (17.1)
Number of awakenings	16.6 (4.4)	13.3 (4.1)
Wake after sleep onset (minutes)	29.2 (9.5)	16.6 (4.4)
Total sleep time (minutes)	324.8 (45.6)	300.1 (91.7)
Sleep efficiency (%)	91.8 (2.1)	92.2 (2.5)

CONCLUSION

These results demonstrate that this novel blue light filtering eyewear was able to reduce the reduction in melatonin production from blue light. Subsequent sleep was not impacted by the eyewear, although this is not surprising given that subjects were generally good sleepers.