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LETTER

Effect of Illumination on Near Positive Fusional Vergence in Young Adults [Letter]

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Dear editor

We have read with great interest the recent study by Atuanya et al investigating the effect of lighting on positive fusional vergence (PFV) in young adults.[1] The authors demonstrated that PFV values decreased significantly with increasing illuminance intensity, with the highest measurements occurring at 50 lux and gradually decreasing at 150 lux. The study concluded that low to moderate lighting optimizes binocular coordination during near vision tasks.[1] While we appreciate this important contribution, we believe that the complex relationship between illuminance intensity, color temperature, and cognitive performance should also be considered.

Recent evidence emphasizes that both illuminance and color temperature should be carefully adjusted to optimize visual performance and comfort. A study examined mental workload, which is defined as the amount of processing resources a participant must allocate to perform a task within a given time, under lighting conditions with color temperatures ranging from 3000 K to 6500 K and illuminance levels between 300 and 1000 lux.[2] Attention and memory tasks were employed to assess cognitive performance.Their results showed that the combination of 3000K color temperature and 750 lux illuminance produced the lowest mental workload.[2]

Moreover, additional research has determined that light with shorter wavelengths, higher intensity, and higher color temperature leads to melatonin suppression, increased alertness, and faster reaction times. Laboratory studies indicate that 500 lux is considered an optimal level for maintaining concentration in office work.[3] Studies have found that exposure to higher illuminance, even in the absence of sleep deprivation, increases alertness, vitality, and performance on tasks requiring sustained attention.[3] Additionally, higher illuminance levels in the morning have been shown to enhance mood and alertness, while color temperature also plays a key role, with 4300 K found to be particularly effective in promoting focused and stable attention.[3] These findings reveal a critical shortcoming in the study by Atuanya et al, which evaluated vergence in isolation, whereas other research demonstrates that color temperature interacts with illuminance to regulate cognitive load through non-visual pathways.[3]

Another recent study examined the effect of correlated color temperature and illuminance on stress and cognitive recovery among office workersThe results indicated that warm and dim lighting at 3000 K and 100 lux respectively effectively reduced physiological stress markers and perceived stress levels.[4] In contrast, cooler lighting was associated with improved cognitive performance and reduced cognitive fatigue.[4] These findings reinforce the understanding that the effects of lighting on PFV may be mediated through complex cognitive and physiological pathways, not just through the visual vergence system.

The convergence of these studies highlights the need to examine lighting effects through a multidimensional framework. While Atuanya et al controlled for time of day and screen exposure, they did not account for spectral composition, factors identified as critical modulators of attention and reaction time. Clinically, these insights support task-specific lighting protocols, suggesting that softer, warmer illumination may enhance visual comfort and stability during near work, whereas brighter, cooler lighting can promote alertness and cognitive efficiency in educational or occupational environments.

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