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THE EFFECTS OF SHORT-DISTANCE EXPOSURE TO BLUE LIGHT ON HUMAN REACTION TIME

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Introduction. Blue light (450–495 nm), a high-energy visible wavelength emitted by digital screens, has been implicated in modulating cognitive functions, including reaction time(Alkozei et al., 2016). While chronic exposure is often studied for its disruptive effects on circadian rhythms(Chang et al., 2015), the acute impact of short-duration blue light on psychomotor performance remains underexplored. This study investigates how brief, controlled blue light exposure influences reaction time across diverse demographic and device-use groups, addressing gaps in existing literature regarding individual variability and occupational exposure thresholds.

Aim: to assess if acute blue light enhances reaction time for clinical use.

Materials and methods. The study involved 38 participants (ages 14–57; mean = 28.4 ± 10.2 years), stratified by occupational screen exposure (<4 hrs/day [low], 4–6 hrs/day [moderate], >6 hrs/day [high]). Participants completed baseline reaction time tests via the Human Benchmark platform (3–5 trials, brightness 50–70%, blue light filters disabled), followed by 20 minutes of typical device use (laptops: n=22; phones: n=16) under dim lighting (optional; 4–7 PM recommended). Post-exposure tests were conducted under conditions identical to those of pre-exposure. Data analysis included paired t-tests for pre/post comparisons and ANOVA for group differences, with outliers examined via case studies.

Results and their discussion. The difference between pre-exposure (mean = 299.475 ms) and post-exposure (mean = 272.7 ms) measurements was significant at $p < 0.05$.Participants with high occupational exposure (>6 hrs/day) demonstrated greater improvements (mean $\Delta = 32.4$ ms) vs low-exposure groups (mean $\Delta = 18.9$ ms), $p<0.01$ Device type and age also influenced outcomes, with laptop users (mean $\Delta = 36.2$ ms)$p<0.05$ and younger participants (mean $\Delta = 30.1$ ms) showing stronger effects, $p<0.05$ Outliers (e.g., Participant Dim, +56 ms) highlighted individual variability.

Conclusion. Short-term blue light exposure under dim lighting improves psychomotor vigilance evidenced by the response significant acceleration in the reaction time test. This effect holds clinical potential for enhancing alertness in occupational activities, e.g. in surgery, in neurological rehabilitation, and shift-work performance. Further research should address individual variability and long-term safety. The present study of a controlled exposure offers a promising, non-invasive tool for optimizing psychomotor performance.