The Investigation of Photobiomodulation as a Factor to Impact Physical Damage, Psychological Behavior, and Metabolic Activity Following a Traumatic Brain Injury in Drosophila melanogaster

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In this pandemic, blue light has become a common part of everyday life through LEDs and computer monitors. The researcher hypothesized that a severe exposure to blue light before a Traumatic Brain Injury (TBI) would be harmful. Therefore, this research examined the effects of various light conditions on Drosophila melanogaster after a TBI. Adult male Drosophila was isolated into the following light conditions for seven days: 0.5-hour blue/11.5-hour yellow/12-hour dark (BYD); 12-hour yellow/12-hour dark (12YD); 12-hour blue/12-hour dark (12BD); 12-hour white/12-hour dark (12WD); 24-hour dark (24D); 24-hour yellow (24Y); 24-hour blue (24B); 24-hour white (24W). Then, a TBI was induced through a homemade device; and mortality, mobility, behavior, and metabolic activity were examined after twenty-four hours. Afterward, the researcher modified ReadPlate code and used it to measure metabolic activity through ImageJ software. A minimal or nonexistent blue light exposure indicated decreased mortality and increased mobility compared with the 12WD group. The 24D group had the longest first-interaction time while blue light tended to shorten interaction time. The TBI caused hypermetabolism (highest in 24B; lowest in 24D) and required additional nutrition for survival. In conclusion, moderate or excessive blue light exposure caused increased mortality and decreased mobility after a TBI. Blue light exposure also shortened interaction time--possibly representing aggression--and affected metabolic status after a TBI. Further studies should be pursued to confirm the underlying mechanisms as well as the location of blue light receptors to prevent these harmful effects in risky populations, such as babies, sports players, seniors, and military personnel.