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PROBING EYE ADAPTATION IN ANALOG MISSION ENVIRONMENTS

Abstract

The study delves into the intricate process of eye adaptation crucial for human survival in low-light environments, particularly relevant in the context of space exploration. Conducted within the simulated conditions of the AATC habitat, the research focuses on dark adaptation, employing a methodology derived from "Dark Adaptation Testing" by Kehat and Perlman. Participants undergo a controlled regimen of light exposure, commencing with a 3-minute exposure to bright light to initiate rhodopsin bleaching, followed by a 20-minute period of complete darkness to facilitate dark adaptation. During the dark adaptation tests, participants fixate on a steady red light while detecting variations in intensity of a green test light, modulated from zero intensity. The lowest detectable intensity of the green light is recorded as a measure of dark adaptation. The experimental setup, situated within a darkened room, features two LEDs controlled by an Arduino Uno, ensuring precise manipulation of light stimuli. Calibration of the diode power output is meticulously conducted prior to experimental trials. Preliminary findings indicate consistent results with referenced literature, validating the effectiveness of the experimental approach. This research holds significance for space exploration, offering insights into optimizing visual acuity and performance in low-light environments encountered during missions. Understanding eye adaptation in space conditions is imperative for ensuring the safety and efficiency of astronauts during prolonged missions. By elucidating the mechanisms underlying dark adaptation, this study contributes to the broader goal of advancing human exploration beyond Earth's confines. Further exploration in this area promises to refine strategies for mitigating the challenges posed by the unique visual conditions encountered in space, ultimately facilitating the realization of ambitious space exploration endeavors.