Trichromatic and Dichromatic Relative Sensitivity to Green Light in Mild Hypoxia.

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Introduction

Several studies have found a relative decrease in sensitivity to green light using flicker photometry in hypoxic environments equivalent to altitudes above 4000 m and using participants with normal color vision. Because there is little information available for mild hypoxic environments (less than 4000 m) that included color-deficient participants, we examined the effect of mild hypoxia on the relative sensitivity to green light using color-normal and color-deficient participants.

Procedure

Relative sensitivity to red and green lights was measured using the Medmont C100 at ground, 2440 m, and 3780 m in an altitude chamber. Twenty-four individuals participated in the 3780 m trial, 32 participated in the 2440 m trial, and 14 participated in both trials. The ratio of color-normals to the various color-defectives was approximately the same for all 3 trials with 6 color-normals:2.5 deuteranopes:3 deuteranomalies:2 protanopes:1 protanomaly. The red-green luminance ratio was determined from the average of 4 settings measured once during the 4-hr trial.

Results

Consistent with previous studies, color-normals and anomalous trichromats showed a small, but significant, decrease in sensitivity to the green test light at 3780 m compared to ground performance. However, their settings at 2440 m were similar to their ground values. In contrast to the trichromatic results, the dichromatic mean settings at either altitude did not differ from their values at ground.

Conclusions

Our results show that the relative decrease in sensitivity to green light occurs in mildly hypoxic environments that are equivalent to altitudes greater than 3500 m. The lack of any change in the relative sensitivity to the green light for the dichromats and the decrease in sensitivity for the trichromats at the higher altitude suggests that the hypoxic effects are taking place near the second adaptation site of the L- and M-cone inputs into the achromatic channel.