CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)

Lekha R. Duvvoori

Project Number

J1211

Project Title

I See What Eye See: Measuring Low Light Color Vision, Assessing Its Impact on Web Design and in Daily Life

Abstract

Objectives/Goals

To investigate differences in low light color vision between genders and ages, so that if older adults have trouble seeing color in low light, we can help people be aware of this.

Methods/Materials

A low light apparatus was created by covering a lamp and creating a card slide with pin point openings beneath. Consented subjects were placed in a dark room, and very low light gradually increased until they were able to see numbers on Ishihara Color Plates which have color dots. The process was replicated over 4 plates. The number of pinpoints of light intensity was calibrated against a photographer's light meter.

Results

As hypothesized, the ability to see color is affected by the amount of light, and people are able to distinguish objects before their colors. The results from over 50 subjects between 6 and 75 years, supported my hypothesis that older adults have more difficulty with low light color vision. Over 30 years, there is an increased difference between subjects in their ability to see color in low light. Gender difference was not significant.

Conclusions/Discussion

In my research, I did not find much written on low light color vision. Color is constantly used in daily life without considering low light effects. My findings suggest that we should be careful in choosing colors as many people, especially the elderly, have difficulty distinguishing colors in low light. When designing web pages, apps or even traffic signs, lighting and color choices matter. When testing for safety among pilots, truckers and others, we need to also test for low light color vision and not just color blindness. Optometrists and doctors could use simple tests for low light vision.

Summary Statement

I developed an apparatus to measure color vision in very low light and observed that as people age, they need brighter light to distinguish colors, requiring changes in how we use color in technology and daily life.

Help Received

Scott Lance, Gilroy Photographer and artist, for a talk on light, loan of color correcting lamp and light meter; PD Rohan, Science Teacher, Mount Madonna School; Brother Kavi for recruiting high school test subjects; Mother for logistical support; Father for information on using spreadsheets for graphs.