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Color vision in normal aging, congenital deficiency and retinal disease

Significant advances in understanding the genetics of color vision make it possible to account for a great deal of the observed variability in both normal trichromats and in congenital color deficiency. Advancements in shading evaluation systems additionally yield within subject variability and hence more accurate assessment of both red/green (RG) and yellow/blue (YB) chromatic sensitivity with reliable classification of the subject's class of color vision (i.e., normal trichromatic color vision, deutan-, protan- or tritan-like and acquired deficiency). The severity of color deficiency can also be quantified more accurately with reliable separation of RG and YB loss leading to clear distinction between congenital and acquired loss. A third element that has contributed to the recent flurry of interest in color vision is the availability of reliable data that describe the effect of normal aging on RG and YB chromatic sensitivity. Such advances have made color vision assessment more attractive as a diagnostic tool for early detection of diseases of the retina such as age-related macular degeneration (AMD) and glaucoma and systemic diseases that can also affect visual function such as diabetes. The outcome of conventional tests of color vision will be reviewed and data that describe the variability observed within normal trichromats and in subjects with congenital deficiency will be presented. This improved understanding has significant effects on color assessment and the establishment of minimum color vision requirements within visually-demanding occupational environments. Studies that led to color vision changes as a result of normal ageing and the application of these to early detection of acquired loss of chromatic sensitivity will be discussed. Finally, results of extensive, clinical studies designed to detect the earliest changes in color vision in diabetes, glaucoma and AMD will also be presented.

Biography

John Barbur is a Professor of Optics and Visual Science at Applied Vision Research Centre at City, University of London. He combines fundamental vision science with applied and clinical research, which underpins a long record of research achievement and wider impact. He works on camouflage for the royal signals and radar establishment led to insights into the processing of luminance and color signals that have important applications in color vision assessment. These and other studies led to the development of several Advanced Vision and Optometric Tests (AVOT), initially for research studies and later for more precise assessment of vision in visually-demanding environments such as aviation and rail transport. The CAD (Color Assessment and Diagnosis) is now used throughout the world to assess pilots, firefighters, seafarers, police officers and air traffic controllers.

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