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ORIGINAL ARTICLE

Background chromatic contrast preference in cases with age-related macular degeneration

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KEYWORDS
Low vision rehabilitation;
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Abstract
Objective: To identify background chromatic contrast preferred subjectively by patients with age-related macular degeneration (AMD).
Methods: Prospective observational case series. Study subjects with AMD were recruited and compared to a control group of study subjects with normal vision. Study subjects were presented with letter size printed sheets of white paper with randomly typed 2 M size standard black optotypes. Chromatic contrast was created with colored plastic sheets positioned on top of the black on white printed sheets. The 4 major color hues which were selected for testing were blue, yellow, green and red. Study subjects were required to identify background contrast best preferred for viewing at the end of 4 trial sequences.
Results: 40 subjects with AMD were recruited together with 57 study subjects with normal vision. In either the control group or the group with AMD subjects the majority's chromatic preference for background was yellow (56.14%, $p = 0.42$ and 71.67%, $p = 0.006$ respectively) with subjects with AMD preferring yellow color background significantly more than subjects with normal vision ($p = 0.0002$).
Conclusions: Yellow color background seems to be preferred by most of healthy and AMD eyes. This preference may be modulated by factors such as the yellow-blue vision processing channel and/or luminosity differences produced by selectively transmitted light.

PALABRAS CLAVE
Rehabilitación de la baja visión;
Visión del color;
Contraste cromático;
Sensibilidad de contraste

Preferencia de contraste cromático de fondo en casos con degeneración macular asociada a la edad

Resumen
Objetivo: Identificar el contraste cromático de fondo preferido de modo subjetivo por los pacientes con degeneración macular asociada a la edad (DMAE).

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Métodos: Estudio prospectivo observacional. Se seleccionó a un grupo de pacientes con DMAE con DMAE para ser comparado con un grupo control de pacientes con visión normal. A ambos grupos de pacientes se les presentaron hojas de papel blanco impresas con optotipos negros estándar de tamaño 2 M, en secuencia aleatoria. Se creó contraste cromático mediante láminas de plástico de colores situadas por encima de las hojas impresas en blanco y negro. Se seleccionaron para la prueba los 4 tonos de colores principales: azul, amarillo, verde y rojo. Se solicitó a los pacientes bajo estudio que identificaran el contraste de fondo preferido para la visión, al final de 4 secuencias de prueba.
Resultados: Se seleccionaron 40 pacientes con DMAE, y 57 pacientes con visión normal. Tanto en el grupo de control como en el grupo de pacientes con DMAE la preferencia cromática mayoritaria fue para fondo amarillo (56,14%, p=0,42 y 71,67%, p=0,006 respectivamente), teniendo los pacientes con DMAE una mayor preferencia por el color amarillo que los pacientes con visión normal (p=0,0002).
Conclusiones: El fondo de color amarillo parece ser el preferido por la mayoría de pacientes, tanto sanos como enfermos. Esta preferencia podría modularse mediante factores tales como el canal de procesamiento de la visión amarillo-azul y/o las diferencias de luminosidad producidas por la luz transmitida selectivamente.

Introduction

Visual perception is a multi-dimensional sense encompassing detection, resolution, recognition and color identification abilities of targets presented for viewing. Visual perception is dependent on detection of hue differences between the target observed and its background. Chromatic contrast facilitates visual perception and chromatic contrast sensitivity seems to be superior to black versus white contrast sensitivity.[1] Aside from the psychophysical measures which qualify such abilities, functional vision measures provide the true utility value of such abilities. Subjective chromatic contrast preference is such a functional vision measure affected not only by psychophysics but also by a variety of other factors. Attempts made in the past to relate subjective chromatic contrast preference to objective psychophysical outcome measures did not produce conclusive evidence to support any prescribing protocol of chromatic contrast.[2] A logical approach to produce a prescribing protocol for subjective chromatic contrast preference would be to separate the assessment into two parts: assessment of abilities to identify chromaticity of targets against an achromatic background in order to quantify chromatic preference of targets and second, assessment of achromatic targets against various chromatic backgrounds to determine chromatic preference for backgrounds. It is the aim of this study to clarify the above second premise.

Methods

The study was designed as a prospective non randomized observational case series. Patients were identified prospectively as they presented to one of the clinics run by one of us. We selected for this study subjects with previously diagnosed age-related macular degeneration (AMD) and as a control group, subjects with normal vision.

Inclusion criteria for the subjects with AMD group were documented stable macular disease, low vision in both eyes and best corrected visual acuity (BCVA) of 20/50–20/400 in the better eye (test eye) and older than 45 years of age. Excluded from the study were subjects with cognitive impairment, other retinal disease, color blindness, previous retinal surgery (excluding laser), significant media opacity or contraindications to dilation drops. Inclusion criteria for the group of subjects with normal vision were no significant ocular pathology, BCVA better than 20/50 in the poorer eye and age older than 45 years. Exclusion criteria were similar to the group of subjects with AMD.

Demographic details, refraction and BCVA (with ETDRS – Early Treatment Diabetic Retinopathy Study Charts)[3] data were collected for both groups. Contrast sensitivity was assessed with the Contrast Sensitivity Function Test (VCTS) chart.[4] Screening for color blindness was done using Ishihara color plates.

Chromatic contrast was created with colored overlays (www.irlen.com) of plastic sheets positioned on top of the black on white printed sheets (Fig. 1). It was the specific intention of the study protocol to use commercial chromatic sheets widely available from a commercial supplier in order to facilitate duplication of the study. The four major color hues were selected for testing. Blue, yellow, green and red colored overlays were used for testing. Colored overlays were positioned to cover only half of the testing sheet (Fig. 1) and hence creating two distinct side-by-side areas for evaluation of two choices. Colored overlays were presented in a random sequence. Those selecting black over white contrast as preferred over chromatic contrast were excluded from the study. The intent of the study was to test color preference among those who preferred chromatic contrast.

Subjective chromatic preference testing was done in a clinical setting. Normal indoor background illumination was supplemented with a lamp with a 60 W frosted incandescent bulb positioned at about 1 m from the testing sheet at 45° angle of incidence. This illumination source produced 235 LUX at the testing sheet plane. Viewing distance was allowed to match best correction for near vision available to the