Vol: 02, Issue 04
OPHTHALMOLOGY PAKISTAN

AGE RELATED DECREASE IN CONTRAST SENSITIVITY IN NORMAL POPULATION

Author's Affiliation

Nida Haider

Dr. Tehseen Mahju

Correspondence Author:

Nida Haider

Lecturer/ Coordinator
School of Optometry,
University of Faisalabad.

Purpose: The purpose of this study was to determine whether old age is associated with a decrease in contrast sensitivity.

Methods: A total of 70 subjects were taken ranging in age from 15 to 70 years of age. Age groups were made (group 1: 15-25, group 2: 26-35, group 3: 36-45 and so on till 75). Contrast sensitivity was measured on Pelli Robson Contrast Sensitivity chart in all of the subjects

Results: Group 1 (15-25 years) showed normal contrast sensitivity which is 1.50-1.65 on Pelli Robson. Group 2(26-35 years), Group 3(36-45 years) and Group 4(46-55 years) showed similar results i.e. normal contrast sensitivity. However a decrease was seen in group 5 (56-65 years) and group 6 (66-75 years). The decrease seen in subjects above 55 years of age was around 1.35 and a further decrease was seen in subjects aged over 70 years.

Conclusion: The age related decrease in contrast sensitivity was seen in subjects aged over 60 years confirming that contrast sensitivity decreases with increasing age.

INTRODUCTION

The ability to perceive slight changes in luminance between regions which are not separated by definite borders is contrast sensitivity.[1]

Objects can generally better be distinguished from each other or from their background, if the difference in color or luminance is large.[2] Contrast can be defined as "The ratio of the difference between the maximum and the minimum luminance (L) of a test stimulus and the sum of the maximum and minimum luminance"[3], or

$$L_{max} - L_{min} / L_{max} + L_{min}$$

The contrast threshold is the amount of contrast needed by a person to see a target. The detection threshold for a target is usually the lowest contrast threshold. In clinical care setting as well as during research, the term "contrast sensitivity" is used instead of contrast threshold which is simply the reciprocal of the threshold.

Thus a person with a low threshold will have high sensitivity and vice versa. Both, the contrast sensitivity and contrast threshold are expressed on a logarithmic scale.[4]

Contrast sensitivity changes throughout adulthood. Recent reports indicate that with advancing age, contrast sensitivity decreases in normal healthy eyes for medium and high frequencies. The cause of this loss of contrast sensitivity changes with age can be broadly categorized into:

1. Optical Changes
2. Neural Changes

Optical changes include decreased retinal luminance and increased intraocular light scatter. Neural changes include neuronal cell loss and degeneration. These changes have been shown to be to occur from retina to cortex.[5]

Factors such as age, blur, retinal eccentricity, glare and changes in levels of luminance affect contrast sensitivity. Some clinical conditions like glaucoma, cataract, retinitis pigmentosa, amblyopia, refractive errors, and macular degeneration etc. decrease contrast sensitivity.[6]

There are variable methods available for the measurement of contrast sensitivity. These methods include computer controlled video displays, optical projectors and photographic plates.

The contrast-sensitivity tests used these days can be classified as (i) grating tests and (ii) letter tests. A number of chart based systems have become available today. These are cheaper, less bulky and allow rapid assessment of CS. One example of these is the Pelli-Robson chart.[7] A number of other charts are also available like CSV-1000 Charts, Melbourne edge test etc.

Contrast-sensitivity tests can provide useful information by revealing some conditions where visual loss cannot be identified through routine visual acuity tests and thus provide a better explanation of visual problems faced by persons with vision impairment.[8]

METHODOLOGY

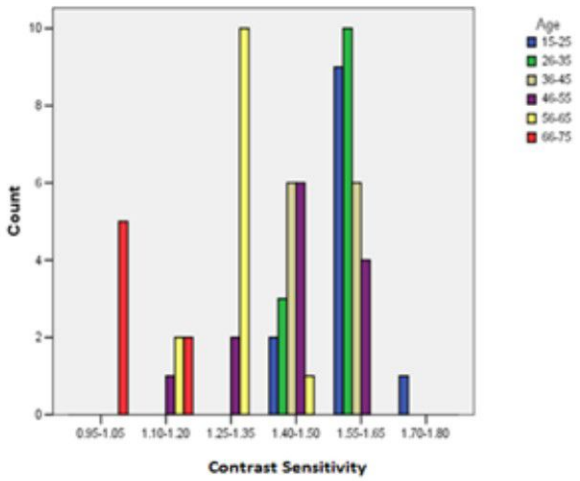
Study Design: Cross-sectional survey

Equipments used: Snellen visual acuity E chart, Pelli Robson Contrast Sensitivity Chart

Population and sample size: Normal population aged 15-75 years and above. 70 subjects were included in the study. People with decreased visual acuity due to any ocular pathology e.g. cataract, glaucoma, ARMD etc. were excluded

Data collection method: Data was collected by screening subjects of different ages, without any ocular pathology, by taking their visual acuity and measuring their contrast sensitivity by filling the proforma

RESULTS



The results depicted that the contrast sensitivity measured in normal subjects was decreasing as the age was increasing. The subjects aged 15-55 showed normal contrast values which is 1.65 log unit and above. Subjects in age range of 55-65 showed lower contrast 1.25-1.35, some subjects of this range have contrast in the range of 1.10-1.20. Subjects in age range of 66-75 showed even lower contrast i.e., 0.95-1.05.

DISCUSSION

A study in Japan was done to see age-related changes in contrast sensitivity in a population aged 40 to 79 years. These middle to elderly aged subjects showed a significant decrease. The results were statistically analyzed relative to age. The results suggested that for aged groups, visual acuity tests alone can prove insufficient as visual performance test and contrast sensitivity tests may have to be supplemented especially for higher frequencies.[9]

Different studies conducted to measure contrast sensitivity thresholds over a range of spatial and temporal frequencies have demonstrated a significant reduction in contrast sensitivity among the older age group. The probable reason for this was postulated as increasing age resulting in neural loss within the visual pathways[10,11,12]

In the current study, age related decrease in contrast sensitivity was measured using Pelli Robson Contrast Sensitivity chart. A total of 70 subjects were taken ranging in age from 15 to 70 years of age. Six groups based on age were created. Group 1 included subjects ranging in age from 15-25 years. Group 2 included subjects aged 26-35 years. Group 3 had subjects from 36-45 years of age. Group 4 consisted of subjects from 46-55 years of age, group 5 from 56-65 and group 6 included subjects ranging from 66-75 years of age. Subjects included in age groups 1 to 4 had normal contrast sensitivity values which ranges from 1.50 to 1.65 or above on Pelli Robson chart. However subjects in group 5 showed decreased contrast sensitivity i.e., 1.35 to 1.40. My study results show that contrast sensitivity reduces in subjects aged over 60 years and decreases even further for subjects aged over 70 years.

The results of my study agree with previous studies showing that contrast sensitivity declines with increasing age i.e., older adults have decreased contrast sensitivity as compared to young aged population.

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