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Variation in colour perception among normal individuals- A survey

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ABSTRACT

Ishihara test consist of coloured plates it consist of circle of dots appearing in different size and different colour. Within the pattern are dots which form a number or shape clearly visible to those with normal color vision, and invisible, or difficult to see, to those with a red-green color vision defect. Other plates reaveal number only to those with a red/ green colour deficiency and be invisible to those with normal red green colour vision and normal test consist of 38 plates. study is mainly intended to evaluate the colour perception among normal individualsThis was mainly intended to determine the variation in colour perception among normal individuals.

Keywords*: Ishihara's, colour, perception, variation, age*

I. INTRODUCTION:

The Ishihara test is a color perception test for red-green color deficiencies, the first in a class of prosperous color vision tests called Pseudo Isochromatic Plates ("PIP"). It was denominated after its designer, Dr. Shinobu Ishihara, a pedagogic at the University of Tokyo, who first published his tests in 1917 (1). The test consists of a number of coloredplates, called Ishihara plates, each of which contains a circle of dots appearing randomized in color and size.(2). Within the pattern are dots which form a number or shape limited visible to those with color vision, and invisible, or arduous to visually perceive, to those with a red-green color vision defect(3).Other plates are intentionally designed to reveal numbers only to those with a red/green color vision deficiency, and be invisible to those with red/green color vision. The full test consists of 38 plates, but the subsistence of a rigorous deficiency is customarily ostensible after only a few plates (4).There is an Ishihara test consisting 10, 14 or 24 test plates.). Being a printed plate, the precision of the test depends on utilizing the felicitous lighting to illuminate the page(5). A "daylight" bulb illuminator is required to give the most precise results, (6) of around 6000-7000K temperature (ideal: 6500K, Color Rendering Index (CRI) >90), and is required for military color vision screening policy. Fluorescent bulbs are many times utilized in school testing, but the color of fluorescent bulbs and their CRI can vary widely. Incandescent bulbs should not

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be utilized, as their low temperature (yellow-color) give highly erroneous results, sanctioning some color vision deficient persons to pass.(7)

Opportune testing technique is to give only three seconds per plate for an answer, and not sanction coaching, physically contacting or tracing of the numbers by the subject. The test is best given in arbitrary sequence, if possible, to reduce the efficacy of prior memorization of the answers by subjects. Some pseudo-isochromatic plate books have the pages in binders, so the plates may be rearranged periodically to give an arbitrary order to the test.(8)

Since its engenderment, the Ishihara Color Optical incapacitation Test has become commonly used ecumenical because of its facile use and high precision. In recent years, the Ishihara test has become available online inpristine paper version. Though both media utilize the same plates, they require different methods for a precise diagnosis. The Amalgamated states Navy utilizes the Ishihara plates (and alternatives) for color vision screening. The current passing score is 12 correct of 14 red/green test plates (not including the demonstration plate). Research has shown that scores below twelve denote color vision deficiency, and twelve or more correct betoken mundane color vision, with 97% sensitivity and 100% specificity.

The sensitivity of the Ishihara test varies by the number of plates sanctioned to pass, which can vary by institutional policy. Sensitivity additionally may be influenced by test administration (of lighting, time sanctioned to answer) and testing errors (coaching by administrators, smudges or marks made upon the plates). (9). Visual impairment and optical incapacitation has remained as one of the most consequential health issues in the Eastern Mediterranean countries [10], as there are 40.5 million living with visual impairment and 5 million afflicted with visual impairment which in some cases could have been obviated with prophylactic and screening measures. World Health Organization has estimated the prevalence and causes of visual impairment in the region [11].

Congenital colour vision defects affect 8% and 0.5% of males and females, respectively on an ecumenical substratum. (12)The high prevalence of colour visual impairment necessitates early diagnosis, since these individuals with this disorder cannot accurately make colour discrimination which will impact their performance both personally and professionally [13]. Ergo, colour vision assessment is essential in a visual examination(14). Many tests have been developed and distributed ecumenical to diagnose colour vision defects. Colour defect tests are performed mostly for three goals, the first for screening for the presence of congenital or acquired defects, the second to diagnose the type and of the defects and the third to assess the impact of the defect on a concrete vocation or employment [15].

Generally verbalising, a precise, facile, and cost efficacious test is needed to diagnose visual colour defects accurately [16].The Ishihara plates are commonly used as an initial occupational screening test for color vision. While effective at detecting red-green deficiencies, the color deficient subject can learn the test using different techniques. (17). There are, however, several disadvantages in the present arrangement of the plates. A modification of the test, involving the rearrangement of the order of the plates, is presented which, together with a new recording chart, simplifies both the administration and the interpretation of the test.(18).

II. MATERIALS AND METHODS:

A cross sectional questionnaire survey was carried out to know variation in colour perception among normal individuals. The following questionnaire is given below.

Name:

Age:

Gender: M/F

Vision: Normal / Myopia

Colour vision: Normal / Difficulty

Following which the selected ishihara's chart was given to the study population and the time taken for identification of the number in the ishihara's chart were noted as follows.

Immediate recognition ( )

10 Seconds ( )

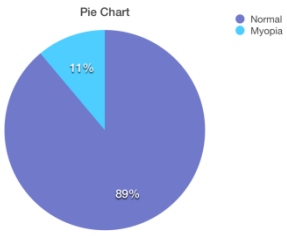
10- 15 seconds ( )

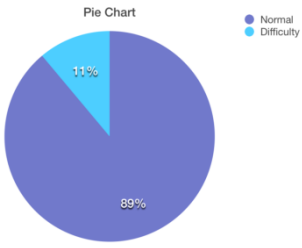
> 15 seconds ( )

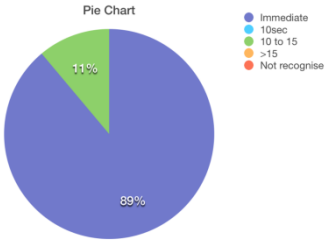
Not recognised ( )

III. Results:

GRAPHS:



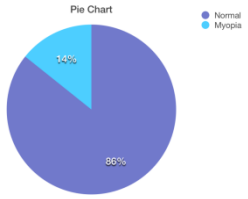


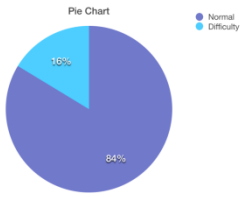


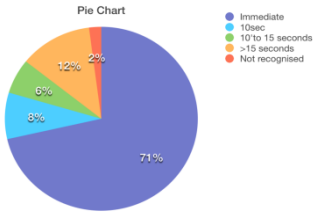
Age group 0 to 20

Normal vision(chart 1a) Colour vision(chart1b) Recognition(chart1c)

Age group 20-40

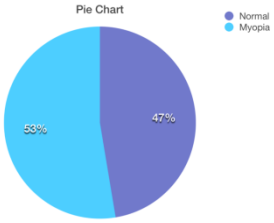


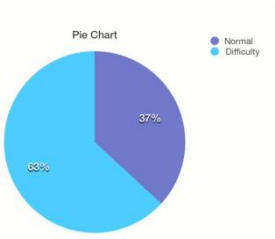


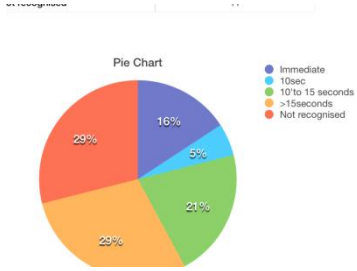


Normal vision(chart2 a) Colour vision(chart2 b) Recognition(chart2c)

Age group 40-70







Normal vision. (Chart 3 a) Colour vision (chart3 b)Recognition (chart 3c)

IV. Discussion:

There are a number of available colour vision tests but all have some limitations, and there is a need for a reliable test that can be performed without any specific clinical settings, expensive tools or a specially trained technician (19). Ishihara's test must be quick to administer and easily scored to assess the type and severity of colour vision defects .Based on this, the study was carried out to know the variation of colour perception among normal individuals.

In this study 100 individuals were given the questionnaire, the data was then analysed and tabulated. In the age group of 0-20(chart 1a) majority 89% had normal vision and (11%) were myopic.Related to colour vision (chart 1 b) 89% were normal and 11% had difficulty in answering. According to the time of recognition of the numbers (chart 1c) 89% gave immediate response and the other 11%recognised with in 10-15 seconds.

Age group of 20-40 years, (chart 2a)86% had normal vision and 14% of people were myopic and(Chart 2b) 84% of people had normal colour vision and 16% of people had difficulty in answering. Regarding the time of recognition (Chart 2c)71%gave a immediate response,8% of people recognised with in 10 seconds, 6% of people answered with in 10 to 15 seconds, 12% of people recognised the chart more than 15 seconds and 2% did not recognise the chart.

Age group of 40-70 (Chart3a) 53% were myopic and 47% were normal. Related to Colour vision (chart 3b) 63% had difficulty in colour vision and 37% were normal, (Chart 3c) 16% of recognised immediately whereas 5% of people recognised the chart within 10 seconds, 21% of people recognised the chart with in the range of 10 to 15 seconds, 29% recognised the chart at 15 seconds and 29% of people did not recognise the chart.

This study showed that the age group <20 years there are more number of population with normal vision, the colour perception was normal and fast, all could recognise the numbers. In the middle aged group that is 20-40 years, as the results show there were population with normal vision but less than that of the age <20, there were population with delay in recognition time, some were not able to recognise the numbers at all. At last the elder age group, showed more number of population with myopia,more number of population that couldn't identify the numbers at all. So the study proved that the colour vision and recognition capacity is increased among adolescence around 20 years of age.(20) As the age increases the time for recognition also increased. This shows that there is a significant reduction in the colour perception among elderly individuals. (21).This finding is correlating with the study done by Paramei GV, Oakley B(22) that chromatic sensitivity improves in adolescence, reaches a maximum around 30 years, and then undergoes a gradual decrease. For advancing age, sensitivity decline in all chromatic systems.

Our study showed that there is definite perception variation in colour vision. As the study done by Caitlin Anderson et al (23) in Drosophila flies clearly state the genetic basis in the perception variation. The expression of genes like Ss stochastic gene, klu gene and most known Rhodopsin gene are all involved in the normal variation of colour perception. Even in twins the genetic expression is different and the colour perception is different (24).

V. Conclusion:

Ishihara's chart test is the best known and easy to perform test among common population. With the basic of variation in the stochastic gene expression and rhodopsin gene expression, this study was done and found out that the age is a very important factor for the colour perception among normal individuals. As the age increases the colour perception is decreased and the colour perception is more in adolescent age group.

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