



Original Article

Effect of Colour Vision Deficiencies on Daily Life.

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ABSTRACT:

PURPOSE: The main objective of this study was to determine effects of colour vision deficiency on daily life activities and difficulties that colour vision deficient experience while performing everyday tasks.

STUDY DESIGN: Descriptive type/cross sectional study.

METHOD: Fifty subjects with colour vision deficiency of age 15 up to 45 years completed a psychosocial proforma and questionnaire regarding the difficulties in daily life. Visual acuity of patient was taken using ETDRS Chart and Bailey Lovie chart at distance. D15 test was used as diagnostic tool to determine the category of colour vision deficiency.

RESULTS: Statistically significant results were found for difficulties in daily life activities. Out of 50 colour blinds 66% (33) were male and 34% (17) were females. Protanopes were 40% (20), deuteranopes were 52% (26) and tritanopes were 8% (4) with mean age of 26.72 years.

Colour blind subjects with Protanopia and Deuteranopia feel more difficulty in daily life activities as compared to subjects with Tritanopia. Colour blinds feel difficulty in selection of clothes, recognizing paints, cooking, and natural colours, playing games, recognizing coloured prints, charts and slides. They could be eliminated from their job due to colour vision deficiency. Tinted sunglasses are not beneficial to them.

KEYWORDS: Colour blindness, Colour vision deficiency, Everyday tasks, Everyday work.



INTRODUCTION:

Colour vision deficiencies are a group of conditions in which a person cannot perceive colour. Colour is related with electromagnetic radiation of different range of wavelength which can be seen with human eye. Colour is detected by red, green and blue cone cells present on retina and signals are produced. Brain mixes all the signals to generate wide spectrum of colour that we detect.

Colour vision is clinically classified into three basic types: Protanopia, when person cannot perceive red colour, Deutanopia, when a person cannot perceive green colour and Tritanopia, when a person cannot perceive blue colour. Absolute colour blindness is called achromatopsia. In this a person cannot perceive all three colours.² All colour blind people except deutanopes said that they have very difficulties in performing everyday task because nowadays colour is used in each material and print. This study contains that colour blind people also have difficulty in finding jobs so there should be well mannered system and law that protects all abnormal people and provide them job without any discrimination. They have difficulty in colour detection for example ripeness of fruits, cooking meat and nature colours.³ Prevalence of colour blindness in practitioners of esthetic dentistry in Karachi was 4.60% out of which 10% were males and 1.60% were females.⁴ A study conducted in Singaporean children shows that 5.3% boys and 0.2% of girls were colour deficient.⁵ In India a study conducted on the school children shows that prevalence of colour blindness in males was 3.16% and in females was 0.40%.⁶ In this study daily difficulties of colour blind people was checked by PV 16 test and by asking a questionnaire. The study reveals that congenital colour blind people take much time for work completion. Blind people were assessed to complete visual display terminal having colour naming test and there was no limit of time for task completion but there was contrast between time and error rate. The group of colour blinds took long time to recognize the individual colours on VDT. The response times of colour blind people were 10 to 52% slow as compared to the normal colour people.⁷

Steward and Cole presented a report on colour related difficulties of everyday life. Colour deficient people presented difficulties in everyday life involving colours in their jobs. Colour blinds feel difficulty in choosing career and sometimes they are eliminated from their occupation. Miles et al interviewed 27 colour blind salesman who claimed to have problem in selling coloured things and had found ways to overcome the difficulty.⁸ In 1798, John Dalton was the first scientist who described experience of his own colour blindness. Colour blindness can be congenital and acquired. Colour blindness in case of red green colour deficiency is characterized by X-linked recessive inheritance. It is present

more in males than females and 0.8% of women are carriers.⁹ Colour blindness also causes problems in studies like one study was conducted on 2000 medical students of different medical colleges in Faisalabad. 750 were males and 1250 were females. Out 750 males 18 were colour blind (2.4%) and out of 1250 females only 56 were colour blind (4.48%). These colour blind students feel difficulty in recognizing slides, failing to examine the patients, lab instruments and specimens.¹⁰

A study shows that colour blind medical practitioners feel difficulty in recognizing redness of inflammation, blood in body products. They feel difficulty in seeing jaundice and cyanosis. Colour blind optometrist can also face some problems of seeing redness of conjunctiva, recognizing redness of optic nerve head and ocular adnexa. It would be helpful for all the students to have their colour vision deficiency assessment so that they could not face difficulties in future career.¹¹

People with colour blindness cannot drive safely. According to a study difficulty in recognizing road traffic signals is 30%, and problem in seeing brake lights of a car is 13%. It is claimed that 33% colour blindness affects career choice and difficulty in jobs is 25%. The overall problem in everyday life colour judgments is 75%. It is also a handicap in creative arts and graphics.¹² Clothes matching is also a main problem for colour blind people. Paper reveals that a new computer based technology was introduced for cloth matching to help colour deficient people by using a pair of images of two different clothes taken by a camera. Colour and texture matching process was done by using a laptop which maintained colour without any texture and clothes with various colours and complex texture pattern.¹³

A study was done to find out whether coloured sunglasses could help colour deficient people in detecting traffic signals or not. But protanopes and deutanopes got some problems in detecting yellow and green signals with these tinted sunglasses. So the use of these sunglasses was a risk factor during driving.¹⁴ A cross sectional study done on the 633 clinical lab technologists and students to detect the colour vision deficiency by the Ishihara test and coloured pictures shows that there is wide range of errors in results by medical lab technologists. So colour blinds should avoid choice of job as medical lab technologist.¹⁵

A study was done to find out whether there is a correlation between colour vision deficiency and choice of occupation and job. 6422 males and 6112 females from British birth cohort were assessed from birth to 33 years. D15 test was done at the age of 11 years. Total 431 males were colour vision deficient who pursued to select the occupation in which colour was an essential component. Eight men out of 141 men were in armed forces and firefighting services at 33 years but they were also under represented. Due to colour vision deficiency no men were selected for the job of electrical and electronic engineering. So all the colour vision subjects were

guided to select the occupation according to their deficiency.¹⁶

MATERIAL AND METHODS:

It was an institution based study conducted on 50 patients having young age from 15 to 45 years and only colour blind people were included in this study. This study explained the difficulties of colour blind people in daily life activities. Data were collected by a self-designed proforma and questionnaire. All the data were entered and analyzed using Statistical Software SPSS Version 22.00.

RESULTS:

Difficulties in daily life activities	Protanopes		Deutanopes		Tritanopes		p-values
	-20		-26		-4		
	Yes	No	Yes	No	Yes	No	
Cloth colour	14	2	19	7	0	0	0.001
Cosmetic colour	13	7	15	7	0	0	0.002
Paint colour	13	3	15	11	0	4	0.009
Flower colour	14	4	14	7	0	4	0.01
Fruits and vegetable colours	14	6	14	12	0	4	0.03
Cooking colours	11	9	11	11	0	4	0.002
Sports colour	16	4	11	sometime	0	4	0.002
Skin colour	14	4	7	3	0	4	0.001
Medicines colour	9	11	8	7	sometime	0	0.002
Traffic signal lights	13	7	16	10	0	4	0.05
Warning lights on barricades	9	4	14	5	0	4	0.014
Choice of career	7	8	15	2	1	3	0.065
Job difficulty	11	7	15	5	0	4	0.05
Difficulty in present job	10	8	19	0	0	4	0.02
Difficulty in diagrams & colour prints	18	2	19	4	4	0	0.05

Difficulties in daily life	Protanopes		Deutanopes		Tritanopes		p-values
	-20		-26		-4		
	Yes	No	Yes	No	Yes	No	
Body colour change	6	8	15	3	0	0	0.007
Blood colour	6	9	11	12	0	0	0.019
Mouth and throat colours	12	8	15	8	4	0	0.06
Hemorrhages & pigment colours	8	3	6	4	0	4	0.015
Colour coded charts and printed slides	11	9	14	5	0	0	0.013
Colour of microscopic strips	4	12	3	8	0	0	0.007
Nature colours	4	14	7	14	0	0	0.008
Benefits of tinted sunglasses	3	4	3	13	0	4	0.147

Table: Colour deficiency and difficulties in daily life

Table shows the difficulties that protanopes, deutanopes and tritanopes feel in performing daily life activities. It shows that deutane feel more difficulty in selection of clothes than protane while tritane feel difficulty sometimes. Deutane feel more difficulty in colour cosmetics that protanes while tritane feel difficulty sometimes. Protane and deutane feel equal difficulty (28%) in identification of flowers. Protane and deutane feel equal difficulty in judging the ripeness of fruits and vegetables while tritane never felt difficulty in this regard. Protane and deutane feel equal difficulty (22%) in deciding whether food is cooked properly or not while tritane never felt difficulty. It shows that protane feel more difficulty (32%) in playing games while deutane feel less difficulty (22%) and tritane never felt difficulty. Protane feel more difficulty (28%) than deutane (14%), while 22% deutane feel difficulty sometimes in recognizing skin rashes and sun burn. 18% protane and 16% deutane took wrong medicine due to colour coding while 22% protane and deutane said that they never took wrong medicine due to colour vision deficiency. Deutane feel



more difficulty 32% than protane 26%. Tritanes never felt difficulty in recognizing traffic signals. Deutane feel more difficulty (28%) in seeing warning lights on barricades than protane that feel only (18%) difficulty. Colour blindness affects the choice of career of deutane while protane choice of career is not much affected by this. But as a result deutane choice of career is more affected by colour vision deficiency. 28% deutane lost their job due to colour vision deficiency while just 22% protane lost their job due to colour vision deficiency. Colour blindness has more effect on deutane present job than on protane job, while it has no effect on tritane job. Deutane feel more difficulty (38%) in recognizing diagrams and coloured prints while 36% protane feel this difficulty and 8% tritane are also affected by this. 16% protane cannot see the change in body colour but 30% deutane and 12% protane can see the change in body colour like cyanosis and jaundice. 24% deutane and 18% protane cannot see blood in different things. While 8% tritane feel difficulty sometimes in seeing blood in different things. Only 16% protane and deutane cannot feel the throat and mouth conditions, while others can feel all the conditions. 16% protane and 12% deutane as an optometrist can see the pallor disc, hemorrhages vs. pigments. While 14% deutane and protane and 8% tritane feel difficulty sometimes. 28% deutane and 22% protane can see the colour coded charts and printed slides. While 8% deutane and tritane sometimes feel difficulty. 24% protane and 16% deutane cannot see the microscopic strips. While only 8% protane and 6% deutane can see the strips. 14% deutane feel problem sometimes. 28% protane and deutane cannot see the tree colour. While only 14% deutane and 8% protane can see the tree colour. Tinted sunglasses are helpful to only 6% protane and deutane.

DISCUSSION:

People with colour blindness face many problems in this colourful world. This problem is increasing day by day because colour is involved in every aspect of life. There is a change in behavior of colour blind people. Sometimes people don't know about their colour blindness but they cope very well with this condition. They would handle this condition very well if they came to know about its consequences. People with colour blindness feel difficulty in occupational tasks and leisure's of life. Colour blind people having medical profession face difficulty in treating patients' different conditions like they cannot see the blood in different things, stained slides and they miss some important signs in microscopic slides that show some kind of serious disease like hepatitis and cancer. Colour blinds cannot play games like cricket because of red ball on green background. They also feel difficulty in watching sports on television. Women with colour vision deficiency feel difficulty in cooking as they cannot differentiate whether food

is cooked properly or not. They also feel difficulty in judging ripeness of fruits and vegetables. Drivers with colour vision deficiency cannot differentiate between red, green and yellow signals. Some people used tinted sunglasses to overcome with this deficiency but it was not helpful to them. Colour blind person cannot do job in traffic police as it is very dangerous because they cannot differentiate between signal lights. Colour blind person preferred daytime driving to overcome with this deficiency. Prevalence of colour vision changes according to the different regions. People with colour vision deficiency take much time for work completion that is related to the colours. With the increased use of natural colours colour blindness become a handicap for the people, because they cannot enjoy the tree colours, flower colours and other beauties of nature. People with blue green colour vision deficiency were very rare during the study. Results showed that tritanopes feel less difficulty in daily life activities than protanopes and deutranopes. So it can be said that people with red green colour vision deficiency feel more difficulties in daily life activities than blue green colour vision deficient.

CONCLUSION:

People with colour vision deficiency had significant difficulty in daily activities of life. Deutane had more difficulty than protane while tritane had just small amount of difficulty but they were a rare category of colour blindness. Results also showed that tinted sunglasses are not helpful to colour vision deficient.

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