The Influence of Color on the Process of Learning: An Analysis of Medical students' perception

ABSTRACT

Aims: The aim of the present study is to evaluate the perception of medical students about the different colors employed for the text and background that ease the process of readability and learning.
Study design: Cross-sectional study.
Place and Duration of Study: Faculty of medicine at Northern Border University (NBU) between 1/1/2023 till 1/2/2023
Methodology: After the ethical approval, the questionnaire was circulated among the willing participants from the students of faculty of medicine – NBU. There are two components of questionnaire. The part one is comprised a color chart in which there were one hundred different combinations of text and background color. The second part of questionnaire contains basic information such as study year of MBBS and gender along with the questions regarding the color text with the background that is more easy to read & understand and the background color which you like most.**Results:**One hundred and seventeen (117) medical students participated in this study which included seventy-two (72) female students and forty-five (45) male students.

The majority of students liked the black text with white background while small number of students liked the other text colors such as black text with cyan background, yellow text with black background, white text with green background and black text with yellow background.

Conclusion: The perception of majority of the medical students is that the most easily read text is the text written with black color on the white background.

Keywords: Color Influence, Learning Process, Memory, Perception

1. INTRODUCTION

Readability and comprehension of the text are important component of teaching and learning process. Ease in readability facilitates the understanding of the content of text regarding the knowledge. The state of mind is another factor which contributes significantly in the process of learning. Human brain is affected by the surrounding environment and color is also an important component of the environment. The colors affect the learner's motivation towards the learning process[1].

The light is an energy which travels in the form of waves of varying wavelengths. The largest wavelength that a human eye recognizes is red color and the smallest wavelength which human sees is violet color. The human eye cannot perceive the infrared and ultraviolet wavelength of light. The different colors have different impact on the functions of brain such as memory and retention[2]. The color based methods have revealed better learning among the students[3]. These observations suggest that the different colors are associated

with different effects on the human psychology. The study of electroencephalogram (EEG) responses revealed that the beta wave intensity in the occipital region was reduced after the subject was exposed to the blue color as compared to white and red color which suggested that the blue color has produced more relaxing effect on the human brain[4]. Similarly, when the person saw blue color, beta two waves were observed in the parietal region and alpha one waves were observed in the occipital region as well as in the parietal regions. Beta two waves have been noticed in frontal region when the person was shown red color which revealed that different color exert different impact on the human brain. It has also been observed that the color also exerts their influence on blood pressure, pulse rate and skin temperature[5].

The appropriate selection of colors for the text and background can facilitate the readability, reduce the unnecessary cognitive load and enhance the retention of learning[6]. Since the human psychology is influenced by genetic and cultural factors, it would be appropriate to evaluate the perception of impact of different colors among the various cultures. The aim of the present study is to assess the perception of medical students about the color of text with background color which influence the easy readability.

2. MATERIAL AND METHODS

After getting the approval from the Local Committee of Bioethics at Northern Border University, the questionnaire was circulated among the students of faculty of medicine who consented to participate in the study. This questionnaire comprised two part. The part one comprised a color chart in which there were one hundred different combinations of text color and background color. The second part of questionnaire contains basic information such as study year of MBBS and gender along with the questions regarding the color text with the background that is more easy to read and understand with the background color which you like. The questionnaire does not contain any question regarding personal identification of the participant such as name, age, address, email address, phone number or ID number. For the better understanding purpose, the Arabic translation of the questionnaire was also made available to the participants. After collecting the responses of medical students, the data was analyzed by the computer software.

3. RESULTS AND DISCUSSION

In the present study, a total of one hundred and seventeen (117) medical students participated which included seventy-two (72) female students and forty-five (45) male students. According to the majority students' perception, the best text color which is easily readable is black text with white background. The minority of students liked the other text colors such as black text with cyan background, yellow text with black background, white text with green background and black text with yellow background. The results are shown in table 1.

Table 1.The perception of medical students regarding the easy readability of text color with the background color

Text color	Female		Male		Total	
	N	%	N	%	n	%
Black text with white background	35	48.6	23	51.1	58	49.6
White text with blue background	7	9.7	4	8.9	11	9.4
White text with black background	4	5.6	4	8.9	8	6.8
Black text with cyan background	6	8.3	0	0.0	6	5.1
Black text with blue background	3	4.2	2	4.4	5	4.3
Yellow text with black background	2	2.8	2	4.4	4	3.4
White text with green background	1	1.4	2	4.4	3	2.6
Blue text with cyan background	2	2.8	1	2.2	3	2.6
Black text with yellow background	3	4.2	0	0.0	3	2.6
White text with cyan background	2	2.8	0	0.0	2	1.7
Blue text with white background	2	2.8	0	0.0	2	1.7
Yellow text with cyan background	1	1.4	1	2.2	1	1.7
Black text with green background	0	0.0	2	4.4	2	1.7
Yellow text with blue background	0	0.0	1	2.2	1	0.9
Yellow text with green background	1	1.4	0	0.0	1	0.9
Green text with orange background	0	0.0	1	2.2	1	0.9

Orange with text with white background	1	1.4	0	0.0	1	0.9
Red text with white background	0	0.0	1	2.2	1	0.9
Red text with orange background	1	1.4	0	0.0	1	0.9
White text with maroon background	0	0.0	1	2.2	1	0.9
White text with magenta background	1	1.4	0	0.0	1	0.9
Total	72	100.0	45	100.0	117	100.0

Human brain is affected by the surrounding environment and color is also an important component of the environment which influences the learner's motivation towards the learning. The different colors have different impact on the functions of brain such as memory and retention. Ease in readability facilitates the understanding of the content of written learning matter. In the present study, the students' preference for the text color is black with white background. the environmental factors play a role in the learning process[7.] The color is also an important component of the environment. A study revealed that the memory in learning is affected by the color[8]. The use the various colors in the teaching and learning process has been made easy by the availability of electronic teaching material to the learner. The digital learning resources are cost effective as compared to the printed learning material. The E- learning has emerged as a very beneficial technique in the teaching process[9-10]. Even the learning on social networks also improved the comprehension of the subjects among the students[11].

It would be quite useful to apply appropriate colors in the digital teaching. The contrast color is better perceived by the brain. So the use of contrast color in the text and background may yield better results for the purpose of learning. The contrast level will depend upon the level of difference among the colors. The colors close to one another will have a low level of contrast while the colors opposite to one another will show the high contrast level. The black text on white background and white text on black background will reveal high contrast level. In this regards, the contrasting colors may be used in the lectures / presentations for better and easy readability.

4. CONCLUSION

According to the medical students' view point, the easiest to read text is text written with black color on the white background. This shows that high level contrast will have effect on the readability of the content.

CONSENT

All authors declare that written informed consent was obtained from the participants for publication of this article. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board members of this journal.

ETHICAL APPROVAL

All authors hereby declare that all steps have been examined and approved by the local bioethics committee at Northern Border Universitywith decision number (9/43/h).

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