Shade Matching Ability of Dental Students Using Two Visual Light Sources

Joshi R, Acharya J

[1] Dr. Rojin Joshi, Lecturer, Department of Conservative Dentistry and Endodontics, College of Dental Sciences and Hospital, Kathmandu, Nepal, [2]Dr. Jemish Acharya, Department of Community and Public Health Dentistry, College of Dental Sciences and Hospital, Kathmandu, Nepal

Corresponding Author: Dr. Rojin Joshi, Lecturer, Department of Conservative Dentistry and Endodontics, College of Dental Sciences and Hospital, Kathmandu, Nepal; E mail: rozinjoshi@yahoo.com

ABSTRACT

The success of aesthetic restorations depends primarily on proper shade selection, and matching of the correct tooth shade for anterior teeth and this is one of the most critical procedures in aesthetic dentistry. Routinely, shade selection is performed visually with the help of different ceramic shade guides, which makes this process highly subjective. Dental students should have proper knowledge on the various light sources used for shade selection because they will be selecting various shades of restorative materials in their clinical practice. Hence, we conducted this study to assess the shade matching ability of dental students in natural and clinical light.

A total of 111 dental students participated in this study. The students performed Ishahar's test to determine color deficiency. For shade matching procedure, two Shade Vita shade guides were used. From the first shade guide, 9 shade tabs including C2, C3, C1, B3, B2, B1, A3, A2 and A1 were randomly selected. The identification codes of 9 shade tabs were concealed and the students were asked to match the shade tabs with concealed code by using complete shade guide.

The students matched the shades under natural light and clinical lighting condition. Scores were calculated by adding the number of correct matches. Pearson's Chi-square test showed no significant difference between gender. There was no significant difference of shade matching ability of students under natural light and clinical light.

Keywords: Light sources, Shade guide, Shade selection

INTRODUCTION

The success of aesthetic restorations depends primarily on the proper shade selection, and matching of the correct tooth shade for anterior teeth is one of the most critical procedures. Many factors that contribute to the quality of shade matching have been mentioned in literature which includes tooth texture and contour, light source, the surroundings, and background.[1-3]

Shade matching ability of dentists and transferring it to the laboratory is an essential factor in natural tooth color reproduction. Accurate shade matching in dentistry has become essential for an optimal dental restoration and successful clinical practice. Color matching in dentistry can be performed using visual or instrument-based methods.

Routinely, shade selection is performed visually with the help of different ceramic shade guides, which makes this process highly subjective.[4] Instrument based methods including the use of colorimeter, spectrophotometer, computer software and digital photos efficacy of these methods have been proved.[5-7] Visual color selection in dentistry is dependent on many factors, and variation in any of them can lead to an altered color perception. Various light sources, each produce a distinct spectrum of color leading to metamerism.[8] Tooth color consists of strati form layers of enamel and dentin that absorb, reflect, transmit, or refract incident light, thereby producing the quality of color.[9] Light quality is considered the most critical influencing factor in the selection of correct shades; changes in lighting conditions can cause changes in the perceived color.[3] Therefore, accurate and reproducible color matching requires a standard light source and spectral distribution.[10] Shade matching ability is influenced by age, experience and the degree of individual color deficiency. Aging leads to yellowing lens and cornea of human eyes which results in a tendency towards seeing objects in yellow and brown.[11] Color vision deficiency is an inherited and X-linked disorder which affects men more than women. Color defect can be diagnosed by using Ishahara's test.

MATERIALS AND METHODS

This comparative cross sectional study was conducted among senior dental students in Dental Department of Nepal Medical College and Teaching Hospital, Attarkhel, Jorpati, Kathmandu. We conducted this study after obtaining permission from NMC – RESC (Research and Ethical Sub-Committee-reference no.06-072/073). The total duration of study was three months (14th

November to 14th February). Informed consent was taken from all students to be a part of the study. Confidentiality and anonymity of the study respondents was assured and maintained. Senior dental students participated in this study. They were the students in fourth, fifth years of study and interns. The students performed Ishahar's test to determine color deficiency. Color blind students were excluded from the study. For shade matching procedure, two vita shade guides were used. From the first shade guide, 9 shade tabs including C2, C3, C1, B3, B2, B1, A3, A2 and A1 were randomly selected. The identification codes of 9 shade tabs were concealed and the students were asked to match the shade tabs with concealed code by using complete shade guide. Ten minutes was allocated for this procedure. Time was limited because allowing more time increased the possibility of error. The students matched the shades under the natural light and clinical lighting condition. The clinical lighting condition was a compound of natural light and fluorescent light as well as incandescent light.

Shade matching under natural light was conducted between the hours of 9 AM and 3 PM. As previous subjective background could adversely affect shade matching, there was an interval of 1 week between sessions of shade selections under natural and clinical light. After the students had completed the matching of selected items (shade tabs with the identification code concealed) to a vita shade guide, the chosen shade tabs were recorded and the correct matches were counted. Scores were calculated by adding the number of correct matches. The highest score was considered if a student matched all the items correctly.

The data was exported and analyzed using Statistical Package for Social Sciences (SPSS) version 17. The descriptive statistics like mean, median, STD deviation were calculated. The data was statistically analyzed using Pearson's Chi-square test and t-test.

RESULT

A total of 111 students participated in this study. Among the study participants, 19 students were from fourth year, 61 from final year and 31 were interns. (Table 1)

Table 1. Distribution of respondents

VARIABLE	N	Percentage
Gender		
Male	31	27.9
Female	80	72.1
Year		
BDS Fourth year	19	17.1
BDS Fifth year	61	55
Interns	31	27.9

Majority of students were from final year. According to gender majority of students were females (72.1%). Correct shade selection was the highest for shade B_1 in both natural (57.7%) and clinical (38.7%) light. Followed by shades B_3 and C_1. The least correct shade selection were seen for shades C_2 and C_3.

Table 2. Percentage of correct and incorrect shades under natural light and clinical light.

Shade	Natural light		Clinical light	
	Correct	incorrect	Correct	Incorrect
A_1	34.2	65.8	36	64
A_2	25.2	74.8	25.2	74.8
A_3	30.6	69.4	37.8	62.2
B_1	57.7	42.3	38.7	61.3
B_2	28.8	71.2	37.8	62.2
B_3	35.1	64.9	26.1	73.9
C_1	35.1	64.9	26.1	73.9
C_2	26.1	73.9	20.7	79.3
C_3	26.1	73.9	20.7	79.3

Table 3. Percentage of correct and incorrect shades under natural light and clinical light.

	N	%	Mean ±S.D
Normal light			
Good	9	8.1	1.4054±.63787
Fair	27	24.3	
Poor	75	67.6	
Clinical light			
Good	4	3.6	1.3063±.53586
Fair	26	23.4	
Poor	81	73	

The score of male students was higher in clinical light whereas the overall score was higher for female students in natural light.

Table 4. Score according to gender

Normal light				
Gender	Good	Fair	Poor	p-value
Male	3.2%	22.6%	74.2%	
Female	10.0%	25.0%	65.0%	0.45*
Clinical light				
Gender	Good	Fair	Poor	p-value
Male	6.5%	22.6%	71.0%	
Female	2.5%	23.8%	73.8%	0.605 *

*P-value taken from Pearson Chi-Square

DISCUSSION

In this study, senior dental students were selected to minimize the variability of different factors such as age, degree of knowledge, training and experience. Clinical experience and knowledge of color science in dentistry can lead to better performance in a clinical setting, especially with complex color matching.[11] Classical vita shade guide was chosen for this study

Table 5 : Means of two scores

	Mean	t	df	Mean diff	sig	95% CI
Normal score	1.40±0.63	23.213	110	1.40	0.00	1.28-1.52
Clinical score	1.30±0.53	25.684	110	1.30	0.00	1.20-1.40

because it is commonly used by dentists. However, the major limitation of classical vita shade guide is that the numerical values do not reflect regular distribution in value and chroma.[12] Clinicians with less experience demonstrated more success in shade selection with vita 3D- Master, a systematic designed shade guide. It is a fact that the number of correct matches might increase if the vita 3D-Master shade guides had been used instead.[13-14]

There was no significant difference between shade matching ability of natural and clinical lighting condition which was consistent with a study conducted by Mohammadreza *et al*.[12] On the contrary in a study done by Bushra Jabeen dental interns performed better shade selection in natural light.[15] In terms of gender, the traditional belief has been that women are more capable of matching colors than men.[16] Other researchers have evaluated whether a difference exists between men and women in terms of shade matching ability.[8,17,18] Haddad *et al* found that females achieved significantly better shade matching results than males.[16] Miranda reported that men were more successful in discriminating shades.[18] However, investigators in other studies have been unable to identify a significant influence of gender on shade matching ability.[17,19,20] In agreement, our results showed that gender is not an important factor in shade matching. There was no significant difference of male and female participants in natural as well as clinical light

A limitation of this study was that shade selection was done under two visual light sources only. There was no significant difference between the two light sources. Now a days shade selection is performed under different lighting conditions and various instrument based devices are used. Certain conditions can alter the results of shade selection. Another limitation of this study is two shade tabs were matched. They were not matched to natural teeth. In our clinical setting the shade tabs are matched to natural teeth. More studies should be conducted using different light sources and lighting conditions as well shade tabs should be matched to natural teeth.

The results of our study indicated that there was insignificant difference between the shade matching ability of students under natural light and clinical light. Gender didn't influence the shade matching ability of the students.

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Conflict of interests: None

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