



**ORIGINAL RESEARCH PAPER**

**Prosthodontics**

**SHADE MATCHING BY DENTAL STUDENTS IN PROSTHODONTICS & ENDODONTICS: RESEARCH STUDY**

**KEY WORDS:** Esthetic, Hue, Shades, Vita shade guide

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**ABSTRACT**

The aim of esthetics in dentistry is to provide life in prosthesis and to help patient for being acceptable in society. Various clinicians have their own methods of assuming shades. Some assume by arranging shade tabs by the lightness or darkness of the color. The present study was undertaken with the aim of evaluating the knowledge of dental graduates in shade selection of teeth and to find out the shade most commonly mismatched.

**MATERIALS & METHOD:** 25 dental students participated in the study. A shade tab of vita classical was taken and markings were covered with the help of tape. Another vita classical shade guide was taken and used as control. Each student was subjected to 10 unmarked shade tabs separately for shade selection against the Vita shade guide classical, which was used as control and asked to correctly identify the shade. An A4 sheet of gray card was used to rest the subject's eyes between shade assessments.

**RESULTS:** Out of 250 readings, 185 readings were found to be correct, 54 readings were found to be incorrect and remaining 11 cases were failure to identify the shades. In respect to A2, 20 readings out of 25 were found to be correct, in relation to A3, 18 were found to be correct, In A3.5-14 readings, In B1- 23 cases, In B2- 18 cases, In B3- 13 cases, In C1- 17 cases, In C2- 15 cases, In C3- 21 cases and in D2- 14 cases respectively. A significant difference does exist between the shades when tested for significance at the level of 0.001

**CONCLUSION:** The results of the present study suggest that Hue is the most difficult factor assessed by dental graduates. B1 was most correctly matched and maximum difficulty was in identification of B3, A3.5 and D2, all three being identical.

**INTRODUCTION**

Color is the characteristic of human visual perception described through color categories, with names such as red, orange, yellow, green, blue, or purple. Color categories and physical specifications of color are associated with objects through the wavelength of the light that is reflected from them. This reflection is governed by the object's physical properties such as light absorption, emission spectra, etc. The science of color is sometimes called chromatics, colorimetry, or simply color science. The study of color is an integral part of esthetic dentistry. Dentistry aims to restore form, function and esthetics of the individual to normal or above normal state. The increased expectations of the patient have led us to be more vigilant for the color and shape of prosthesis. Dentistry is a science that besides providing basic health care facility has to be artistic and provide life to the artificial substitutes.<sup>1</sup> A slight alteration or change in color can lead to unacceptability by the patient leading to failure of the restorations To achieve esthetics, four basic determinants are required in sequence; viz., position, contour, texture and color.<sup>2</sup> Esthetic dentistry imposes several demands on the artistic abilities of the dentist and the technician; knowledge of the underlying scientific principles of color is essential. Color or shade selection is not a step in prosthesis fabrication but a complete science in itself. Color was just a mystery before Isaac Newton<sup>3</sup> differentiated light in seven wavelengths each having its own importance.

The increased interest of dentists in the field of color science helped in usage of various manuals and automated shade systems. Shades can be checked by two systems: Visual and quantitative. Quantitative systems are there in market but are costly to be used in routine practice limiting their use only in research activities. Visual system or commonly called as munsell system is the main system used in clinics. The system consists of hue determining the basic color, value determining the darkness or lightness of color and hue determining intensity of the color.<sup>4</sup> Various commercial brands like Vita pan, Vita 3d master, Ivoclar shade guide are there in market and are used in routine practice but needs a lot of experience and skill to determine the correct shade. The aim of the present study is to analyze the shade matching capacity in dental students of Jammu.

**II. MATERIALS & METHOD**

**Frequency** determines **color**, but when it comes to light, **wavelength** is the easier thing to measure. Our eyes perceive each wavelength as a different **color**. The shorter **wavelengths**

of visible light are violet — we might call them purple. Then as the **wavelengths** get longer and longer, the visible light changes in **color** to blue, green, yellow, orange, and finally the longest, which is red.

In color-matching procedure, the questions that must constantly be answered are just how great a color difference exists between the samples to be matched and the standards and/or just how great a difference is acceptable in a given situation. Tooth shade guides offer a series of standards simulating the natural teeth, and the dentist must decide which standard offers the most acceptable color match with the tooth or teeth in question and if such a match will please the patient. The success or failure of this procedure is closely related to the adequacy of the shade guide plus the familiarity of the dentist with basic color-matching procedures. Requirement of color guide is that there should be logical arrangement of color spaces and an adequate distribution of color space

The colors of the visible light spectrum		
Color	Wavelength interval	Frequency interval
Red	~ 700–635 nm	~ 430–480 THz
Orange	~ 635–590 nm	~ 480–510 THz
Yellow	~ 590–560 nm	~ 510–540 THz
Green	~ 560–520 nm	~ 540–580 THz
Cyan	~ 520–490 nm	~ 580–610 THz
Blue	~ 490–450 nm	~ 610–670 THz
Violet	~ 450–400 nm	~ 670–750 THz

The present study was undertaken and 25 dental students participated in the study consisting of 34 boys and 16 girls under the supervision of senior prosthodontist and endodontist. The study was conducted on 25 dental students and the students took oral consent. The study was carried out in a room with ample sunlight. A shade tab of vita classical was taken and markings were covered with the help of tape. Another vita classical shade guide was taken and used as control. Each student was subjected to 10 unmarked shade tabs separately for shade selection against the Vita shade guide classical, which was used as control and asked to correctly identify the shade. Each student was allocated 1 minute for each shade selection. An A4 sheet of gray card was used to rest the subject's eyes between shade assessments. Examiners were asked to look at it for 15 seconds to avoid color fatigue. Each shade tab was kept at an arm's length. Similar proceedings were carried out for all the 25 dental students. Data recorded was tabulated

and analyzed statistically.

**III. Results**

The data collected for each patient was analyzed and mean values for shade was selected. Out of 250 readings, 185 readings were found to be correct, 54 readings were found to be incorrect and remaining 11 cases were failure to identify the shades. In respect to A2, 20 readings out of 25 were found to be correct, in relation to A3, 18 were found to be correct, In A3.5-14 readings, In B1- 23 cases, In B2- 18 cases, In B3- 13 cases, In C1- 17 cases, In C2- 15 cases, In C3- 21 cases and in D2- 14 cases respectively. A significant difference does exist between the shades when tested for significance at the level of 0.001.

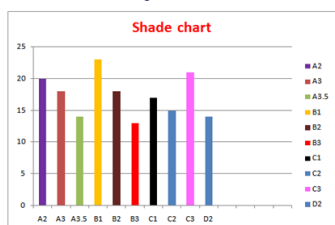
S. No	Shade	Total Readings	Correct Readings	Percentage (%)
1.	A2	25	20	80%
2.	A3	25	18	72
3.	A3.5	25	14	56
4.	B1	25	23	92
5.	B2	25	18	72
6.	B3	25	13	52
7.	C1	25	17	68
8.	C2	25	15	60
9.	C3	25	21	84
10.	D2	25	14	56

avoiding any bias in the result. Vita Classical shade guide was used in the study, as this is the most common and economical shade guide used in routine practice. Visual method was used in this study as previous studies by studies<sup>6,10</sup> indicate that shade-matching instruments are more accurate, evidence to the contrary is also available.<sup>08,11,12</sup> A recent study by Hugo et al<sup>13</sup> demonstrated that human examiners showed a significantly higher agreement value when compared with computer aided tooth shade determination device. The devices reached on average only a value of 28.6%. Ratzmann et al<sup>14</sup> showed that validity was better for visual than for electronic color assessment.

An A4 sheet of gray card was used to rest the subject's eyes between shade assessments to avoid color fatigue. A senior prosthodontist and endodontist was included in the study to guide students for methods of shade matching and to clear any query of dental students included in the study. Entire Study Was carried out in same room to avoid any inclusion of sunlight as factor in the study. The students, followed by C3, A2, A3, B2, C1, C2, D2, A3.5 and B3 respectively, most commonly identified the B1 color. B1 was most commonly identified due to the lightest and whitest of all the tested specimens. Maximum confusion reported by dental graduates was in B3,

A3.5 and D2; All three being identical. The results of the present study are in accordance to the study by Winkler et al<sup>15</sup>, which concludes that dental students have more confusion in identification of darker shades. The results of the present study also suggest giving importance to the shade matching exercise in dental curriculum. This study also suggests that dental graduates have maximum difficulty in identification of hue groups. Preston and Bergen<sup>16</sup> recommend that students begin shade selection with a value (brightness) comparison. It should be noted whether the shade-guide tooth is higher or lower in value. The hue should be determined next. Natural teeth lie within the range of yellow-red to yellow. The last determination should be the relative saturation (Chroma) of the pair being considered. Future studies should be directed in in-vivo conditions and using large sample siz

**Graph 1: Results of the study.**



**CONCLUSION**

The results of the present study suggest that hue is the most difficult factor assessed by dental graduates. B1 was most correctly matched and maximum difficulty was in identification of B3, A3.5 and D2, all three being identical.

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