

# The Relationship of tooth shade and skin tone and its influence on the smile attractiveness among people in Tamilnadu- A cross sectional study

B. Karthika, B Suriya prasath, S.Swathi sree, T.Sridhar, M.Pavani, A.priya.  
Department of Oral Medicine and Radiology, Priyadarshini Dental college and Hospital, Tiruvallur.

## Abstract:

### Objective:

The purpose of this clinical study was to determine the relationship of tooth shade and skin tone and its influence on the smile attractiveness among Dental students.

### Materials and methods:

A cross sectional study conducted among 336 (Male:144, Female:192) in Tamilnadu. A consent was obtained from each participant prior to being enrolled in this survey. The nature and purpose of the study explained to institution review board of Priyadarshini Dental College and Hospital and ethical clearance was obtained.

A smile photograph was digitally manipulated to create a range of images with varying colors. The skin shade was modified to create four tones (p1: light, p2: light medium, p3: dark, p4: medium dark) using the L'Oreal True Illusion shade as a guide. The tooth shade was modified in four different tones. A1, A2, B1, B2 using the VITAPAN Classical shade guide to produce 16 images. A sample of 336 participants rated each image for attractiveness by means of a visual analog scale (VAS)

### Result

Table 1 shows the responses of the extremely attractive and extremely unattractive. Light skin tone (L'Oreal)(P1) people are compatible to the tooth shade B1 (vita classical) (Brighter) (92.26%). Light medium skin tone (L'Oreal) (P2) people are compatible to the A1 shade (vita classical) (lighter) (82.44%). Dark skin tone (L'Oreal) (P3) people are compatible to the B2 shade (vita classical) (bright) (84.82%). Dark medium skin tone (L'Oreal) (P4) people are compatible to the B2 shade (vita classical) (bright) (84.23%). Table2 shows the comparison between sex groups( $P < 0.05$ ).

### Conclusion:

Variations in tooth and skin tone can significantly influence the perception of smile attractiveness. In the tested conditions, a bright tooth shade significantly affected the attractiveness of the smile independently from skin tone.

**Keywords:** Esthetics, Skin tone, Smile attractiveness, Tooth color.

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## I. Introduction:

Smile is an important means of communications and facial expression. Many patients go to the dentist to correct their smile, in order to achieve a more pleasant and natural appearance. The dentist can meet and satisfy the Patient's esthetic needs by modifying the morphological and chromatic characteristics (Shape and color) of teeth, adopting increasingly effective techniques of adhesive and restorative dentistry.<sup>1-3</sup>

It is general misconception in people that white bright teeth are more attractive than yellow teeth. But we as dentists are aware of the fact that teeth shade varies with skin colour, age and gender.<sup>4,5</sup> Tooth color has a strong correlation with age, generally becoming darker and yellower with time.<sup>6-7</sup> As the age advances the pulp chamber which are large during young age becomes smaller as a result of deposition of secondary dentin, making tooth more opaque. Many studies have shown that women have lighter and less yellow teeth than men.<sup>8,9</sup> Shade selection is a critical and sometimes demanding step in the shade-matching process for a completed dental restoration. Inconsistencies in shade determination are the result of multiple factors, including the physiological and psychological color vision status of the person selecting the shade.<sup>10-13</sup> Environmental factors such as light conditions also play an important role in shade selection.<sup>14,15</sup>

In our beauty conscious society, a smile has great impact. When a patient's smile is destroyed by dental disease, the result often is loss of self-esteem and damage to his or her overall physical and mental health.<sup>16</sup>

Special devices such as spectrophotometer give result in a more objective measurement of color and have shown good repeatability of natural teeth color.<sup>17-19</sup> Spectrophotometer's measure one wavelength at a time from the reflectance or transmittance of an object and have been used to measure the visible spectra of teeth.<sup>20</sup>

The differences in the perception of a beautiful smile not only exist among individuals but also between cultures.<sup>21</sup> Therefore, the professional opinion may not be consistent with the perception and expectations of the subject.<sup>22</sup> Information has been published about patient satisfaction with dental esthetic and attitude toward improvement of esthetics of different populations. Recognizing the perception of the patients and their satisfaction with the present dental appearance and desired treatments to improve dental esthetic can guide clinicians to strategies to improve esthetics.<sup>23-28</sup>

The purpose of this clinical study was to evaluate how tooth and skin tone can influence the perception of the smile attractiveness. The research hypothesis was that skin tone and tooth color had the same influence on smile attractiveness.

## **II. Materials And Methods:**

A cross sectional study conducted among 336 Dental students (Male:144, Female:192) in Tamilnadu. A consent was obtained from each participant prior to being enrolled in this survey. The nature and purpose of the study explained to institution review board of Priyadarshini Dental College and Hospital and ethical clearance was obtained. The study sample was composed of a population of dental students in the college. Exclusion criteria were color blindness (tested by the Ishihara test) (Figure 1).

The authors selected a young woman (23 years) with a smile exhibiting good dental alignment and tooth size symmetry. A standardized frontal view smile photograph showing teeth, lips, and surrounding skin in ambient light was made with a digital camera. The nose and chin were cropped out to reduce the number of confounding variables. The photographic image was digitally modified (Adobe Photoshop CS5; Adobe) to create a range of images with varying skin and tooth shades (Figure 2). The selected smile image was edited into Photoshop in order to separate teeth, gums, lips, and skin into four different levels. In this manner, it was then possible to alter hue, vividness, saturation, and light to match the reference shade scales and produce the complete set of photographs with all variants.

The skin shade was altered to create four tones (p1: light, p2: light medium, p3:dark, p4:medium dark) selected from the L'Oreal True Illusion compact makeup shades (L'Oreal). This guide has 15 shades from which 4 were selected to represent the main range of complexions. The tooth shade was modified to create four different tones (A1, A2, B1, and B2) using the hue selected from the Vita classical A1-D4 system.

At the beginning of the interview, the examiner recorded, on a separate sheet of paper, sex (M/F), level of education (middle school, high school, university), and skin tone of each participant (n = 336; 192 females and 144 males). Skin tone was evaluated from the forearm and categorized in four tones (light, light medium, medium dark, and dark) according to same scale used for the images. A slide show presentation was prepared with images placed on a black background, arranged in the previously randomized order. Defective color vision was identified by the Ishihara test (Figure 1), placed on the first slide. The images were viewed on a 24.6 cm laptop screen (Hp 21 laptop), set to a brightness of 50% and contrast of 100%, while the participants rated the images. A blue screen appeared for 5 seconds between each image. The slides appeared in the same sequence for all participants. Participants rated the images without conferring with others. Participants rated each image for attractive ness by using a visual analog scale (VAS), that consisted in a 100 mm line from point 0 = extremely unattractive to point 10 = extremely attractive. Each VAS was printed on a different sheet of paper for a total of 16 pages. Every participant was asked to mark an "X" on the line answering to the question "How attractive do you consider this smile?". Every interview was made in a well-lighted location with natural and artificial light between 9 AM and 4 PM.

### **Statistical analysis:**

A power calculation was based on the mean VAS values obtained from a previous pilot study, where 10 participants evaluated images resulted from the matching of one skin tone (p1) and 2 adjacent tooth shades (a1, a2) (p1-a1 respectively).

All data were initially entered into a database (Excel; Microsoft Corp) and analyzed with statistical software (SPSS v20.0; SPSS Inc). Chi-square tests were used to compare the 2 groups, and the level of significance was set at  $P \leq 0.05$ .

## **III. Results:**

Table 1 shows the responses of the extremely attractive and extremely unattractive. Light skin tone (L'Oreal)(P1) people are compatible to the tooth shade B1 (vita classical) (Brighter) (92.26%). Light medium skin tone (L'Oreal) (P2) people are compatible to the A1 shade (vita classical) (lighter) (82.44%). Dark skin tone (L'Oreal) (P3) people are compatible to the B2 shade (vita classical) (bright) (84.82%). Dark medium skin

tone (L'Oreal) (P4) people are compatible to the B2 shade (vita classical) (bright) (84.23%). Table2 shows the comparison between sex groups(P<0.05).

#### **IV. Discussion:**

The hypothesis of this study was that skin tone and tooth shade had the same influence on smile attractiveness. The results rejected this hypothesis: variations in tooth shade were more important than differences in skin tone. Results showed that independently from skin tone, the preferred tooth shade was always the brighter (higher VAS) and values for darker teeth were significantly lower.

In a similar study, conducted on a sample of 140 participants, Sabherwal et al<sup>21</sup> reported that perception of smile attractiveness was different between "young" and "old" people. Our results are in contrast with Sabherwal et al<sup>21</sup> since no statistically significant differences based on participants age were found. The highest VAS values were found for images with darker skin and lighter tooth shade, this is also in contrast with Sabherwal et al.<sup>21</sup> where this combination was seemed to be less attractive. This result could be related to the quality of the tested images. In the present study the images were prepared to appear as realistic as possible with great attention to replicate true skin tones and tooth shades (VITA and L'Oreal), while Sabherwal et al did not use any color reference.<sup>29-31</sup>

The VITA guide was selected because it is popular in India, The A shade was chosen as it has been reported from many authors the most frequently used and therefore the closer to natural teeth color shade.

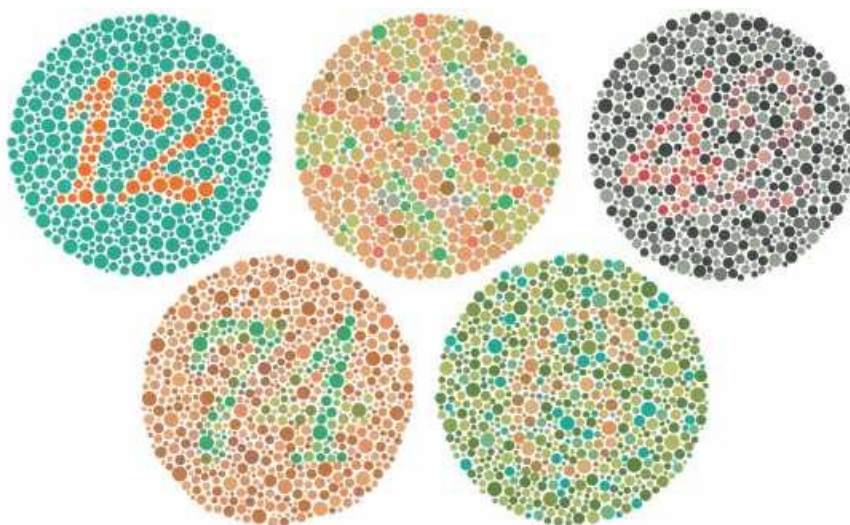
Tooth color is one of the important factors affecting aesthetics. Color is complex and encompasses both subjective and objective phenomenon. The most popular method for describing color is the Munsell system. It has been widely used in dentistry. The three attributes of color in this system are hue, value and chroma. Hue is defined as the particular variety of a color, shade or tint produced by a specific wavelength of light acting on the retina. Chroma is defined as the intensity of a hue that is amount of color saturating per unit area of an object. Value is defined as the relative lightness or darkness of a color or the brightness of an object. Value is considered to be of greater importance.<sup>32-34</sup>

A major goal of dental treatment should be to re-establish esthetics and enable patients to feel confident about smiling without having to hide their teeth. (However, it is possible that some patients may be overly sensitive about the appearance of their teeth and do not need whitening or other esthetic treatment.

In patients with light colored skin, the choice of bright teeth shade appears important. Even if, in current literature, no significant association was detected between ethnicity and attitude about dental esthetics, future research should be orientated in investigating if these results may change in different cultures and with a more heterogeneous sample.

#### **V. Conclusion:**

The results of this observational study suggest that there is a significant relationship between tooth shade and skin color. Persons with fair skin color were more likely to have tooth shades with high values (brighter) and medium-to-dark skin color with lighter skin tones tended to have teeth with higher values (lighter). Based on the relationships skin color may be a useful guide for the selection of tooth shade in removable and full-mouth reconstructions achieve a more natural appearance, especially among the elderly and persons with darker skin tones.



**Figure 1** (Ishihara test)



Figure 2

Table 1 shows the responses of extremely attractive and extremely unattractive shades

Table 1

SHADE	SKIN TONE	RESPONSE	FREQUENCY(n)	PERCENTAGE (%)
A1	P1	Extremely Attractive (point -10)	279	83.04
		Extremely unattractive (point-0)	57	16.96
	P2	Extremely Attractive (point -10)	277	82.44
		Extremely unattractive (point-0)	59	17.56
	P3	Extremely Attractive (point -10)	52	16.96
		Extremely unattractive (point-0)	284	84.52
	P4	Extremely Attractive (point -10)	57	15.48
		Extremely unattractive (point-0)	279	83.04
A2	P1	Extremely Attractive (point -10)	46	13.69
		Extremely unattractive (point-0)	290	86.31
	P2	Extremely Attractive (point -10)	44	13.1
		Extremely unattractive (point-0)	292	86.9
	P3	Extremely Attractive (point -10)	279	83.04
		Extremely unattractive (point-0)	57	16.96
	P4	Extremely Attractive (point -10)	270	80.36
		Extremely unattractive (point-0)	66	19.64
B1	P1	Extremely Attractive (point -10)	310	92.26
		Extremely unattractive (point-0)	26	7.74
	P2	Extremely Attractive (point -10)	239	71.13
		Extremely unattractive (point-0)	97	28.87
	P3	Extremely Attractive (point -10)	56	16.67
		Extremely unattractive (point-0)	280	83.33
	P4	Extremely Attractive (point -10)	54	16.07
		Extremely unattractive (point-0)	282	83.93
B2	P1	Extremely Attractive (point -10)	68	20.24
		Extremely unattractive (point-0)	268	79.76
	P2	Extremely Attractive (point -10)	71	21.13
		Extremely unattractive (point-0)	265	78.87
	P3	Extremely Attractive (point -10)	285	84.82
		Extremely unattractive (point-0)	51	15.18
	P4	Extremely Attractive (point -10)	283	84.23
		Extremely unattractive (point-0)	53	15.77

Table 2: Comparison between sex groups (using chi-square test)

<b>Table 2</b>						
SHADE	SKIN TONE	RESPONSE	MALE n (%)	FEMALE n (%)	P VALUE	
<b>A1</b>	P1	Extremely Attractive (point -10)	119(42.7)	160(57.3)	0.98	
		Extremely unattractive (point-0)	25(43.9)	32(56.1)		
	P2	Extremely Attractive (point -10)	108(39)	169(61)	<0.01**	
		Extremely unattractive (point-0)	36(61)	23(39)		
	P3	Extremely Attractive (point -10)	15(28.8)	37(71.2)	<0.05*	
		Extremely unattractive (point-0)	129(45.4)	155(54.6)		
	P4	Extremely Attractive (point -10)	20(35.1)	37(64.9)	<0.05*	
		Extremely unattractive (point-0)	124(44.4)	155(55.6)		
<b>A2</b>	P1	Extremely Attractive (point -10)	28(60.9)	18(39.1)	<0.05*	
		Extremely unattractive (point-0)	116(40)	174(60)		
	P2	Extremely Attractive (point -10)	21(47.7)	23(52.3)	0.59	
		Extremely unattractive (point-0)	123(42.1)	169(57.9)		
	P3	Extremely Attractive (point -10)	117(41.9)	162(58.1)	0.54	
		Extremely unattractive (point-0)	27(47.4)	30(52.6)		
	P4	Extremely Attractive (point -10)	116(43)	154(57)	1	
		Extremely unattractive (point-0)	28(42.4)	38(52.6)		
	<b>B1</b>	P1	Extremely Attractive (point -10)	132(42.6)	178(57.4)	0.88
			Extremely unattractive (point-0)	12(46.2)	14(53.8)	
		P2	Extremely Attractive (point -10)	109(45.6)	130(54.4)	0.13
			Extremely unattractive (point-0)	35(36.1)	32(56.1)	
P3		Extremely Attractive (point -10)	22(39.3)	34(60.7)	0.65	
		Extremely unattractive (point-0)	122(43.6)	158(56.4)		
P4		Extremely Attractive (point -10)	22(40.7)	32(59.3)	0.84	
		Extremely unattractive (point-0)	122(43.3)	160(56.7)		
<b>B2</b>	P1	Extremely Attractive (point -10)	25(36.8)	43(63.2)	0.31	
		Extremely unattractive (point-0)	119(44.4)	149(55.6)		
	P2	Extremely Attractive (point -10)	34(47.9)	37(52.1)	0.40	
		Extremely unattractive (point-0)	110(41.5)	155(58.5)		
	P3	Extremely Attractive (point -10)	126(44.2)	159(55.8)	0.30	
		Extremely unattractive (point-0)	18(35.3)	33(64.7)		
	P4	Extremely Attractive (point -10)	119(42)	164(58)		
		Extremely unattractive (point-0)	25(47.2)	28(52.8)	0.58	

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