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## Original paper

# **Study on tooth shade and skin photo type correlations among dental medical students in Romania**

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### Abstract

Our study aims to establish correlations regarding the satisfaction between the tooth shade and skin type among a group of students. A transdisciplinary study based on an online survey was performed, on 57 students in the Faculty of Dental Medicine of Carol Davila University of Medicine and Pharmacy. For every student the skin colour and skin photo type (using the Fitzpatrick Test) were determined and their central incisor (I.1) tooth shade (colour) was selected using the Vita 3D Master and Vita Classic Lumin shade guides. A statistical data analysis was performed. The results show a significant and positive high-grade correlation ( $p < 0.001$ ,  $R = 0.812$ ) between skin photo type and skin colour. Also a significant and positive moderate-grade correlation ( $p = 0.032$ ,  $R = 0.327$ ) was found for participants with lighter photo type (II-III) that have more frequently light-coloured teeth (A/B colour group) while participants with darker photo type (IV-V) have more frequently dark-coloured teeth (C/D colour group). Most participants are neutral or content about the correlation between the colour of their teeth and their skin both during the day and during the high sun exposure periods but 70% of them would perform a colour change procedure of their teeth. Some of the correlations issued from this study can lead to further advanced trans disciplinary studies.

### Keywords

Tooth shade, skin photo type, sun exposure.

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## **Introduction**

In nowadays aesthetic focused world, the correct tooth colour selection remains one of the most important elements that can lead to a predictable appreciated aesthetic result, for dentate and edentulous patient (ESAN & al [1], PREOTEASA & al [2]). The colour and appearance of teeth is a complex phenomenon, with many factors such as lighting conditions, translucency, opacity, light scattering, gloss and the human eye and brain influencing the overall perception of tooth colour (JOINER [3], DRAGHICI [4]). Prosthodontists have always been faced with the challenge of harmonizing tooth shade with a facial appearance in fully edentulous patients. They suggest that the colour of the teeth must harmonize with the surrounding environment such as skin, hair, eye colour, and age all with the aim of enhancing facial aesthetics (REKHA [5]). Between the different factors that influence tooth colour selection, such as environmental light illumination, patient preference, eyes and hair colour, the patients skin type is one of the most important. Especially in edentulous, with no pre extraction records of teeth shade, searching correlations between the tooth colour and other factors could be very useful. There are not very many studies regarding the correlations between the skin type and the tooth colour. Some of these studies found inverse relationship between skin colour and tooth shade while others found no relationship. Because of the different ethnic origin of the studied populations, the results vary very much. For example, one of the studies concluded that there was only moderate agreement between skin colour and tooth shade (AL-DWAIRI [6]). Other ones observed that there was an inverse relation between skin complexion and tooth value among a Jordanian population (AL-NSOUR [7]) or that tooth shade is also significantly associated with colour of the skin, in that people with lighter skin tones tend to have teeth with darker colours while those with darker skin tones possess teeth of lighter colours (AGRAWAL [8]).

Bearing in mind the aspects presented above, we planned a study with the scope of finding some correlations regarding the satisfaction between the tooth shade and skin type among a group of students of the Faculty of Dental Medicine of Carol Davila University of Medicine and Pharmacy in Bucharest, Romania.

## **Material and Method**

A lot of 57 students in the Faculty of Dental Medicine of Carol Davila University of Medicine and Pharmacy in Bucharest, Romania, with 23,74 years as an average age was selected. We applied the following inclusion criteria: no fillings, prosthetic restorations, endodontic fillings or whitening on the central incisors (1.1).

For each and every student the skin type and central incisor tooth colour were determined. The Fitzpatrick

cutaneous photo type test, that allows physicians to assess a person's risk of developing sunburn and, by extension, the need for sun protection to prevent the development of skin cancer (EILERS [9]) was used in order to determine every students skin type. The current Fitzpatrick skin type classification denotes six different skin types, skin colour, and reaction to sun exposure which ranges from very fair (skin type I) to very dark (skin type VI) depending upon whether the patient burns at the first average sun exposure or tans at the first average sun exposure, and the two main factors that influence skin type are genetic disposition and reaction to sun exposure and tanning habits.

In selecting tooth colour, it is important to understand the Munsell Colour System which is divided into three parameters: hue, chroma and value. Hue is the colour dimensions that differs one type of colour from the other colours (red, yellow, blue, etc). Chroma is the colour dimension that describes saturation, intensity or strength of hue, while value is colour dimensions that shows level of darkness or brightness (JUBHARI [10]).

For every 1.1 central incisor the hue, chroma and value (6) were determined, using 2 tooth colour selection keys, Vita Lumin Classic and Vita 3 D master, both being the most well known and used tooth colour determination shade guides. Being a subjective evaluation, the same illumination conditions were used for every tooth colour determination: daylight, the doctor's eyes at 30 cm to the patient mouth, between 8 and 12 in the morning, the same environmental conditions.

A Google form online survey based on 18 questions, structured as follows: 4 demographic questions and 14 specific ones, was submitted to the participants. The survey remained active for 7 days. The students had to answer to questions regarding their personal satisfaction with the correlation between the colour of the teeth and the colour of the skin in everyday life compared to the desire to change the colour of their teeth. We selected 4 aspects considered relevant for the actual paper.

## **Data analysis**

All the data from the study was analyzed using IBM SPSS Statistics 20 and illustrated using Microsoft Office Excel/Word 2013. Quantitative variables were tested for normal distribution using the Shapiro-Wilk Test and were written as averages with standard deviations and categorical variables were written as counts or percentages. Categorical variables were tested using Fisher's Exact Tests or Pearson Chi-Square Tests and all existent correlations were demonstrated using Pearson Contingency Correlations.

## **Results and Discussions**

The average age is  $23.74 \pm 2.266$  years, most of the participants being female (72%). All participants come from an urban environment (100%). The most observed

phototype is type III Fitzpatrick (30%) and IV (40%). 90% of the participants have an absent to moderate sunburn reaction, but 76% of participants are frequently getting a tan, with 74% moderately to intense intensity of the tan. Only 54% of them have a normal skin without any sensitivity.

In the VITA Classic dental colour evaluation, the most common hue group was A (46%), and in the VITA 3D Master evaluation, the most common hue group was Medium (60%) and the most common value group was 2 (50%). (Table 1)

**Table 1.** Distribution of participants by tooth shade(colour)

Dental colour group evaluated with VITA Classic	Nr.	Percentage
A	23	46%
B	10	20%
C	7	14%
D	10	20%
Teeth value group evaluated with VITA 3D Master	Nr.	Percentage
0	1	2%
1	5	10%
2	25	50%
3	17	34%
4	2	4%
Dental colour group evaluated with VITA 3D Master	Nr.	Percentage
Light	15	30%
Medium	33	60%
Reddish	2	4%

**Table 2.** Distribution of participants by phototype and natural skin color

Phototype/Skin color	White porcelain		Light-colored		Medium, white		Olive		p*
	Nr.	%	Nr.	%	Nr.	%	Nr.	%	
II	1	100%	4	19%	0	0%	0	0%	<0.001
III	0	0%	13	61.9%	2	13.3%	0	0%	<0.001
IV	0	0%	4	19%	12	80%	4	30.8%	R=0.812
V	0	0%	0	0%	1	6.7%	9	69.2%	**

\*Fisher's Exact Test, \*\*Pearson Correlation Coefficient

Data from Table 2 shows the distribution of participants by photo type and natural skin colour. Differences between groups were tested using Fisher's Exact Test, the results show statistically significant differences ( $p < 0.001$ ). The significant and positive high-grade correlation ( $p < 0.001$ ,  $R = 0.812$ ) and the Bonferroni correction Z-tests show that among participants with class II photo type, the largest share was those with white porcelain skin (100%), among participants with class III

photo type, the largest share was those with light-coloured skin (61.9%), class IV photo type – medium, white skin (80%) and in class V photo type – olive skin (69.2%). This data shows a clear correlation between skin photo type and skin colour. In the following studies, skin colour had been correlated with skin photo type (AGIN et al, 1985; ANDREASSI et al, 1987; HENRIKSEN et al, 2004; PALMER et al, 2006; YOUNG et al, 1991 DEL BINO [11]).

**Table 3.** Distribution of participants according to the dental color evaluated by VITA Classic and phototype

Phototype / Dental color VITA Classic	Light-colored (A-B)		Dark-colored (C-D)		p*
	Nr.	%	Nr.	%	
Light-colored (II -III)	17	51.5%	3	17.6%	0.032
Dark-colored (IV-V)	16	48.5%	14	82.4%	0.032
					R=0.327**

\*Fisher's Exact Test, \*\*Pearson Correlation Coefficient

Data from Table 3 shows the distribution of participants according to the dental color evaluated by VITA Classic and phototype. Differences between groups were tested using Fisher's Exact Test, the results show statistically significant differences ( $p=0.032$ ). The significant and positive moderate-grade correlation ( $p=0.032$ ,  $R= 0.327$ ) shows participants with lighter phototype (II-III) have more frequently light-colored teeth (A/B color group) while participants with darker phototype (IV-V) have more frequently dark-colored teeth (C/D color group).

Our result is opposite to the one of REKHA SB, PADMASREE S, APARNA N, KUMARI R [5], who discovered significant tooth shade differences between subjects and skin colours ( $P < 0.001$ ). Individuals with medium to dark skin tones were more likely to have lighter teeth, whereas with lighter skin tones have darker ones. JAHANGIRI L, REINHARDT SB, MEHRA RV and MATHESON PB found that persons with medium-to-dark skin tones were more likely to have teeth with lighter shades whereas individuals with lighter skin tones tended to have teeth with darker shades (JAHANGIRI [12], AZAD [13]).

**Table 4.** Distribution of participants according to their personal satisfaction with the correlation between the color of the teeth and the color of the skin in everyday life compared to periods of exposure to the sun

Everyday life/ Exposure periods	Exposure: Low		Exposure: Moderate		Exposure: High		Exposure: Very High		p*
	Nr.	%	Nr.	%	Nr.	%	Nr.	%	
Low	0	0%	1	7.1%	1	3.1%	0	0%	0.025
Moderate	0	0%	11	78.6%	7	21.9%	0	0%	0.004
High	1	100%	1	7.1%	19	59.4%	2	66.7%	R= 0.406
Very High	0	0%	1	7.1%	5	15.6%	1	33.3%	**

\*Pearson Chi-Square Test, \*\*Pearson Correlation Coefficient

Data from Table 4 shows the distribution of participants according to their personal satisfaction with the correlation between the color of the teeth and the color of the skin in everyday life compared to periods of exposure to the sun. Differences between groups were tested using Pearson Chi-Square Test, the results show statistically significant differences ( $p=0.025$ ). The significant and positive moderate-grade correlation ( $p=0.004$ ,  $R= 0.406$ )

and the Bonferroni correction Z-tests show that among participants with moderate everyday life satisfaction, the largest share was those with moderate satisfaction in exposure periods (78.6%) and among participants with high everyday life satisfaction, the largest share was those high satisfaction in exposure periods (59.4%).

No other study evaluated this correlations showing the originality and importance of our study.

**Table 5.** Distribution of participants according to their personal satisfaction with the correlation between the color of the teeth and the color of the skin in everyday life compared to the desire to change the color of their teeth

Everyday life satisfaction / Desire to change the dental color	Absent		Present		p*
	Nr.	%	Nr.	%	
Low	0	0%	2	5.7%	0.006
Moderate	1	6.7%	17	48.6%	0.001
High	9	60%	14	40%	R= -0.491
Very High	5	33.3%	2	5.7%	**

\*Fisher's Exact Test, \*\*Pearson Correlation Coefficient

Data from Table 5 shows the distribution of participants according to their personal satisfaction with the correlation between the colour of the teeth and the colour of the skin in everyday life compared to the desire to change the color of their teeth. Differences between groups were tested using Fisher's Exact Test, the results show statistically significant differences ( $p=0.006$ ). The significant and negative moderate-grade correlation ( $p=0.001$ ,  $R=-0.491$ ) and the Bonferroni correction Z-tests show that among participants with moderate everyday life satisfaction, the largest share was those that wanted to modify their dental color (48.6%) while among participants with very high everyday life satisfaction, the largest share was those that didn't want to modify their dental color (33.3%).

## Conclusions

Colour of the teeth and colour of the skin compared to periods of exposure to the sun and colour of the skin in everyday life compared to the desire to change the colour of their teeth, were significantly correlated. Most participants were neutral or content about the correlation between the colour of their teeth and their skin both during the day and during the high sun exposure periods but 70% of them would perform a colour change procedure of their teeth. The results of our study can be extrapolated and be very useful for tooth colour selection in edentulous patients. Other studies may be necessary to establish more accurate transdisciplinary correlations.

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