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RESEARCH ARTICLE

SHADE MATCHING PERFORMANCE OF DENTAL STUDENTS WITH THREE VARIOUS LIGHTING CONDITIONS

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ABSTRACT

Aims and objectives: To measure the ability of REU dental students and interns to match the dental shade under three light sources (daylight, clinical unit light, and corrective light source), to assess the importance of clinical experience on shade-matching accuracy, to assess the influence of the three standard light sources on the matching ability of the shade tabs. **Methods:** Cross-sectional (observational).Two hundred twenty-two female students (level7 to 12) and dental interns at REU participated. Any student with a color deficiency disease was excluded after taking the Ishihara eye test. **Results:** In this study, 222 interns and female dental students participated. The interns gave the most (100%) correct answers, followed by the level 9 students (92.8%); level 12 students (68.4%); level 11 students (35.2%), and the level 10 students reached the fewest correct answers (20%). Surprisingly, level 7 and 8 students had a high percentage of correct answers as well: (71.4%) and (83.4) respectively. The percentage of correct matches for each light source was corrective light (38.62%),daylight(63.83%), and clinical light(32.81%).The number of correct choices under the corrective light source was significantly higher than the two other light sources ($p < 0.0001$).At the same time, there was a highly significant difference between natural light, clinical light, and corrective light in significant correlation. **Conclusion:** As our research showed that the corrective light source was ideal for shade matching, we recommend using it to match the shade taken in daylight, along with improving knowledge of the different shades. It is also beneficial to practice shade-matching while r every 30 seconds by looking at a blue object such as a blue napkin. In this way, we can assure that the patient will get the maximum benefit and the aesthetic results would be optimal.

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INTRODUCTION

Shade-matching performance is an essential factor in natural tooth colour reproduction. It is commonly used to visualize the desired shade of dental restorations, and the results are transmitted to the dental laboratory to get a perfect final restoration and the highest patient satisfaction. Shade matching and selection is one of the most important attributes when evaluating the success of a restoration. (Nakhaei, *et al*. 2013)
Today's dental restorative materials should include perfect control of shape, surface texture, translucency, and colour of the restoration to replace a missing tooth structure. (Gasparik *et al.,* 2014). There are many methods for selecting the shade of a restoration such as using the spectrophotometer, computer software colorimeter, and digital photos. (Nakhaei *et al.,* 2013)
The human eye-brain complex can detect the differences in colour between two objects. When there is a difference, we will have a considerable variation in opinion among different observers.

Aging is another factor influencing colour perception; the aging cornea tends to perceive objects in shades of yellow and brown (Gasparik, *et al*. 2014). Clinicians perform shade-matching through comparing the remaining tooth shade with a commercially available shade guide (Nakhaei *et al*. 2013)to have successful and aesthetic dental restorations with the adjacent teeth and adaptation of the restoration to surrounding tissues. (Çapa *et al*. 2010). Many factors affect shade matching; they include selecting the proper light source, the surrounding environmental setting, and the experience of the dental professional.(Mete, Jitendra J, *et al* .2013)Dental practitioners who perform restorative procedures routinely show a higher ability in shade matching compared to those who do not. This means it is an acquired skill. (Nakhaei *et al*. 2013). There was a study showing that professional experience was associated positively with the outcome, while sex, eye colour and use of eyeglasses or contact lenses did not affect shade matching results (Çapa *et al*. 2010). The types of light sources and external lighting conditions are critical components and have significant values (Nakhaei, *et al*. 2013) An outdoor environment on a cloudy day has the Industry-standard colour temperature of 5500°Kelvin. Warm, incandescent light is found in many indoor environments and has a colour temperature of approximately 3200°Kelvin color. This is for verification of shade-taking. Mixed lighting conditions of daylight and room light existing in many indoor environments have approximately 3900°Kelvin colour temperature. Most of the clinicians prefer to perform the process of colour matching under clinical light or daylight, which affects the accuracy of shade matching. Daylight varies greatly according to the time of day, year, and the types of light sources in the office. This entails a mixture of daylight, fluorescent, or incandescent light. For this reason, colour-corrected lighting tubes and handheld light-correcting devices have been recommended to minimize the effect of lighting differences. The first types of handheld light-correcting devices used fluorescent tubes and had several inconveniences such as large dimensions and lack of user-friendliness (Gasparik *et al.,* 2015).

Daylight lamps improve colour matching and standardize light conditions. Natural light is ideal for this procedure when the shade matching occurs between midday and 3 p.m. or north sky daylight. However, this condition might be affected by cloud cover, humidity, and pollution. (Nakhaei, *et al*. 2013). Another factor affecting shade matching is the congenital deficiency of colour vision (CVD).Colour blindness is an inherited condition where a defective retinal pigment gene on the single male X chromosome is expressed, resulting in subjects with an altered perception of colour. It is an X-linked disorder and affects men more than women (Alabdelmoneam *et al*.2011). The colour vision tests used in clinical practice include pseudoisochromatic plate tests such as the Ishihara test, Hardy-Rand-Rittler (HRR) test, and the colour arrangement test. The Is haharas test provided rapid screening and accurate differentiation to diagnose the red-green colour defect (NirSorkin *et al*.2016). According toa study on the prevalence of congenital colour vision deficiency in Saudi Arabia, the investigation showed a prevalence of congenital red-green CVD of 5.85% and 0.75% among Saudi Arabian male and female children, respectively (Alabdelmoneam *et al*.2011). This study aims to measure the ability of REU dental students and interns to match the dental shade under three light sources (daylight, clinical unit light, and a corrective light source), to assess the importance of clinical experience on shade-matching accuracy, to assess the influence of three standard light sources on the matching ability of shade tabs.

MATERIALS AND METHODS

Ethical approval: The study proposal was submitted to the research centre of Riyadh Elm University, and approval for the study was obtained.

Study design: Cross-sectional (observational).
Study site and: Riyadh Elm University.
Time period: Three months.

Inclusion Criteria: Female students (level7 to 12) and dental interns at REU.

Exclusion criteria: Any student with color deficiency disease was excluded after taking the Ishihara eye test.

Sampling technique: A convenience sample.

Data recording: Electronic sheet.

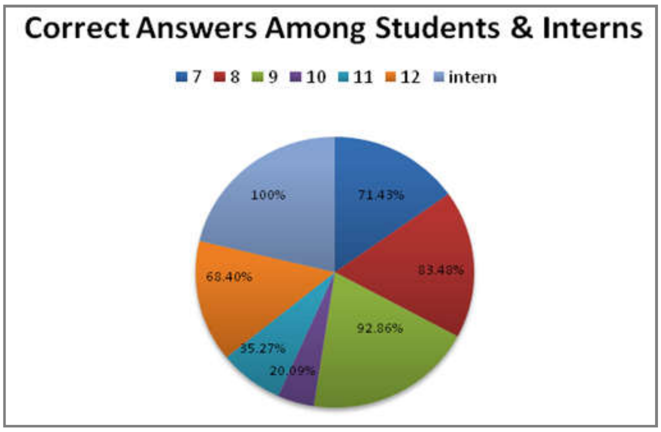
Sample Size: In a published paper, (Billards, 2017) it is stated that: "The first survey question was used to assess the participants' satisfaction with the shade-matching outcome (Table 4). Despite the ΔE clinical and ΔE laboratory discrepancies, most of the patients (94.2%), dental students (82.5%), and faculty members (58.3%) were satisfied or extremely satisfied." As this study was conducted with the students of REU, we used the percentage 82.5% to calculate the required sample size and with 95% confidence to control the error of estimation to within a 5% error margin. The calculated sample size we needed was 222 subjects.

Statistical Analysis: All the statistical analysis in this study was done by using the software package SAS version 9.4 (SAS Institute Inc., Cary, NC, USA). Descriptive statistics for the continuous variables will be reported as mean ± standard deviation, and categorical variables were summarized as frequencies and percentages. The categorical variables were compared by the Chi-square test, and the continuous variables were compared by the students' t-test and ANOVA test.

The level of statistical significance wasset at $p < 0.05$. Sampling Technique and Data Collection Method: Two classical VITA shade guides were used consisting of 16 randomly selected shades. Their identification codes were concealed, and the randomization was determined by hand drawing of numbers to eliminate eye fatigue. The students were asked to match these selected shades by using a complete VITAs hade guide under three varied lighting conditions (clinical light, daylight, corrective light source). The chosen shade tabs were recorded, and the correct match was counted. Scores were calculated by adding the number of correct matches. (*Nakhaei, M. 2019*).

Instruments: (1) Classical VITAshade guide , (2)Base light(tri -shade matching light), (3)Light settings: (A) Daylight 550 kelvin(B) Room light:3200 kelvin (C) Ambient light:3900 kelvin.

RESULTS



In this study, 222 interns and female dental students participated. The interns gave the most (100%) correct answers, followed by the level 9 students (92.8%); level 12 students (68.4%); level 11 students (35.2%), and the level 10 students reached the fewest correct answers (20%). Surprisingly, level 7 and 8 students had a high percentage of correct answers as well: (71.4%) and (83.4) respectively. The percentage of correct matches for each light item was calculated shown in (Figure1).

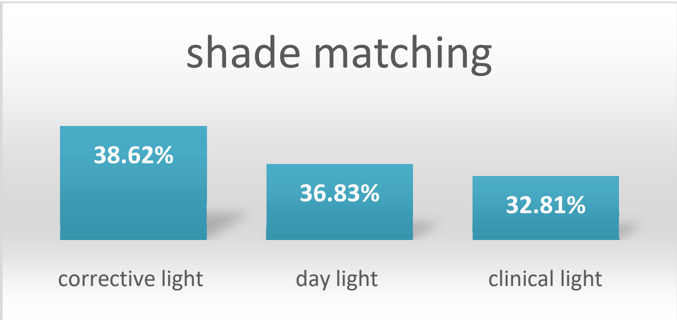


Figure 2. The percentage of correct answers under corrective light compared to the other 2 lights

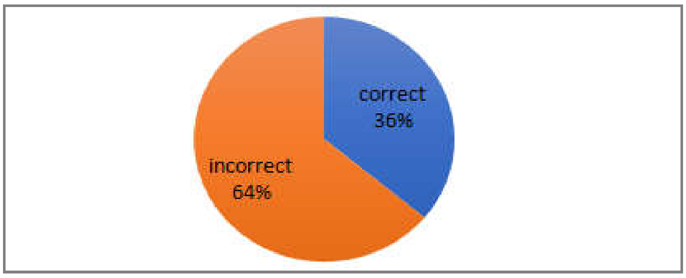


Figure 3. The percentage of corrective light compared to the other 2 lights.

Percent	Clinical Light	Daylight	Corrective light
Correct	32.81	36.83	38.62
Wrong	67.19	63.17	61.38

The percentage of correct answers under corrective light: Most of the participants reported a lack of differentiation withclinical light (67.19%), which was less than daylight (63.83%). The response for corrective light was 61.38%. The number of correct choices under the corrective light source was significantly higher than two other light sources ($p < 0.0001$).At the same time, there was a highly significant difference between natural light, clinical light, and corrective light in significant correlation. The chi-square test revealed significant differences in shade matching under the three light sources ($p= 0.0001$).

DISCUSSION

Shade matching varies under different types of light sources. Thus, it is important for dental practitioners to use the right light source to obtain a correct shade and offer the patient optimal aesthetic results. In this study, we aimed to assess if different light sources influenced the accuracy of shade matching and if the clinical experience of the various levels of dental students and interns at REU had any impact. The results of our study revealed a significantly higher percentage of right answers in detecting the appropriate shade under the corrective light source compared with clinical light and daylight. This agrees with Nakhaei *et al.,* 2013 and disagrees with Gáspárik *et al.,* 2014 who stated that there is no difference amongst the three. The second-best shade-matching answers were taken using a light source that simulated daylight. These results disagree with Japeen, 2015, who preferred clinical light over daylight. Our study also revealed that the experience of dental students does not necessarily play a role in shade selection.

The ability to choose the right shade varied slightly between dental interns and the junior dental students of REU, which is in accordance with the study by Helene *et al.,* 2009, and in dissensus with the studies of Samra *et al,*. 2017, Capa *et al.,* 2019, and Jaju *et al.,* 2010, which state that clinical experience plays a significant role in shade-matching abilities. This result may be influenced by the fact that our seniors are over-occupied with clinical work and with concentration requirements to be part of studies such as ours. It is important to help the students to choose correctly through improving their knowledge, and to encourage them to practice this process more often to avoid any complications in their future careers as dentists. The study had several limitations such as that the shade-matching study was held in different clinics at REU. Some of the clinics had natural daylight, and some did not. Consequently, the environmental area for shade matching was not controlled completely even though the three light sources were all available on one device. Some of the students had patients waiting for them; thus they were not comfortable with taking their time in matching the shades. Also, there are not any comparative studies to help with supporting the reliability of the specific device we used.

Conclusion

As our research showed that the corrective light source was ideal for shade matching, we recommend using it to match the shade taken in daylight, along with improving knowledge of the different shades. It is also beneficial to practice shade-matching while resting the eye every 30 seconds by looking at a blue object such as a blue napkin. In this way, we can assure that the patient will get the maximum benefit and the aesthetic results would be optimal.

REFERENCES

Alabdelmoneam, Mussaed, 2011. Prevalence of congenital color vision defects in Saudi females of Arab origin.

BUSHRA JABEEN, 2013. Evaluating shade matching ability of dental professionals.

Çapa, Niuray, Malkondu, Özlem, Kazazoğlu, Ender, Çalikkocaoğlu, Senih, 2010. Evaluating factors that affect the shade-matching ability of dentists, dental staff members and laypeople

Gáspárik C., Tofan A., Culic B., Badea M., Dudea D. 2014. Influence of light source and clinical experience on shade matching.

Helene J. Haddad A., Holger A. Jakstat B., Gerwin Arnetzl C., Judit Borbely D., Alessandro Vichi E., Herbert Dumfahrtf, Patrick Renault G, Nicoleta Corcodel H., Bostjan Pohlen I., Gyula Marada J., Juan A. 2009. Martinez Vazquez de Parga k,Mamaly Reshad l, Thomas U. Klinke m, Wolfgang B. Hannak n, Rade D. Paravina, Does gender and experience influence shade matching quality?

Jaju, Rishita A., Nagai, Shigemi, Karimbux, Nadeem, Da Silva, John D,2010. Evaluating tooth color matching ability of dental students.

Mete, Jitendra J., Dange, Shankar P., Khalikar, Arun N., Vaidya, Smita P. 2013. Comparative study of shade matching performance of dental students under natural daylight and daylight lamp conditions.

Moro, Marcella G. 2017. Evaluating Tooth Color Matching Ability of Dental Students.

Nakhaei, M. 2019. Shade matching performance of dental students with three various lighting conditions.

Nir Sorkin, Amir Rosenblatt, Eyal Cohen, Oded Ohana, Chaim Stolovitch, and Gad Dotan, 2016. Comparison of Ishihara Booklet with Color Vision Smartphone Applications.

Samra, Adriana P. Buhrer, Moro, Marcella G,Mazur, Rui F., Vieira, Sergio, De Souza, Evelise M., Freire, Andrea, Rached, Rodrigo N. 2017., Performance of Dental Students in Shade Matching: Impact of Training.

Silva, John D Da,Sc, M. 2010. Evaluating tooth color matching ability of dental students.

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