EVALUATION OF POSSIBLE DISCOLORATION ON VITA CLASSICAL SHADE TABS USED DAILY COMPARED TO NEW REFERENCE SHADE TABS

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ABSTRACT

Introduction Visual shade selection is still a very popular way of shade selection. This method is subjective with uncertain factors like the material of the conventional shade tab and restoration is different, the companies put different colored materials on the market under the same shade tab code. Besides these aggravating factors, the shade tabs can go under discoloration over time causing further difficulty in proper shade determination. This study aims to evaluate the extent of discoloration of the regularly used shade tabs by students in the Department of Prosthodontics. **Methodology** Six shades (A1, A2, A3, C2, C3, D2) were selected from nine regularly used VITA Classical shade guides (54 shade tabs in total) and compared visually and digitally (VITA Easyshade V spectrophotometer) to a corresponding brand-new reference guide. During the digital comparison L*a*b* values were recorded and the color difference (ΔE00) was calculated with the CIEDE2000 formula. **Results** 38 out of the 54 shade tabs were above the perceptibility threshold (0.8 ΔE00) and visual color changes were noticed as well. Unacceptable color differences (above 1.8 ΔE00) were found in 19 cases. Only 16 shade tabs did not show visible and clinically relevant measurable discoloration. **Conclusion** Conventional shade tabs are worn off and go through discoloration over time. In this study, 70.4 % of the regularly used shade tabs went through noticeable discoloration. It is recommended to keep one new shade guide to verify the color of the regularly used shade tabs in the dental office.

KEYWORDS

Prosthodontics, Dental Aesthetic, Color, Spectrophotometry, Discoloration.

1. INTRODUCTION

The success of dental aesthetic rehabilitation depends on the correct tooth shade selection. The color of the restoration is an important factor in patient satisfaction [1,2]. In most cases, the tooth shade determination is still carried out visually with shade tabs. The restoration materials are rapidly developing, new materials appear on the market every year until the most frequently used shade guides were put on the market before the noughties. (Fig. 1) The VITA Classical shade guide (VC) (before VITA Lumin Vacuum, VITA Zahnfabrik, Bad Säckingen, Germany) in 1956, the Chromoscop (Ivoclar-Vivadent, Amherst, NY) in 1990, and the VITA 3D Master (VITA Zahnfabrik, Bad Sackingen, Germany) in 1998 appeared on the market [2-4]. The material, translucency, and thickness of the restorations and the conventional shade guides are not always the same. Furthermore, the different

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companies carry out different shades under the same shade tab code [5]. Besides these aggravating factors that might lead to unsuccess in shade determination, the shade tabs are disinfected daily to prevent cross contamination which can lead to discoloration and worsen the outcome of the shade determination as well [6, 7].

Figure 1. New VITA Classical and 3D Master shade guides (left), old VITA Classical shade guides (right).

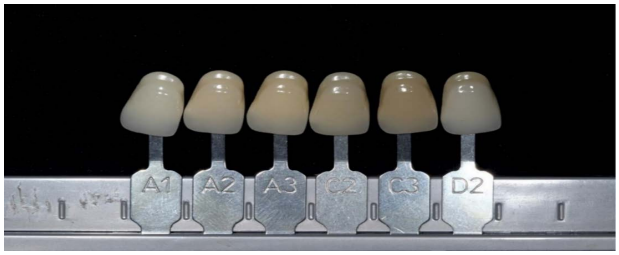

Figure 2. The six evaluated shade from VITA Classical shade tab.

This present study aims to compare the color parameters of VC shade tabs in daily use at the Department of Prosthodontics, Semmelweis University with brand-new, reference VC shade tabs to detect color changes due to the effect of daily use which might lead to inaccuracy in shade determination.

2. MATERIALS AND METHODS

Selection of the shade tabs:
Nine layered ceramic VC shade guide (VITA Zahnfabrik, Bad Säckingen, Germany) was selected randomly from the practice rooms of the Department of Prosthodontics, Semmelweis University, the shade tabs are used by students (manufactured 1 guide in 2010, 4 guides in 2012 1 guide in 2013, and 3 guides in 2015 and all of them are original and produced by VITA Zahnfabrik). The reference was a brand-new VC shade guide provided by the manufacturer and manufactured in 2021. Based on a previous study the A1, A2, A3, C2, C3, and D2 are the most frequent natural tooth shades [8]. In this present study, these six shades were evaluated. (Fig. 2)
Visual shade selection: To provide standard lighting Smile Lite lamp (Smile Line, Switzerland) was used for visual shade determination. The Smile Lite lamp simulated the optimal 5500 K illumination for the correct tooth shade selection [9]. (Fig. 3)
The visual shade selection was evaluated on the fact of the color difference between the used and the reference shade tabs but the degree of the color difference was not recorded. The observers, two dental students and one dentist who is an expert in dental shade selection went through the Ichihara test before the visual shade selection. (Fig. 4)
Digital shade determination:
For digital comparison, a VITA Easyshade V spectrophotometer (VITA Zahnfabrik, Bad SÃ¤ckingen, Germany) was used.

Figure 3. Smile lite lamp (5500 K).

Figure 4. Visual comparison of the used and reference shade tabs.

The standardization of the lighting conditions was essential because the spectrophotometer measured the reflected light for this the shade tabs were evaluated in a dark box, through a little hole the same size as the tip of the spectrophotometer. To provide a standard position the shade tab holder was used. In the holder, the shade tab was positioned centrally with the help of a custom-made deep-drawn foil case (positioning foil). The holder with the positioning foil was placed in the dark box under the hole. (Fig. 5) To standardize the position of the spectrophotometer an acrylic stand was made to hold the device.

Figure 5. Positining the shade tabs.

Figure 6. The VITA Easyshade V spectrophotometer measures L*a*b* values

One point measurement was made on every shade tab after calibration based on the instructions of the manufacturer. Every shade tab was measured three times. The spectrophotometer measures L*a*b* values. (Fig. 6) The L*a*b* values were recorded in an Excel file.

Calculating the color difference:

The ΔE shows the color difference between the used and the corresponding reference shade tabs. The color difference (ΔE00) was calculated with the CIEDE2000 formula. [10]

$$\Delta E_{00}\sqrt{\left(\frac{\Delta L'}{k_L S_L}\right)^2+\left(\frac{\Delta C'}{k_C S_C}\right)^2+\left(\frac{\Delta H'}{k_H S_H}\right)^2+R_T\left(\frac{\Delta C'}{k_C S_C}\right)\left(\frac{\Delta H'}{k_H S_H}\right)}$$

Where ΔL', ΔC', and ΔH are the differences in lightness, chroma, and hue. ΔR is an interactive term between hue and chroma differences. The weighting functions for the lightness, chroma, and hue components, respectively shown by SL, SC, SH. The kL, kc and kh parametric factors are correction terms for experimental conditions. In the present study kL=kc=kh=1.[11] [12] Based on a previous study wherein the Semmelweis University participated in the color difference was not noticeable to half of the observers between 0 and 0.8 ΔE00 [13]. Between 0.8 and 1.8 ΔE00 half of the observers noticed the color difference, but it was considered acceptable, but above 1.8 ΔE00 the color difference was unacceptable.

Correspondingly, in this present study, the perceptibility threshold (PT50:50%) is defined in 0.8 Î"E00 and the acceptability threshold (AT50:50%) is in 1.8 Î"E simultaneously. Based on the AT50:50% and PT50:50% the color difference of the shade tabs were divided into three groups: invisible, acceptable, and unacceptable color differences. (Fig. 7)

Figure 7. The shade tabs are divided into three groups based on the perceptibility and acceptability thresholds.

Results:

The ΔE00 was calculated based on the L*a*b* values. (Table 1)

Table 1. Measured L*a*b and calculated ΔE values in the case of all shades and samples.

Sample 1	L	a	b	deltaE	Sample 2	L	a	b	deltaE	Sample 3	L	a	b	deltaE	Sample 4	L	a	b	deltaE	Sample 5	L	a	b	deltaE
A1	83.4	-0.3	14.2	0.8067	A1	82.7	-0.2	14.6	0.4355	A1	85.5	-0.2	15.7	2.3754	A1	85	-0.3	15.4	2.0014	A1	84.6	-0.7	14.3	1.6811
	83.4	-0.3	14.2	0.8090		82.5	-0.2	14.5	0.2686		85.5	-0.2	15.7	2.3530		84.4	-0.3	15.5	1.6376		84.5	-0.8	14.1	1.6676
	83.4	-0.3	14.2	0.8924		82.6	-0.2	14.4	0.4900		85.5	-0.2	15.8	2.5210		84.5	-0.3	15.5	1.8471		84.5	-0.8	14.2	1.6853
			Average:	0.8360				Average:	0.3981				Average:	2.4165				Average:	1.8287				Average:	1.6780
A2	81.3	1.8	19.2	1.5699	A2	79	1.7	18	0.1855	A2	81	1.9	19.1	1.3592	A2	80.9	1.8	19.2	1.3214	A2	82.6	1.2	22.8	3.4936
	81.5	1.8	19.4	1.7837		78.9	1.7	17.9	0.2097		81.1	1.8	19.1	1.4678		80.9	1.8	19.1	1.3467		82.6	1.2	22.8	3.5478
	81.6	1.8	19.4	1.9317		78.9	1.7	17.9	0.1506		81	1.8	19.1	1.4945		80.9	1.8	19.1	1.4346		82.4	1.1	22.7	3.5342
			Average:	1.7618				Average:	0.1819				Average:	1.4405				Average:	1.3676				Average:	3.5252
A3	76.6	2.1	19.1	3.2300	A3	79.1	1.2	23.1	0.4972	A3	77.2	2.5	20	2.8037	A3	78	1.5	23	1.2772	A3	79.4	1.3	23.2	0.2823
	76.5	2.1	19.3	2.9667		79.1	1.2	23.2	0.3595		77.1	2.5	20	2.6280		78	1.5	23	1.0736		79.5	1.3	23.2	0.1972
	76.5	2.1	19.4	3.0437		79	1.2	23.1	0.4335		77.2	2.4	20	2.6294		78	1.4	23	1.1257		79.5	1.3	23.5	0.2548
			Average:	3.0802				Average:	0.4301				Average:	2.6870				Average:	1.1588				Average:	0.2447
C2	73.7	1.3	17.7	0.4014	C2	73.2	1.6	18.3	0.3174	C2	75.3	2	19.9	1.6174	C2	74.2	1.8	18.9	0.6477	C2	73.1	1.4	18.5	0.5001
	73.7	1.3	17.7	0.4000		73.3	1.6	18.2	0.4588		75.2	2	19.9	1.4395		74.5	1.7	18.7	0.5899		73.4	1.4	18.5	0.5287
	73.6	1.3	17.6	0.4582		73.2	1.6	18.2	0.2975		75.4	2	19.9	1.6441		74.5	1.7	18.7	0.7233		73.2	1.4	18.7	0.4785
			Average:	0.4199				Average:	0.3579				Average:	1.5670				Average:	0.6536				Average:	0.5024
C3	70.3	2.4	19.2	1.6633	C3	68.9	2.5	17.6	0.6130	C3	71.2	2.2	19.5	2.4059	C3	70.6	2.4	20	2.0451	C3	70.6	2.5	20.6	2.1944
	70.5	2.4	19.2	1.7519		68.9	2.5	17.6	0.5185		71.4	2.1	19.4	2.5026		70.4	2.5	20	1.8557		70.8	2.6	20.7	2.3054
	70.4	2.4	19.2	1.6076		68.7	2.5	17.7	0.3258		71.6	2.1	19.3	2.5557		70.4	2.5	20.1	1.8204		71	2.6	20.7	2.3658
			Average:	1.6743				Average:	0.4857				Average:	2.4881				Average:	1.9070				Average:	2.2885
D2	77.2	-0.4	12.1	1.1648	D2	76.2	-0.2	12.2	0.4058	D2	76.7	-0.3	13	0.8542	D2	76.5	0.1	14.1	1.2385	D2	76.4	-0.3	13.1	0.7190
	77.3	-0.3	12.2	1.0154		76.4	-0.2	12.1	0.3830		76.6	-0.2	13.1	0.7166		76.7	0.1	14	1.2750		76.3	-0.3	13.1	0.5973
	77.3	-0.3	12.3	1.3272		76.4	-0.3	12.1	0.7483		76.8	-0.3	12.9	1.0045		76.4	0.2	14.1	1.2535		76.4	-0.3	13	0.7673
			Average:	1.1691				Average:	0.5124				Average:	0.8584				Average:	1.2557				Average:	0.6946

Sample 6	L	a	b	deltaE	Sample 7	L	a	b	deltaE	Sample 8	L	a	b	deltaE	Sample 9	L	a	b	deltaE
A1	85.1	-0.3	15.4	2.0628	A1	84	-0.4	15	1.3043	A1	85.6	0.1	16.2	2.6028	A1	88.6	-0.9	17.3	4.6140
	85.1	-0.3	15.4	2.0423		84.2	-0.3	15.2	1.4443		85.6	0.1	16.4	2.6278		88.6	-0.9	17.3	4.5907
	85.1	-0.3	15.4	2.1757		83.9	-0.4	15	1.3509		85.5	0	16	2.6098		88.6	-0.9	17.4	4.7307
			Average:	2.0936				Average:	1.3665				Average:	2.6135				Average:	4.6451
A2	80.7	1.8	19.2	1.2010	A2	82.2	1.6	19.4	2.1999	A2	80.3	1.6	18.4	0.8195	A2	83.1	0.8	18.6	2.9254
	80.8	1.8	19.2	1.3153		82.3	1.8	19.7	2.3416		80.4	1.7	18.4	0.8772		83	0.8	18.7	2.8458
	80.7	1.8	19.2	1.3469		82.1	1.7	19.4	2.2419		80.4	1.6	18.3	0.9546		83.1	0.7	18.3	2.9927
			Average:	1.2877				Average:	2.2611				Average:	0.8838				Average:	2.9213
A3	77	2.2	18.9	3.1564	A3	76.6	2.2	19.5	3.1270	A3	77.9	1.4	22.8	1.3436	A3	77.9	1.6	23	1.3655
	77.2	2.3	19.4	2.6884		76.3	2.4	20	2.9797		78.3	1.4	23.2	0.8669		77.9	1.6	23	1.1637
	77	2.2	19	2.9957		76.4	2.4	20	3.0293		78.1	1.4	23	1.0554		77.8	1.6	23	1.2975
			Average:	2.9468				Average:	3.0453				Average:	1.0886				Average:	1.2756
C2	73.7	1.7	18.9	0.4481	C2	76	1.5	19.3	1.8827	C2	74.3	1.6	18.8	0.6449	C2	73.1	1.6	18.7	0.4976
	73.8	1.7	19.1	0.6065		75.8	1.6	19.4	1.5868		74.5	1.6	18.9	0.6638		73.4	1.6	18.6	0.4972
	73.7	1.8	19.1	0.5242		76	1.5	19.4	1.8821		74.3	1.7	18.9	0.6470		73.2	1.6	18.7	0.4051
			Average:	0.5263				Average:	1.7839				Average:	0.6519				Average:	0.4666
C3	70.3	2.3	19.6	1.7691	C3	70.5	2.2	19.6	1.9351	C3	71.4	2.3	19.4	2.5128	C3	73.1	2.3	20.7	3.9351
	70.2	2.4	19.9	1.7182		70.7	2.2	19.6	2.0242		71.2	2.4	19.5	2.3079		73.1	2.3	20.9	3.9202
	70.2	2.4	19.9	1.6544		70.5	2.3	19.9	1.8697		71.4	2.2	19.2	2.3714		73.1	2.3	20.9	3.8479
			Average:	1.7139				Average:	1.9430				Average:	2.3973				Average:	3.9011
D2	76.5	-0.3	12.8	0.6811	D2	75.9	-0.4	12.9	0.5190	D2	77	-0.2	12.3	0.9468	D2	78.6	-0.1	13.8	2.2484
	76.4	-0.2	13.2	0.6761		75.7	-0.4	12.8	0.4322		77	-0.2	12.3	0.7907		78.5	-0.1	13.8	2.0854
	76.5	-0.3	12.8	0.7901		75.9	-0.3	13.1	0.5414		77	-0.2	12.3	1.0962		78.5	-0.1	13.8	2.2939
			Average:	0.7158				Average:	0.4975				Average:	0.9446				Average:	2.2092

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Only 16 shade tabs were under the 0.8 ΔE values. 38 shade tabs were above 0.8 ΔE and 19 of the 38 exceeded the 1.8 ΔE values. (Table 2)

	A1 9 samples	A2 9 samples	A3 9 samples	C2 9 samples	C3 9 samples	D2 9 samples	All 54 samples
Under 0.8 ΔE	8	8	7	2	8	5	38
Above 1.8 ΔE	5	3	4	0	6	1	19

Table 2. The number of shade tabs above 0.8 ΔE00 (PT50:50%) and 1.8 ΔE00 (AT50:50%) in the case of six shades.

The most deviations were found in the case of A1, A2, and C3, eight out of nine shade tabs were above the PT50:50% in all of these cases. In the case of C3 six shade tabs were also above the AT50:50%,in the case of A1 and A2 five and three shade tabs were found unacceptable (above AT50:50%) color difference. Categorization and Fisher's exact test equivalent to the Chi-square test were done. The test showed that in the combined groups A1, A2, and C3 significantly (p=0.00056) worse outcome was noticeable than other shades in total. The three examined categories were combined on the basis that they have the lowest proportion of ΔE00 results indicating invisible color difference. (Fig 8,9)

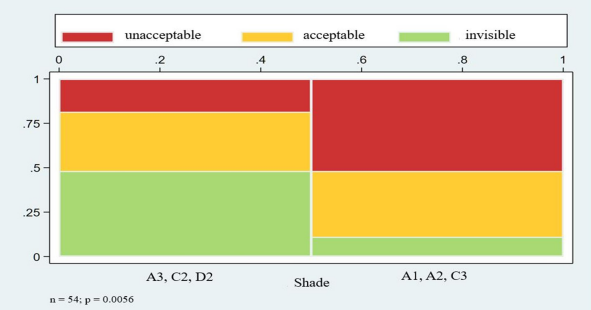

Figure 8. Distribution of ΔE00 categories defined based on the perceptibility and acceptability thresholds in groups formed based on shades and combined according to the similarity of the distribution. Fisher's exact test.

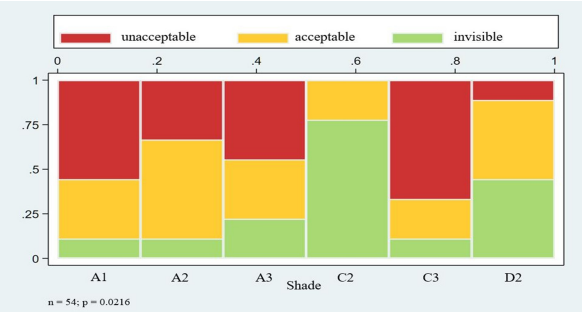

Figure 9. Distribution of ΔE00 categories defined based on the perceptibility and acceptability thresholds in groups formed based on shades. Fisher's exact test.

The ΔE00 of nine samples compared to the reference in every six shades are shown in Figure 10. The perceptibility and acceptability thresholds are marked with an orange line. During the visual comparison, the observers found visible color differences in 38 cases.

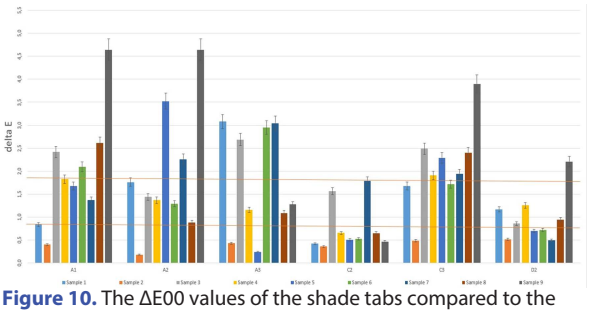

Figure 10. The ΔE00 values of the shade tabs compared to the reference separated to shades. The orange line shows the perceptibility (0.8 ΔE) and acceptability thresholds (1.8 ΔE).

4. DISCUSSION

Evaluation of the method of visual shade selection is a popular topic in dentistry. The most commonly used shade guide for visual shade selection is still the VC shade guide which contains 16 shades [14-16]. In dental practices to prevent cross-contamination the shade guides are disinfected regularly, [17] which can lead to changes in the shade [6, 18]. Al Amri et al. evaluated the effects of the disinfectant liquid on VITA Lumin shade tabs with VITA Easyshade. In their study, 80% of the randomly selected shade tabs showed higher ΔE values than the perceptibility threshold [19]. In another previous study the effect of three disinfectants - Cavicide, Asepticare TB, and Sporicidin – was evaluated with a VITA Easyshade spectrophotometer on VC shade tabs [17]. The study evaluated two years of usage and based on the results the shade tabs did not undergo color changes in this period. Arrejaie et al simulated the effects of one, two and three years of disinfection with three different disinfectants on VITA Toothguide 3D Master shade guides. The measurements were carried out with A 7000A Colour Eye (X-rite, Grand Rapid, MI, USA) spectrophotometer [20]. Clinically significant color change was not described even after the three-year simulation, but the number of simulated disinfectant cycles was less than in other similar articles Hombesh et al evaluated the survivability of VITA 3D Master shade guides. The measurements were carried out with a spectrophotometer and two years were simulated. The test group was treated with isopropyl alcohol (70%), for the control group distilled water was used. A significant color difference was found between the control and the test group but without any clinical significance [6]. Alshetri et al treated the VC shade tabs with a disinfectant containing 70% ethanol and isopropyl alcohol. The potential color difference after the disinfection was evaluated digitally (Shade Eye NCC colorimeter) and visually [18]. Discoloration on the shade tabs was found in the case of 17.8% after two years of simulation, after three years it was raised to 28.9%. Pohjola et al found increased L* (lightness) and c*(chroma) values after two and three years of simulated disinfection with Cavicide disinfectant [21]. Alsethri and Pohjola both recommend keeping one reference shade guide in the dental office to check the color of the frequently used shade guides regularly [18, 21]. In this present study the potential discoloration of the shade tabs - used by students in the Department of Prosthodontics, Semmelweis University - was evaluated due to everyday usage.

During the visual comparison a visible color difference was found on 38 shade tabs. The color difference was not commeasurable, but the transparency of the edges was less visible on the used shade tabs compared to the new reference. (Fig. 11,12) Regarding the C2 shade tabs the best result was observed because discoloration was only found in two cases. (Fig. 13)

Figure 11. D2 shade tabs. Reference shade tab on the left side. Discolored shade tabs on the middle and on the right side. For the upper pictures a cross polarization filter was used to remove glare.

Figure 12. The color difference is visible with the naked eye. The discolored shade tabs on the right side and the reference shade tabs on the left side. For the upper pictures a cross polarization filter was used to remove glare.

Figure 13. C2 shade tabs reached the best results, in this photo discoloration was not visible. For the upper pictures a cross polarization filter was used to remove glare.

During the spectrophotometric digital measurement, 38 out of 54 shade tabs showed higher values than 0.8 ΔE00 (perceptibility threshold) and belonged to the visible color difference group. The most frequent shade tabs were A1, A2, and C3 shade tabs in the visible color difference group. This can be attributed to the more frequent use of the mentioned shades and the increased number of disinfection cycles. The ΔE00 was above 1.8 in the case of 19 shade tabs, so 35.2% of the tested tabs belonged to the unacceptable color difference group. These tabs were considered clinically useless due to the unacceptable discoloration. The most frequent shades in the unacceptable color difference group were the A1 and C3. Only 29.6% of the tested shade tabs did not show noticeable color differences during the digital comparison. (Figure 14)

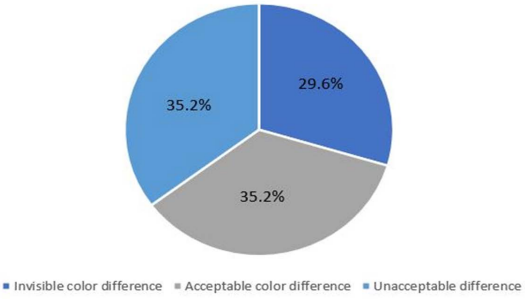

Figure 14. Percentage distribution of invisible, acceptable and unacceptable color differences among the tested shade tabs.

5. CONCLUSION

35.2 % of the tested VC shade tabs underwent unacceptable color changes. The present study demonstrated that the shade tabs were worn out, and discolored over time. The discoloration was even detected visually. The color changes might affect the color of the final restoration and lead to esthetic failures. The shade tabs used daily need to be checked regularly and have to be replaced if discoloration is detected.

Original Articles

AUTHOR CONTRIBUTIONS

DF: Conceptualization,Methodology, Investigation, Writing-Original draft, Visualization, Project Administration
JB: Conceptualization, Methodology, Writing-Review and Editing, Supervision
PH: Conceptualization, Writing-Review and Editing, Supervision

CONFLICT OF INTEREST

Authors declare that there is no conflict of interests.

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REFERENCES

1. Tin-Oo MM, Saddki N, Hassan N. Factors influencing patient satisfaction with dental appearance and treatments they desire to improve aesthetics. BMC Oral Health. 2011 Feb 23;11:6. doi: 10.1186/1472-6831-11-6. PMID: 21342536; PMCID: PMC3059271.
Full text links CrossRef PubMed Google Scholar Scopus WoS
2. Kinra MS, Goyal M, Handa A, et al. Shade Selection for Fixed Partial Dentures. Kasmera. 2015;09(01):15-25.
3. Sulaiman AO, Adebayo GE. Most frequently selected shade for advance restoration delivered in a tertiary hospital facility in South Western Nigeria. Ann Ib Postgrad Med. 2019;17(2):157-161. PMID: 32669993; PMCID: PMC7358804.
Full text links CrossRef PubMed Google Scholar
4. Zenthöfer A, Wiesberg S, Hildenbrandt A, et al. Selecting VITA classical shades with the VITA 3D-master shade guide. Int J Prosthodont. 2014;27(4):376-382. doi: 10.11607/ijp.3770. PMID: 25010883.
Full text links CrossRef PubMed Google Scholar Scopus WoS
5. ~~Alnusayri MO, Sghaireen MG, Mathew M, et al. S~~hade selection in esthetic dentistry: a review. Cureus. 2022;14(3):e23331. doi: 10.7759/cureus.23331. PMID: 35464532; PMCID: PMC9015060.
Full text links CrossRef PubMed Google Scholar WoS
6. Hombesh MN, Praveen B, Sinha HV, et al. Two years survivability of VITA 3D master shade matching guides after disinfection with isopropyl alcohol: an in vitro study. J Conserv Dent. 2019;22(3):275-280. doi: 10.4103/JCD.JCD_573_18. PMID: 31367113; PMCID: PMC6632636.
Full text links CrossRef PubMed Google Scholar Scopus
7. KHodarahmi E, Salari M, Azizi A, Lawaf S. Discoloration of Vita classical shade guide by glutaraldehyde disinfectant. J Res Dent Maxillofac Sci 2021;6(1):4-13. doi: jrdms.dentaliau.ac.ir/article-1-293-en.html
Google Scholar Scopus
8. Stawarczyk B, Brauneis M, Langwieder B, Spintzyk S, Eichberger M, Liebermann A. Mechanical and optical properties of indirect veneering resin composites after different aging regimes. Dent Mater J. 2021;40(2):279-287.
Full text links CrossRef PubMed Google Scholar Scopus WoS
9. Clary JA, Ontiveros JC, Cron SG, Paravina RD. Influence of light source, polarization, education, and training on shade matching quality. J Prosthet Dent. 2016;116(1):91-97. doi: 10.1016/j.prosdent.2015.12.008. PMID: 26851189.
Full text links CrossRef PubMed Google Scholar Scopus
10. Mokrzycki WS, Tatol M. Colour differenceΔ E - a survey. Mach Graph Vis. 2011;20(4):383-411.
Google Scholar
11. Luo M, Cui G, Rigg B. The development of the CIE 2000 colour-difference formula: CIEDE2000. Color Research & Application. 2001;26(5):340-350. doi: 10.1002/col.1049
CrossRef Google Scholar Scopus WoS
12. CrossRef Google Scholar Scopus WoS
13. Paravina RD, Ghinea R, Herrera LJ, et al. Color difference thresholds in dentistry. J Esthet Restor Dent. 2015;27 Suppl 1:S1-9. doi: 10.1111/jerd.12149. PMID: 25886208.
Full text links CrossRef PubMed Google Scholar
14. Hassel AJ, Zenthöfer A, Corcodel N, et al. Determination of VITA Classical shades with the 3D-Master shade guide. Acta Odontol Scand. 2013;71(3-4):721-726. doi: 10.3109/00016357.2012.715197. PMID: 23146130.
CrossRef PubMed Google Scholar Scopus WoS
15. Igiel C, Weyhrauch M, Wentaschek S, et al. Dental color matching: a comparison between visual and instrumental methods. Dent Mater J. 2016;35(1):63-69. doi: 10.4012/dmj.2015-006. PMID: 26830824.
Full text links CrossRef PubMed Google Scholar Scopus WoS
16. Paravina RD. Performance assessment of dental shade guides. J Dent. 2009;37 Suppl 1:e15-20. doi: 10.1016/j.jdent.2009.02.005. PMID: 19329240.
Full text links CrossRef PubMed Google Scholar Scopus WoS
17. Huang PY, Masri R, Romberg E, Driscoll CF. The effect of various disinfectants on dental shade guides. J Prosthet Dent. 2014;112(3):613-617. doi: 10.1016/j.prosdent.2014.04.006. PMID: 24819530.
Full text links CrossRef PubMed Google Scholar Scopus WoS
18. Alshethri SE. Evaluation of color changes in the Vitapan Classical Shade Guide after disinfection. Oper Dent. 2014;39(3):317-324. doi: 10.2341/13-125-L. PMID: 24147748.
Full text links CrossRef PubMed Google Scholar Scopus WoS
19. Alamri MD. The effect of disinfecting solutions on the color of porcelain shade guides. Egypt Dent J. 2008 Apr;54(2):1057-1066.
Google Scholar
20. Pohjola RM, Hackman ST, Browning WD. Evaluation of a standard shade guide for color change after disinfection. Quintessence Int. 2007;38(8):671-676. PMID: 17823685.
Full text links PubMed Google Scholar Scopus WoS

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Questions

1. What are the most commonly used shade guides?
❑a. Vita Classical and Vita 3D Master;
❑b. Vita Classical and Ivoclar Universal A-D shade guide;
❑c. Vita 3D Master and Vita Bleachguide 3D Master;
❑d. None of the above.

2. The visual shade selection is:
❑a. Objective;
❑b. Not used anymore;
❑c. Subjective;
❑d. Always very precise.

3. What is the color temperature of the Smile Lite lamp?
❑a. 1000 K;
❑b. 65000 K;
❑c. 10000 K;
❑d. 5500 K.

4. Please select the true statement:
❑a. The Vita Easyshade V spectrophotometer measures the reflected light;
❑b. For visual shade selection, the standardized light conditions are not important;
❑c. The VITA Easyshade spectrophotometer is not able to measure color parameters like L*a*b or L*c*h;
❑d. The color difference is measurable with the Vita Easyshade spectrophotometer.