DIFFERENCE IN TOOTH SHADE PERCEPTIBILITY BETWEEN CLINICALLY EXPERIENCED AND INEXPERIENCED OBSERVERS USING A COMMERCIALLY AVAILABLE SHADE GUIDE

[1]AHMAD SHOAIB, [2]WALEED ISHAQ, [3]AYESHA NASEEM,
[4]MUHAMMAD AAMIR GHAFOOR CHAUDHRY

ABSTRACT

The objective of this study was to assess the difference in accurate perception of tooth shades between the house officers with prior clinical experience and the dental students without any clinical experience. This cross sectional study was conducted in the Prosthodontics department at Islamic International Dental Hospital, Islamabad. The study duration span was of 6 months (September 2018 - February 2019). A total of 80 participants were selected using convenience sampling and divided in two equal groups (one group with 40 students and another with 40 house officers). A simple shade matching exercise was conducted and the results were registered on to a well-structured proforma. The eighty participants, including 21 males and 59 females, ranged in age from 19 years up to 24 years with a mean age of 21.60 years and standard deviation of 1.62. Ten participants from Group 1(undergraduate students) were able to match shade successfully in comparison to twenty seven of the Group 2 participants (house officers). Chi-square test was applied to determine the significance of clinical experience with successful shade matching obtained by the subjects. When the final scores were correlated among both groups, a highly significant association was returned (p value 0.000). Therefore, the present study inferred that the house officers had better tooth shade perceptibility, owing to their clinical experience, than the dental students.

INTRODUCTION

Contemporary trends in esthetic dentistry focus on innovative techniques and superior dental materials to enhance esthetic services rendered by the clinician.[1] Provision of esthetic restoration requires the dentist to approach the task of tooth shade selection artistically as well as scientifically.[2] The esthetics of a dental material comprises of primary traits such as color, translucency, form and surface texture.[3] Replication of these traits makes shade selection the most crucial step. Therefore it is imperative for clinicians to be familiar with the process of tooth shade selection and its dynamics.[4]

The task at hand can be accomplished by instrumental shade determination or visual shade determination.[5] Instrumental shade determination is found to be more reliable and is done by using spectrophotometer, spectroradiometer or colorimeter.[5,6] Visual shade determination encompasses the comparison of the subject tooth in contrast to commercially available dental shade guides.[5] Due to its dependence on visual perception, it is considered challenging yet the most prevalent method for shade selection.[3,4] Complications in precise shade matching have been reported in the past.[7] Clinical dental studies have reported a color mismatch of 60% in metal-ceramic restorations and 44% to 63% in ceramic restorations.[7,8]

Color perception is a subjective skill.[3] It has been claimed that variables such as experience, age, gender, color deficiency, illumination, operator positioning, patient's make-up, operator fatigue and eye fatigue can lead to discrepancies and influence the shade selection ability.[3,4,9]

Ahmad et al[4] reported accurate tooth shade perceptibility to be an acquired skill. They also concluded in their research that clinical experience can facilitate an

[1] **Corresponding:** Dr Ahmad Shoaib, BDS, FCPS Resident Prosthodontics, Address: House No. 19, Street No. 27, Block-F, Naval Anchorage, Islamabad. Phone: 0321-5625412 Email: ahmad_shoaib_274@hotmail.com
[2] BDS, FCPS Resident Prosthodontics
[3] BDS, FCPS Resident Prosthodontics
[4] BDS, FCPS, Assistant Professor
All Authors from Islamic International Dental Hospital

observer in performing better at tooth shade selection in contrast to the relatively inexperienced observers. In another research, Öngül et al[5] mentioned that shade selection is influenced by human variables such as clinical experience. Similarly, Alomari et al[10] found successful shade selection to be experience-dependent. Contrary to all the above mentioned researches, Bahannan et al[9] reported that experience did not have any influence on shade selection. Another study suggested clinical experience as a non-vital factor for shade matching.[11] Similar findings were also reported by Barna et al.[12]

Keeping in view the previous researches with contradictory results, the present study was planned to investigate and compare the tooth shade perceptibility demonstrated by inexperienced undergraduate students and experienced house surgeons. The gathered data would provide information regarding the influence of clinical experience alone on the shade selection skills.

MATERIALS AND METHODS

This cross-sectional comparative study was carried out in the Department of Prosthodontics at Islamic International Dental Hospital, Islamabad through December 2018. The sampling technique used was Convenience non-probability. The total sample size of the study was 80, including 3rd Year BDS students and House Officers of IIDH, without any gender discrimination. The participants were excluded on the basis of color blindness (failure to comprehend Ishihara Color Charts correctly) or history of eye operation for any reason.

Participants were divided into two groups based on clinical experience. Group 1 included 40 undergraduate 3rd year students who had no prior experience regarding shade selection, whereas, Group 2 included a total of 40 house officers who had completed their Prosthodontics and Operative Dentistry department rotations, acquiring adequate experience.

DATA COLLECTION PROCEDURE

All participants were tested on the basis of completion of a simple shade matching exercise, specifically devised for the study under homogenous conditions and a standardized shade matching apparatus. Vitapan Classical shade guide (manufactured by VITA Zahnfabrik, Bad Sackingen, Germany) was used for the purpose of shade matching. The shade tabs were covered with an opaque tape, numbered randomly and arranged in order of increasing value according to manufacturer instructions. A porcelain denture tooth of shade A3 (manufactured by Pigeon Dental; Made in China) was used for shade matching exercise.

There was no time limit for the exercise. Basic information of each participant was recorded, after which the proforma was handed over to the participant to complete the shade matching exercise. Participants were required to match the denture tooth with the shade tabs provided and write down the number of the selected shade tab in the corresponding space on the proforma. Each proforma was later scored by the principal investigator. At the end, each proforma was marked according to the shade matching procedure as 'Correct' or 'Incorrect'

DATA ANALYSIS PROCEDURE

The task of data analysis was carried out on version 23 of Statistical Package for Social Sciences (SPSS). The study variables were age, gender, clinical experience and the individual perceptibility scores. Mean and standard deviation were calculated for quantitative variable i.e. age. Frequency and percentage were calculated for qualitative variables like gender, clinical experience and the individual perceptibility scores. Data was stratified for clinical experience. Post-stratification, perceptibility scores were statistically analyzed by applying the Chi Square test at 95% confidence interval. P-value of less than or equal to 0.05 was considered significant.

RESULTS

The eighty participants, comprising 40(50%) students and 40(50%) house officers, ranged in ages from 19 years up to 24 years, with a mean age of 21.60 years and standard deviation of 1.62. There were 21(26.25%) males and 59(73.75%) females amongst the study sample. 37(46.25%) of the participants matched the shade correctly while 43 (53.75%) were unable to do so.

Table 1 represents the post-stratification outcome of successful shade matching obtained by the study subjects in relation to their clinical experience. A total of 10 participants from Group 1 were able to match shade successfully in comparison to 27 of the Group 2 participants.

Table 2 illustrates the statistical analysis when Chi-square test was applied to determine the significance of successful shade matching obtained with clinical experience by the subjects. When the final scores were correlated among Group 1 and Group 2 subjects, a highly significant association was established (P-value 0.000).

DISCUSSION

Limited studies with inconclusive results have been done previously on the topic under discussion. Consequently, successful tooth shade matching remains a simple yet troublesome task for the clinician. The use of shade guides for the visual shade-matching procedure

TABLE 1: SHADE SELECTION * GROUP CROSS-TABULATION

Shade Selection	Group				Total
	1 (Students)		2 (House Officers)		
	No.	Percentage	No.	Percentage	
Correct	10	25	27	67.5	37
Incorrect	30	75	13	32.5	43
Total	40		40		80

TABLE 2: CHI-SQUARE TESTS

	Value	df	Asymptotic Significance (2- sided)	Exact Sig. (2- sided)	Exact Sig. (1- sided)
Pearson Chi-Square	14.532a	1	.000		
Continuity Correctionb	12.872	1	.000		
Likelihood Ratio Fisher's Exact Test Linear-by-Linear	15.020	1	.000	.000	.000
Association	14.350	1	.000		
N of Valid Cases	80				

is quick and economic. However, even the wide-ranging shade guides cannot precisely match the shades of the natural dentition, and the uneven distribution of the shade tabs in the shade guide has been a source of problems.[13]

In this study, clinical experience was the basis for division of participants into two groups. Group 1 included participants with no experience (undergraduate students) while Group 2 included participants with experience (house officers). Successful shade matching was performed by 25% of Group 1 participants in comparison to 67.5% of Group 2 participants. The correlation of final scores depicted a significant association among Groups 1 and 2. Hence the experience hypothesis was proven to be true.

Dissimilar results were obtained by Ahmad et al[4] where students actually scored higher than house officers in the shade matching exercise. The mean scores for students was 1.72 as compared to 1.50 for house officers.

Additionally, Curd et al[11] reported clinical experience to be an insignificant variable in shade selection. However, since their study was limited to undergraduate dental students, the results may not be completely analogous to ours, as we have included experienced participants also. Moreover, Bahannan et al[9] reported that the groups divided according to education level did not differ in their shade matching capability. This finding is analogous to the findings of Haddad et al[14], Cal et al[15] and Gehrke et al[16] who also reported no significant effect of experience in shade matching. However, in contrast, Della Bona et al[17] reported better shade matching accuracies with previous training in shade matching.

Education in color science and clinical experience both have been proposed to be the most significant variables influencing a person's ability to select tooth shades correctly.[18,19]

We have targeted the clinical experience factor in our study but due to time and budget constraints, we could not educate our participants about essential shade matching techniques and protocols. This is a limitation to our study as Samra et al[20] concluded that previous education and training in color positively affected shade matching ability of dental students on shade guide pairing tests. Our study also did not include the factor of gender specific shade matching ability even though studies like the one conducted by Pecho et al[21] have showed female observers to have better accuracy on visual shade matching than male observers. Additionally, a more reliable outcome could have been yielded by including a larger sample of both students and house officers. This also was not possible since the study was limited to only one institute.

CONCLUSION

The perception of tooth shades is performed better by experienced observers in comparison to inexperienced observers, irrespective of the gender. However, further deliberation and research is required to ascertain whether this is true for a larger sample of the population.

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CONTRIBUTIONS BY AUTHORS

1 **Ahmad Shoaib:**   Research Idea, Methodology and Reference searching.
2 **Waleed Ishaq:**   Introduction, Data entries and Results.
3 **Ayesha Naseem:**   Data Collection and Discussion.
4 **Muhammad Aamir Ghafoor Chaudhary:** Composing, Editing and Proof Reading