EVALUATION OF PERCEPTION OF DENTAL COLOR BY STUDENTS AND PROFESSORS OF DENTISTRY

ABSTRACT

AIM: To evaluate visual perception of dental color carried out by students and professors of Dentistry area. MATERIAL AND METHODS: For this study, 64 people were selected to respond a personal questionnaire and a color selection questionnaire. The respondents also perform, using the color scale VITAPAN classical, the choice of healthy human tooth color, maintained humid and in an acrylic resin cylinder developed especially for this research. RESULTS: Only 6.25% of respondents answered correctly the natural tooth color. CONCLUSION: According to the color verification through a spectrophotometer, only 6.25% of respondents have carried out correctly the color selection. In this way, for the good aesthetical result, the criteria need to be standardized and pre-established in order to perform the color selection correctly, observing the variables which can interfere on its choice.

KEYWORDS
INTRODUCTION

The worry with smile affects the humanity for long time. Ancient findings dated 2500 B.C. have shown the use of artificial teeth to replace lost teeth. This concern is based on the maintenance of health and also of aesthetics that is obtained by harmony among patient’s teeth, gum, lips and face.1

An aesthetically pleasing smile depends on the color, size, shape, tooth position, superior lip position, visibility of teeth and quantity of gingival exposition. Although each factor might be considered individually, all the components should act together to create a harmonic and symmetric entity that produces the final aesthetical effect.2

The color is determined by several factors, because the light source characteristics and the way in which the object reflects transmit or absorb the light waves that achieve it, playing an important role in the final result called color.3

Tooth color determination by visual mean is considered highly subjective.4 An adequate color choice usually is performed from a series of artificial teeth provided by the manufacturer in the way of color scale. The colors are selected according to the proximity between the scale and the natural tooth. It has been reported the existence of color difference between the scale and the final color of the product restored. This finding may be a source of problems to the dentist, once it is presumable that the resulted restoration is not considered clinically acceptable.5

The failures are possibly due to the lack of control of variables which lead to the unsatisfactory results. Some fundamental concepts must be incorporated to the practice in order to achieve the approximated color of natural tooth in aesthetic restorations.4

The human eye is very efficient in detecting small differences on the color of two objects. But despite this efficiency, some variables can interfere, such as external light conditions, experience, age and the human eye fatigue. Besides, standardized verbal means for communication the color characteristics visually evaluated are also limited.4

With the use of subjective methods for color choice and the observation that it may not be reliable, objective methods were created to choose the color: they are the spectrophotometers, colorimeters or techniques of analysis of images with the help of software.6 Spectrophotometers have great advantages on the color scales, because the color reading is objective, repeatable, quantifiable, and obtained faster. However, this method is not usually applied due to the cost of equipment and the inconvenient of handling.7

Among the factors which determine the difficulty of correct tooth color choice, we can detach the human eye, because when change the surrounding colors or the type of light, it can be induced to see a different color of the
ideal one. Human eye perception occurs through the cones and rods. The color is a light wavelength that our eyes perceive with these cones and rods.\(^8\)

Another important point is detache the eyes fatigue is extremely fast. We should not look fixely at a color for more than 5 seconds, because there is the risk of cones from retina lose part of their acuity. This forced visualization fatigue the cones and result in the chroma perception and sample diminished values. The selection should be carried out in the beginning consult, before fatigued eyes with dentistry procedures.\(^9\)

Adequate light is ideal to the correct color selection. However, many professionals use artificial light, making inadequate their choice. When occur light long time exposition, the rods sensitivity is diminished. After long exposures, it is necessary reload cones and rods, and we must to look at a grey card to do it.\(^8\)

The phenomenon when the object seems to be different under another type of light is called metamerism. Some condition may become the color look different, like surrounding walls colors, clothing, lipstick, and hair color. The effects of metamerism may be diminished when the Chroma is used as hue and value.\(^8\)

The color is measured according with tone, saturation and bright, or by synonyms, like hue, Chroma and value. The color only can be described through these three attributes. Hue is the name given to the color and, through it we can distinguish one color from another.

Value is the color luminosity, and with it is possible differentiate a light from a dark color, measuring on the black and with scale, crossing the grey colors and usually it is not approached on the scales. Chroma is the color strength, the quality which distinguishes a weak color from a strong one.\(^8,10\)

Tooth color perception is a complex phenomenon that might be influenced by many factors, including light conditions, optical properties of teeth, visual experiences of viewer, difference of dentistry specialty, gender, age, among others.\(^2,12-14\) However, some works also report that there is no significant difference on color perception related to the gender,\(^13,15,16\) age\(^16\) and experience.\(^13,14\)

Adequate color choice is usually carried out from a series of guidelines provided by the manufacturer of color scale. The colors are selected according to the proximity of scale and natural tooth.\(^12\)

Each professional of Dentistry area has his/her own sequence for color selection in the clinic. This sequence and other factors mentioned previously may interfere on the color selection. Then, some items should be followed and observed in order to help professional in the right color selection. In a general way, these items are: performing the...
color selection before dental preparation; choosing the first daytime for selection; certification that surrounding colors are neutral (walls, clothing colors, lipstick in women patients); verifying if teeth are clean and free of stains; the patient should be in an upright position in a similar level to the operator and the color guide and in a distance of one arm; observing colors in a fast way in order to avoid eye fatigue; teeth scrutiny to observe characterization which can be reproduced.9

Comprehension of color and factors which affect the selection, methodology of color combination, correct communication of dentist expectations regarding to the laboratory work, more adequate procedures to be followed and the better finalization to be done on the restoration form a complex study in which the dentistry practice still need.17

Further to be well developed the activities performed by the dentist technician, the communication between them is paramount. In this way, the aim of this study was evaluate the tooth visual color perception carried out by faculty students and professors of dentistry area. The null hypothesis is there is no statistically significant difference among students and professor on the color selection.

**MATERIAL AND METHODS**

The study was carried out based on data collection from the answers obtained of questionnaires applied. The research was constituted of Dentistry professors and students of University of Southern Santa Catarina – UNISUL. It was selected 6 students of each semester and 10 professors who compose the Dentistry faculty, totaling 64 respondents. The project was submitted and approved by the Ethics in Research Committee of this institution.

The group of students interviewed was divided into those who have not clinical activities. The group of professors was also divided into those who belonged to the aesthetical area (Dentistry and prosthesis specialists) and those who have not belonged to the aesthetical area (any other area).

For data obtaining, each respondent answer a personal questionnaire and a color selection questionnaire. Within the color selection questionnaire, the respondents perform, using the VITAPAN Classical color scale, the color choice for a health premolar human tooth. The tooth was impregnated in acrylic resin (Clássico, Artigos Odontológicos S/A – Brazil) in a mold of the same material (30 mm height, 22 mm de diameter and an internal space localized in the center of mold, with 10 mm diameter and 20 mm height) along its axis with a paralleleometer (Bio Art Equipamentos Odontológicos Ltda, São Carlos-SP, Brazil), at 3mm of cement-enamel junction. There was any instruction about how we should perform in the moment of color
selection. For this research, the respondent was informed the right to take the scale and the natural tooth in his/her hands to select the color, and there was no time determined. Then, each respondent sat down in a room with natural light from a window. For all the cases, the time of interview was from 09:30h to 15:30h.

The tooth color selection which would use for comparison with the color selected by the participants was performed through spectrophotometer Vita Easyshade (Vita, Zahnfabrik, Germany).

The data were digitalized using the Microsoft Office Excel 2007™ and for statistical analysis the Mann-Whitney test was used (students with no clinical experiences X without clinical experiences; specialist professors x no specialists) and the Spearman correlation test was carried out for all the groups. All the variables for interest regarding to the respondents were described. There was correlation of all the questions with the color selection.

RESULTS

Regarding to the color selection, the results finding in this work are described on the Graphs 1 to 5.

DISCUSSION

From the early last century, the problems with color in Dentistry have been described and nowadays also are challenging. Despite great advances have been achieved in this field, the dependence of subjective standardization with color scales continues a common practice used.5

Donahue15 (1991), Curd et al.13 (2006), Çapa12 (2010), Poljack-Guberina16 (2011), evaluated if there is difference on the color perception by gender and they did not find any significant differences, corroborating with the results finding in this research, where there was also no difference related to the gender (P>0,05).

Most dentist surgeons use the traditional method for color selection; in other words, the use of color scale. This method is based on the training of professional vision; however, not all of them present perfect vision. This fact was found in the results, where was verified that 50% of respondents used corrective glasses, but 5% of them was no using during the color selection.17

Professional age also have influence on the color choice.12,15 This statement match with results obtained in this research, in which the individuals more than forty years old had tendency to choose more yellowish colors when perform the color selection. However, the literature is also controversial with this result, because there are works which report
that age is not considered a significant variable.\textsuperscript{16}

Graph 1. Students with clinical activities.

Graph 2. Students without clinical activities.

Graph 3. Especialist teachers.

Graph 4. Non-especialist teachers.

Graph 5. General analysis.

Professional experience also is considered controversial in the literature; there are reports about negative influence.\textsuperscript{12,15} In this research, the experience did not show significant difference; it was confirmed that 20\% of professors without (n=1), in other words, with less experience in color selection, choose the adequate option; while none (0\%) of professors with specialization carried out the correct color selection, corroborating with
works which report that professional experience does not interfere in the color selection.\textsuperscript{13,14}

All the variables highlighted in this study deserve attention at the time to perform the tooth color selection, because one can influence on the final result. However, for higher reliability of results, new studies should be developed about the theme detached in this research, the color selection.

CONCLUSION

Inside the limitations of this research, it was observed that: 1. Experience, lack of qualification, vision problems and non-correction, further the tooth color selection by visual means is very subjective method, leading to the inadequate color selection; 2. According with the color verification using the spectrophotometer, only 6.25\% was compatible with the result found by the visual method for tooth color selection; 3. To achieve a good aesthetical result, it is necessary follow the steps of color selection, as well as the observation of variables which can influence the choice.

REFERENCES


