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Influence of Color Vision Impairments on Shade Matching among Dental Students †

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Abstract: This study examined the impact of color vision deficits on shade selection accuracy among 119 Portuguese dental students. Only males displayed color vision deficiencies (4/119). Participants completed an Ishihara color vision screening test and a shade selection test using the VITAPAN classical scale. Overall, 59.4% of students correctly matched shades. No significant gender difference was found. Matching shades was easier in the order of C > B > A > D, with darker shades posing more difficulty. Color vision deficiencies did not significantly affect accurate tooth shade selection. However, males showed a higher prevalence of color vision deficiencies, and shade matching ease varied based on matice.

Keywords: color; color vision deficits; shade selection

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1. Introduction

In the past few decades, there has been an increasing demand from the general public for better dental aesthetics [1]. Although patients lack dental-specific knowledge, they are able to distinguish if a restoration has a biomimetic appearance or if it looks artificial and unaesthetically pleasing [2]. For this reason, accurate shade selection in the restorative treatment is crucial for its success. A visual method is commonly used by dentists to perform this selection. However, not all dentists are able to accurately undertake this selection, as the method is subjective and they might suffer from color vision deficits [2]. For this reason, all dentists should have some basic training in the science of color and carry out screening tests to assess their visual acuity.

2. Materials and Methods

The sample for this study comprised 119 dental students from Instituto Universitário Egas Moniz (IUEM, Caparica, Portugal), who were in their final year. The participants were predominantly females (75%), within an age range of 22–42 years old and with a reported mean age of 23. The evaluation process consisted of two stages. Firstly, a color vision test was employed for screening, utilizing the Ishihara test. This test was administered under standardized lighting conditions and involved participants reading numbers displayed inside colored circles. Secondly, a shade selection test was carried out using the VITAPAN classical scale (Vita Zahnfabrik, Bad Säckingen, Germany) for posterior comparison. During this last phase, each student was provided with three teeth from the VITAPAN classical scale and was required to match the shade of each tooth with a complete VITAPAN scale, while being blind to the original shade. Regarding statistical data treatment, descriptive statistics were performed utilizing SPSS v. 26.0 software.

3. Results

Among the participants in the study, color vision deficiency was observed exclusively in males, with 4 out of 119 males incorrectly identifying all discs in the Ishihara test. When it came to matching shades on the VITAPAN classical scale, the overall accuracy rate was 59.4% among all students. Specifically, male students achieved a 54.8% accuracy rate, while female students exhibited a slightly higher accuracy rate of 61%, although this difference was not statistically significant. In terms of shade matching ease, students found it relatively easier to correctly match shades in the following order of matices: C, B, A and D. Darker shades were generally more challenging to match accurately compared to lighter shades on average.

4. Discussion

The topic presented in this study holds significance as accurate shade selection is vital for successful restorative dental procedures. The study aimed to contribute to the existing literature by examining the correlation between color vision deficiencies and shade matching using a commercial tooth shade scale, among a random pool of dental students. The results of this study align with previous research conducted by Khosla et al. (2017) [1] and Ethell et al. (2006) [3], which concluded that color vision deficiencies do not significantly affect color matching. However, contrasting findings have been reported by Davison et al. (1990) and Barna et al. (1981) [4,5], who found that color vision deficiencies can impact color discrimination and may necessitate assistance when using color scales.

Overall, while some studies support the findings of the present study that color vision deficiencies do not significantly impact color matching, other studies have reported differences in color discrimination abilities. These differences could potentially be influenced by variations in lighting conditions and environmental factors during the tests. It is important for dental professionals with color vision deficiencies to be aware of their limitations and seek appropriate support when using color scales in their practice.

5. Conclusions

In conclusion, the findings of this study indicate that color vision deficiencies do not appear to significantly impact the accurate identification and selection of tooth shades using a commercial scale, specifically the VITAPAN classical scale. However, it is noteworthy that a higher prevalence of color vision deficiencies was observed among male participants. Furthermore, the ease of shade matching on the tooth shade scale seems to depend on the hue. These results align with the notion that individuals with color vision deficiencies can still effectively perform shade selection tasks in dental practice using appropriate tools and techniques.

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