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ASSESSMENT OF ESTHETIC SMILE COMPONENTS BY DENTAL STUDENTS

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ABSTRACT

Background: The present information indicates that most students utilized the technology-based system well, but they missed some practical activities. Assessment of students' satisfaction with the e-learning activities and asking for feedback can help institutions to improve the know-how about e-learning practices. Hopefully, the sudden pandemic-related shift through modes of education will not be considered an unfavorable impact on education but an evolving experience to pave a comprehensive way to technology-based educational activities.

Material and methods: The study was performed on 580 dental students. Among the eight components of the balanced smile, six factors (the smile arc, smile line, dark buccal corridors, gingival margin and incisal edge asymmetries, tooth axis, and dental midline inclinations) apart from those related to dental and gingival ones, were examined on photographs. Manipulations were made on the photo of a female patient with the ideal smile.

Results: Statistically significant differences were observed between the preclinical and clinical groups and, in binary comparisons, between curricular years at pre-clinical and clinical levels ($P < 0.05$).

Conclusions: Our findings confirm the reports from previous investigations considering the impact of dental education on dental students' perception of dentofacial esthetics.

Keywords: Esthetic Smile Components, Dental Education, Dentofacial Esthetics

1. INTRODUCTION

A smile is associated with pleasant concepts such as salutation, pleasure, happiness, fun, or joy. Goldstein defines smiling as the second most effective factor in facial attractiveness after eyes. Goldstein (1969), Chen et al. (2020)

An esthetically pleasing smile supposes the concretion of esthetic notions that concert the combination of teeth and dentofacial esthetics. Alhammadi et al. (2018) The dental literature has recommended multiple reference parameters for agreement in the evaluation of smile esthetics. of such parameters, the major ones include the smile arc, smile line, dark buccal corridors, gingival margin and incisal

edge asymmetries, tooth axis, and dental midline inclinations. A harmonious relationship is supposedly considered highly esthetic. Kadhim et al. (2020)

Professionals' esthetic perceptions and differences in such perceptions are reported in the literature. However, clarification is needed about whether subjective perceptions can be attributed to objective esthetic items. Another point that requires further studies is the objective measurement, quantification, of such perceptions and attributions. Frese et al. (2012) Through the undergraduate dental education curriculum, dental students are commonly required to perform rehabilitation on clients' anterior teeth by using cosmetically restorative or prosthetic procedures. Importantly, the curricula of dental education should teach the criteria and standards of smile esthetics through theoretical and practical courses. Chen et al. (2020)

Since the 1980s, many studies have investigated differences in the perception of dental esthetics assessed by people with and without dental education. Although, in the literature, the methodologies and sample sizes have been specified in the studies about the perception of smile esthetics by dental students, the number of studies investigating perceptional differences between dental students by curricular years is limited. Romsics et al. (2020)

The COVID-19 pandemic has affected several domains of life, including dental practice and education. The spread of COVID-19 has created a pandemic with catastrophic consequences on the population due to its effects on public health and the quality of life. Such untoward consequences include the quality of dental education in universities, too, because of the unfavorable effects on practical training, which has a major part in the curricula. Compared to education for other professions, dental curricula specifically require the integration of theory with laboratory and clinical practice. During the COVID-19 pandemic, dentists have fallen into the very high risk category in terms of contracting the infection because the potential for exposure to the coronavirus is high through aerosol-generating operations in dentistry. This study was carried out during the pandemic period. Therefore, we would like to emphasize that the results of the study could be affected and limited by the unfavorable consequences of the pandemic period.

2. OBJECTIVES

The aim of the study was to a-) examine the perception of smile esthetics and its evolution among undergraduate dental students, b-) determine whether variations in such perception exist among students attending different dental curricular levels, c-) compare and identify differences in the perception of smile esthetics between pre-clinical and clinical undergraduate dental students, who attended online classes during the COVID-19 pandemic and who continued formal classroom learning, respectively. The null hypothesis was that there would be no differences in the perception of smile esthetics between student groups attending online education and face-to-face education during the pandemic period when dental school students from different undergraduate curricular years were compared.

3. MATERIALS AND METHODS

This was a cross-sectional study conducted in the Department of Prosthodontics in the period from February 2021 to May 2021. The ethical conduct of this study was approved by the School of Medicine Ethics Committee, Suleyman Demirel University (E-87432956-050.99-38980). The participants signed a written

consent form following the Helsinki Declaration of the World Medical Association. Only personal information collected from participants was demographics. The teaching technique in the preclinical curriculum of dental education is normally a practice-based student-centered active learning program at Suleyman Demirel University, School of Dentistry. In the first two years of dental education, theoretical and practical training in basic medical sciences is intense, followed by the dental education curriculum starting from the 3rd year. Normally, students attend preclinical laboratory courses in the first and second years, third-year students are observers in clinics, and 4th and 5th-year students spend half of the day treating patients in the clinic and the other half with theoretical education. Accordingly, preclinical, and clinical years are the first three years and the 4th and 5th years of the curriculum, respectively.

The sample size was calculated using the G*Power software program (Franz Faul, Universität Kiel, Germany). The sample size analysis revealed that 64 participants were needed per group to achieve a significance level of 0.05 and statistical power of 80%. The calculated sample size was comparable to previous studies. Cruz et al. (2015)

4. PHOTOGRAPH MANIPULATION AND DATA COLLECTION

Among the eight components of the balanced smile, six factors, except those related to dental and gingival, were examined on photographs. Manipulations were made on the photographs of a female patient with the ideal smile. All photos were edited using a photo editing software program (Adobe Photoshop CS6; Adobe System Inc) and photographs of the same size, resolution, and magnification were obtained.

Figure 1

Figure 1 Modified Smile Photographs that were Shown to Dental Students

In order to evaluate the smile symmetry among other smile components, the symmetrical smile photograph on Image B was edited by skewing it to the right and left. In the second photograph, the normal lateral negative spaces (buccal corridor) on Image B were edited by increasing and decreasing the buccal corridor widths. Buccal corridor widths were classified as narrow, medium, and wide based on previous studies in the literature. Nascimento et al. (2012) The upper lip curvature was examined on the third photo. The normal upper lip curvature was edited by skewing upward and downward. On the fourth photo, the lip line was examined. The ideal lip line was taken lower and higher. In order to evaluate the frontal occlusal plane for occlusal plane canting as another smile component, the symmetrical smile in the photograph shown in Image B was modified by creating a right and left canting. Finally, to evaluate the smile arc, the ideal smile arc of the patient in the photograph in Image B was modified in two different ways by accentuating and flattening the smile arc curve (Figure 1).

The parameters evaluated in our study were examined based on the smile components with ideal norm values employed by Sabri (2005)

The modified photographs were integrated into a questionnaire form via Google Forms. The questionnaire link was sent to dental students via e-mail and Whatsapp. (https://forms.gle/6JU5aN7bpYZD686e7). Dental students were asked to score the images by using a visual analog scale (VAS). The scores were rated by participants on a scale from 1 to 10, where the most esthetic smile could be scored as 10 and the least pleasant one could be scored as 1. Responses were collected via Google Forms and compared statistically.

5. STATISTICAL ANALYSIS

The Kolmogorov–Smirnov test was used to determine the normality of the distribution of our data. Parametric tests were used because the data showed a normal distribution pattern. Descriptive statistics were calculated for scores of smile components for all groups. Age and gender distributions of the groups were analyzed using the chi-square test. One-way analysis of variance (ANOVA) and LSD post hoc tests were used to compare the scores between the dental student groups by their curricular years. The independent t-test was used to compare the scores of smile components between the pre-clinical and clinical student groups. SPSS package program (for Windows, version 20.0; SPSS Inc., Chicago, IL) was used to analyze the data. The results were considered statistically significant at the $p < 0.05$ significance level.

6. RESULTS

The total number of participants was 580; of whom 296 (51.03%) were clinical-level students and 225 (38.79%) were males. The overall response rate was 87.78%, with a rate of 75.11% for the pre-clinical group and 99.95% for the clinical group, and 79.05% for males, and 93.31% for females (Table 1). When the participation rates by the preclinical and clinical groups were examined, it was observed that almost all of the 4th and 5th year students participated in the study, and very few of the 3rd year students did not participate in the study.

The examination of the age distribution of the groups revealed that most of the students in the pre-clinical group were in the 17-20 years age range and most students; in the clinical group were in the age range of 21-23 years. The comparison of demographic data between groups showed that there was a statistically

significant predominancy of women in all groups and the age distribution was significantly different between the groups (P <0.05) (Table 1). Gender distribution was homogeneous because of the predominancy of women in the whole student population in the school of dentistry.

Table 1

Table 1 Demographic Data

	Mean ± SD / %
Total / Participants	661 / 580 (87.74)
Clinical Status	284 Pre-Clinical (48.96)
	296 Clinical (51.04)
Age (years)	20.76 ± 2.61
Gender	
Male	225 (%39)
Female	355 (%61)

In esthetic smile scoring, in all groups, the photograph with the ideal esthetic smile in Image B received significantly higher scores for all components compared to other photographs (P < 0.05) (Table 2).

Table 2

Table 2 Statistical comparison of aesthetic smile components according to dental students' classes

		Dental Students' Classes															
			1 2	3	4	5	Post-Hoc Tests										*p'*
		Mean ± SD	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**	1-2	1-3	1-4	1-5	2-3	2-4	2-5	3-4	3-5	4-5	
Smile Symmetry	A	3.83 ± 1.93	4.25 ± 1.79	3.27 ± 1.73	3.02 ± 1.64	2.7 ± 1.29	NS	*	**	***	***	***	***	NS	**	NS	**p≤0.001**
	B	8.4 ± 1.56	7.86 ± 1.67	7.96 ± 1.44	7.96 ± 1.53	7.88 ± 1.55	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	**NS**
	C	3.72 ± 2.03	4.02 ± 1.98	3.01 ± 1.55	3.01 ± 1.80	2.85 ± 1.49	NS	**	**	**	***	***	***	NS	NS	NS	**p≤0.001**
	p	**p≤0.001**	**p≤0.001**	**p≤0.001**	**p≤0.001**	**p≤0.001**											
Lateral Negative Space	A	4.80 ± 1.96	5.24 ± 1.87	4.36 ± 1.65	3.56 ± 1.76	3.32 ± 1.69	NS	NS	***	***	***	***	***	***	***	NS	**p≤0.001**
	B	7.51 ± 1.98	7.08 ± 1.74	7.27 ± 1.69	7.48 ± 1.83	6.92 ± 2.03	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	**NS**
	C	5.11 ± 2.81	5.39 ± 2.47	4.73 ± 2.46	4.89 ± 2.34	5.43 ± 2.72	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	**NS**
	p	**p≤0.001**	**p≤0.001**	**p≤0.001**	**p≤0.001**	**p≤0.001**											
Upper Lip Curvature	A	3.04 ± 1.87	3.6 ± 2.26	3.24 ± 2.07	3.15 ± 2.03	2.8 ± 1.56	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	**NS**
	B	8.12 ± 1.89	7.48 ± 2.07	7.65 ± 1.59	7.53 ± 1.62	7.36 ± 2.03	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	**NS**
	C	2.22 ± 1.59	2.51 ± 1.99	2.2 ± 1.54	2.27 ± 1.62	1.89 ± 1.61	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	**NS**
	p	**p≤0.001**	**p≤0.001**	**p≤0.001**	**p≤0.001**	**p≤0.001**											
Lip Line	A	2.77 ± 1.79	3.02 ± 2.18	2.68 ± 1.69	2.66 ± 1.86	2.53 ± 1.61	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	**NS**

Occlusal Frontal Plane	B	7.88 ± 1.75	7.08 ± 1.93	7.26 ± 1.67	7.19 ± 1.69	7.66 ± 1.85	**	*	*	NS	NS	NS	*	NS	NS	NS	**0.015**
	C	4.64 ± 2.45	4.75 ± 2.59	4.11 ± 2.24	4.1 ± 2.25	3.56 ± 2.05	NS	NS	NS	**	*	*	***	NS	*	NS	**0.003**
	p	**p≤0.001**	**p≤0.001**	**p≤0.001**	**p≤0.001**	**p≤0.001**											
	A	3.98 ± 2.24	4.25 ± 2.19	3.84 ± 1.91	3.44 ± 1.83	3.28 ± 1.63	NS	NS	NS	*	NS	**	**	NS	*	NS	**0.003**
	B	8.24 ± 1.7	7.62 ± 1.81	7.56 ± 1.68	7.42 ± 1.94	7.53 ± 1.96	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	**NS**
	C	2.69 ± 1.77	2.77 ± 2.08	2.39 ± 1.6	2.21 ± 1.6	2.06 ± 1.23	NS	NS	NS	*	NS	*	**	NS	NS	NS	**0.015**
	p	**p≤0.001**	**p≤0.001**	**p≤0.001**	**p≤0.001**	**p≤0.001**											
Smile Arc	A	4.32 ± 2.22	4.85 ± 2.06	4.01 ± 1.9	4.13 ± 1.84	4.03 ± 2.08	NS	NS	NS	NS	**	*	**	NS	NS	NS	**0.026**
	B	7.66 ± 1.94	6.93 ± 1.94	7.09 ± 1.73	7.28 ± 1.86	7.01 ± 1.87	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	**NS**
	C	5.04 ± 2.8	5.4 ± 2.49	5.15 ± 2.27	4.8 ± 2.29	4.62 ± 2.33	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	**NS**
	p	**p≤0.001**	**p≤0.001**	**p≤0.001**	**p≤0.001**	**p≤0.001**											

Abbreviations: SD, Standard Deviation; NS, not significant; p, Results of One-way ANOVA test (Comparison of photographs in classes); p', Results of comparing classes with each other by One-way ANOVA test (Post Hoc (LSD) test); *P < .05. **P < .01. ***P < .001.

When scores were evaluated by the curricular years, the scores attributed to the photograph in Image B picture were found to be similar between the groups (P >0.05). There was not a significant difference in the scores attributed to the upper lip curvature by the curricular years and between the preclinical and clinical groups (P >0.05) (Table 3).

Table 3

Table 3 Statistical Comparison of Aesthetic Smile Components According to Clinical Status of Dental Students

		Pre-Clinical Students	**Clinical Students**	***P'***
		Mean ± SD	**Mean ± SD**	
Smile Symmetry	A	2.87 ± 1.49	3.65 ± 1.83	**p≤0.001**
	B	7.92 ± 1.54	8.02 ± 1.54	**NS**
	C	2.93 ± 1.66	3.42 ± 1.83	**p≤0.001**
	p	**p≤0.001**	**p≤0.001**	
Lateral Negative Space	A	3.45 ± 1.73	4.68 ± 1.81	**p≤0.001**
	B	7.21 ± 1.95	7.27 ± 1.77	**NS**
	C	5.15 ± 2.53	4.99 ± 2.55	**NS**
	p	**p≤0.001**	**p≤0.001**	
Upper Lip Curvature	A	2.98 ± 1.83	3.29 ± 2.08	**NS**
	B	7.45 ± 1.83	7.71 ± 1.81	**NS**
	C	2.09 ± 1.62	2.29 ± 1.68	**NS**
	p	**p≤0.001**	**p≤0.001**	
Lip Line	A	2.61 ± 1.74	2.79 ± 1.85	**NS**
	B	7.41 ± 1.78	7.34 ± 1.77	**NS**
	C	3.84 ± 2.17	4.41 ± 2.39	**p≤0.01**

	p	**p≤0.001**	**p≤0.001**	
Occlusal Frontal Plane	A	3.36 ± 1.74	3.98 ± 2.06	**p≤0.001**
	B	7.48 ± 1.94	7.72 ± 1.74	**NS**
	C	2.14 ± 1.44	2.55 ± 1.78	**p≤0.01**
	p	**p≤0.001**	**p≤0.001**	
Smile Arc	A	4.08 ± 1.95	4.31 ± 2.04	**NS**
	B	7.14 ± 1.86	7.17 ± 1.85	**NS**
	C	4.71 ± 2.31	5.19 ± 2.44	**p≤0.05**
	p	**p≤0.001**	**p≤0.001**	

Abbreviations: SD, Standard Deviation; NS, not significant; p, Results of One-way ANOVA test (Comparison of photographs in classes); p', Results of comparing groups with independent t test; *P < .05. **P < .01. ***P < .001

Increased lateral negative spaces were scored higher in the preclinical group compared to the clinic group (P <0.05) (Table 3). Statistically significant differences were observed both between groups and in binary comparisons of pre-clinical and clinical curricular years (P < 0.05) (Table 2).

Images A and C with an asymmetrical smile arc were scored higher by the 2nd year students, while students in the 5th year attributed the lowest scores. A statistically significant difference was found between the groups (P < 0.05). The higher scores by the 2nd year students created a significant difference between the preclinical years (P < 0.05) but no differences were found between the clinical years (P > 0.05) (Table 2). For Images A and C, where the frontal occlusal plane was canting to the right and left, higher scores were given by the 2nd year students, while the lowest scores were recorded by the 5th year students (Table 2). A statistically significant difference was found between the groups (P < 0.05) (Table 3). Finally, when the lip line and the smile arc were examined, Image C with a high lip line and Image C with the convex smile arc were scored significantly higher in the clinical group (P < 0.05) (Table 3).

7. DISCUSSION

The null hypothesis was rejected. There were significant differences in perception of smile esthetics between online education and face-to-face education among students attending different undergraduate curricular years during the pandemic period.

Many factors that can affect the perception of esthetics cover emotions, impulses, conditions, cultural autobiography, and case history. The competence in identifying differences in patients' smiles can help the dentist to produce the most appropriate smile design and create an effective treatment plan. Chen et al. (2020), Lombardi (1973), Tsukiyama et al. (2012)

The orofacial esthetic scale developed by Larsson and colleagues in 2010 is an eight-item self-reporting tool to determine the esthetic impact of the treatment on patients' facial outlook. The items of the scale are scored on a numeric scale ranging from 0 (very unsatisfied) to 10 (very satisfied). It is reported by investigators that this quantitative tool is suitable for determining esthetic characteristics in clinical and research settings. Peerlings and colleagues developed a photographic scale to analyze facial esthetics and reported that it was suitable to be used in clinical practice. Larsson et al. (2010), Larsson et al. (2010), Peerlings et al. (1995) The photographic scale developed by Peerlings and colleagues was used in our study because it was considered to be potentially more useful for the study purposes.

In this present study, students attending earlier years of dental education gave different scores for the same photograph. In scoring an esthetic smile, Image B with the ideal esthetic smile was scored significantly higher for all smile components in all groups compared to the scores attributed to other photographs.

The biggest challenge in producing ideal smile esthetics is to achieve the most suitable esthetic perfection for that patient and to create the ideal match between the smile components, including the dentofacial components of the participants, 88.3% reported that the smile arc was an important component and should be addressed carefully for producing ideal smile esthetics. The findings of our study are similar to the results reported by Câmara and Machado. Kadhim et al. (2020), España et al. (2014), Camara (2010), Machado (2014)

The buccal corridor is a gap between the edges of the lips and the buccal surface of the posterior teeth, which is one of the components of a natural smile. For a more esthetic smile, the area of this buccal dark space is desired to be as limited as possible. Romsics et al. (2020) In our study, two different combinations were obtained by increasing and decreasing the buccal dark spaces in the photographs, which were compared with the ideal esthetic smile. In all student groups, it was concluded that the ideal smile should have buccal dark spaces, albeit slightly (**Image 1 / 2B**). The results are in line with a previous study, which has reported that small buccal dark spaces are found to be more attractive by students. Romsics et al. (2020)

Other important components of an esthetic smile are symmetry and dark buccal corridors. It is mostly desired that all components of the smile arc, such as lips and teeth, would be symmetrical and that dark spaces on lip edges would be minimal during smiling. It was observed that the recognizability of these components by dental students was high. Increased lateral negative spaces were scored higher in the pre-clinical group compared to the clinic group. Statistically significant differences were observed both between groups and in binary comparisons between pre-clinical classes and clinical classes.

When smile symmetry was evaluated in a study in the literature, most of the participants (95.2%) reported that the guidance of the maxillary occlusal plane during the planning of dental treatments should also be addressed as another important component of smiling. Sabri (2005) Smile symmetry is determined by the connection points of the edges of the mouth in the vertical plane, with the parallelism of both the commissural and pupillary lines. Hulsey (1970), Janzen (1977) Although the commissures move upward and to the sides during smiling, studies have reported differences in the range and the direction of the movement on the plane extending between the right and left sides. Rubin (1974) , Paletz et al. (1994), Benson & Laskin (2001)

As for variations of the occlusal plane, the students in higher curricular grades (from the third year on) identified such characteristics more readily. Our study findings agree with those reported by Geron and Atalia but are different from those reported by McLeod et al. in this respect. España et al. (2014), McLeod et al. (2011)

There were no significant differences in the scoring of the upper lip curvature between students from different curricular years and between preclinical and clinical groups.

Janson et al. showed that, among smile components, the smile arc alone was not sufficient for an ideal smile. Janson et al. (2011) Having a pleasant smile was found to be an important component for smile esthetics (91.5% concern vs. strong concern) and this finding was acknowledged by other researchers, too. Oshagh et al. (2010), Londoño Bolívar & Botero Mariaca (2012)

In an ideal smile arc, which could be defined as harmonious, the line formed by the maxillary incisors should be parallel with the border of the lower lip during smiling. Kadhim et al. (2020) Less than 61% of the participants were able to distinguish different features in the smile arc. More than 61% of the participants defined the elliptical region, when evaluating the smile arc. For the photos with inconsistent characteristics in this feature, participants attributed lower scores and reported the smile as unattractive. An elliptical smile arc (convex smile line), where the edge of the mouth is lower compared to the center of the lower edge of the upper lip, was found to be the least esthetic smile of all smile types, where smile arcs were compared. Dindaroğlu et al. (2016)

Smile arc is considered to be one of the most critical parameters in smile esthetics because it causes individuals to look younger or older. Camara (2010), Machado (2014) This was confirmed by excellent editing (91.6%) on the photographs to create a negative impact of the smile arc. There are also concerns that a flat cutting plane could lead to the smiling person being perceived as older than his/her real age. Cruz et al. have reported that the esthetic features of the smile, such as the presence of a smile arc and buccal corridors, exist in harmony in individuals with normal occlusion and are not affected by facial biotype. Cruz et al. (2015)

Regarding the smile arc, a slightly inverted arc is the most endemic option, which is a slight deviation from what is usually agreed to be the esthetic norm. Machado (2014) These can be considered esthetic options that usually exist in all participant groups in the study, regardless of the curricular year and gender. Romsics et al. (2020)

Usually, the ability to identify a deviation from the optimal in this study was higher among clinical students than among pre-clinical students and increased as the level of education increased. This could be explained by the effect of the clinical practice and increased information and knowledge improving the ability of the dentist to notice a deviation from the optimal. Chen et al. (2020)

Dental students are part of the dental liveware and should be able to define needed procedures with options to be performed on the individual. Dental students should acquire decision making skills on dental esthetics and they should learn to decide when to intervene. Our present research focuses only on an early step in the investigation of smile esthetics. Year-four and year-five students can be considered dental professionals and year-one and year-two students can be considered laypersons in a study to find out how the perception of smile esthetics evolves through the years of professional education. Dental students in their clinical years should be encouraged to discuss differences in the perception of smile esthetics between professionals and laypeople and during the treatment planning process with patients. Understanding the patient's perception of a smile plays a key role in meeting the expectations of the patient and the requirements of the treatment. Armalaite et al. (2018), Omar & Tai (2014)

Our study was conducted during the COVID-19 pandemic process. This particular period resulted in the emergence of concerns about whether dental students received adequate training on smile esthetics by distant (online) learning. Furthermore, exposure of dental students to social media and a virtual environment during the pandemic may have acted on their perception of esthetics.

Our study emphasizes that a dental student acquires skills to discriminate between different dental esthetics characteristics during the dental school years. It is not until studies are over that this visual esthetics skill is acquired. We, therefore,

believe that our study would confirm the results reported by other studies indicating differences between different students from different curricular levels.

One of the main limitations of this research was the use of static smile photographs. Different smiles were created by digital modifications on photographs. Standardization was achieved by cropping each photo to a standard size and removing the chin and nose.[2] Another limitation was that participants were from different curricular years receiving education from different teachers. This may have differently affected dental students' perception of smile esthetics. However, the students were from the same university and were attending the same program. España et al. (2014)

University campuses have been closed due to natural disasters and other unwanted events in recent years and this has allowed learners to evaluate technology-based educational activities. However, online activities fail to become complementary to practical activities. Investigations on learners' satisfaction with e-learning and asking for feedback can help institutions to improve e-learning know-how. It is hoped that this shift from face-to-face learning to online education will not be considered harming the education but an opportunity to pave an extensive way to technology-based education. Santos et al. (2021), Puljak et al. (2020)

8. LIMITATIONS

The study was to examine the perception of smile esthetics and its evolution among undergraduate dental students, determine whether variations in such perception exist among students attending different dental curricular levels, compare and identify differences in the perception of smile esthetics between pre-clinical and clinical undergraduate dental students, who attended online classes during the COVID-19 pandemic and who continued formal classroom learning, respectively. This study was carried out during the pandemic period. Therefore, we would like to emphasize that the results of the study could be affected and limited by the unfavorable consequences of the pandemic period.

9. CONCLUSION

- To our knowledge, our study has been the first to investigate the dentofacial esthetic heteroperception of dental students from all curricular years of the dental school as a large and culturally homogeneous sample during the COVID-19 pandemic. Our findings confirm the results of most previous investigations about the impact of dental education on the dentofacial esthetic perception of students. We, hereby, have reported that the impact can be represented on the curricular level, which we refer to as the particular curricular ingredients.
- It has been observed that pre-clinical groups that received distance education during the pandemic were not as successful as clinical groups in distinguishing smile components. Even though they received the necessary training in the clinics during this period, the scorings of the 4th and 5th grades were different from those performed by students from earlier curricular years. This situation may also have been caused by the working conditions during the pandemic, which may include few patients presenting for treatment and consequently fewer opportunities for practical training.

- The pandemic can also be considered an opportunity to study the needs of technological innovation in the provision of the best possible educational activities to future dentists.

CONFLICT OF INTERESTS

None.

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