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Original Article

Evaluation of the Impact of Interdisciplinary Case-Based Courses in Dental Education on Smile Evaluation Skills of Undergraduate Students

Didem Nalbantgil[1], R. Burcu Nur Yılmaz[1], Elif Akın[1], Mehmet Ali Erden[1], Simay Yılmaz[1], Fulya Özdemir[2]

[1]Department of Orthodontics, Yeditepe University School of Dentistry, İstanbul, Turkey
[2]Department of Orthodontics, Marmara University School of Dentistry, İstanbul, Turkey

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ABSTRACT

Objective: The purpose of the present study was to compare the perception of smile aesthetic between 3rd-, 4th-, and 5th-year dental students to identify if interdisciplinary courses have an impact on the attitudes of students.

Methods: A total of 118 dental students (3rd-, 4th-, and 5th-year; N=43, 43, and 32, respectively) assessed the aesthetic attractiveness of four smile photographs (normal, high, low, and asymmetric smile lines). To enhance the crown, length-to-width ratio and color Digital Smile Design (DSD) were applied to all photographs, and then scoring was performed by using the Visual Analog Scale (VAS).

Results: The VAS scores were all <60 regardless of the year of the student. The lowest scores were given for asymmetric smile line. Comparison of the scores of the different years showed statistically insignificant scores between 3rd- and 4th-year dental students ($p>0.05$), whereas statistical differences between 4th- and 5th-year dental students were found (Cases 1, 2, and 3: $p<0.05$ and Case 4: $p<0.01$).

Conclusion: All students were critical in the evaluation of smiles. Hence, the motivation for critical thinking based on multidisciplinary courses until 3rd year, the skepticism, and also the perception of the students were increased. The difference between 4th- and 5th-year student aesthetic perceptions showed the impact of interdisciplinary course on enhanced judgment competency of the students.

Keywords: Case-based learning, interprofessional education, undergraduate orthodontic education

INTRODUCTION

At the early 20th century, significant reforms were undertaken in dental medical education (1). Before this educational reform wave, the required cognitive skills for dental practice has been underestimated for years, and the fact that dental students have to be able to apply knowledge from different disciplines and to synthesize this information was overlooked (2). Recently, the American Dental Education Association formed a commission for changes and innovation in dental education and also stated the competencies for undergraduate dental students (3).

Dental students have to be motivated for data-gathering and multidisciplinary discussion of cases, alternative treatment plans, possible complications and treatment outcomes, and decision of one of the treatment plans during their education. Leading dental academies suggested dental educational models that direct the students to evidence-based approaches for clinical decision-making, which rests on critical thinking and integrative understanding of basic and clinical science (4). This competency to synthesize knowledge is approached by multi- and interdisciplinary case-based courses.

Address for Correspondence: R. Burcu Nur Yılmaz, Department of Orthodontics, Yeditepe University School of Dentistry, İstanbul, Turkey
E-mail: drburcunur@gmail.com

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To meet the requirements for this approach, several years ago, an interdisciplinary dental course was integrated into the final year dental educational program at Yeditepe University. In this case-based course, tutors of several dental science departments discuss the cases together with the students interactively to finally constitute the treatment plan, ensuring the most proper functional and aesthetic therapy outcomes. The main aim of the implementation of the interdisciplinary course into the curriculum was to help the students to connect their knowledge in dental science to clinical practice and, consequently, to gain interdisciplinary perspectives not only in functional but also in aesthetic basis.

The perception of aesthetics for smile is highly subjective and has a multifactorial background, such as race, gender, age, socioeconomic status, personal experience, social environment, and media, as well as education. The term "education" may be classified as "educational status" or "professional education" for this topic. By the term "educational status," the educational level, in other words, the graduation from primary, high school, and university, among others, was defined whereas "professional education" for smile means that the professional job of the individual is related with smile aesthetic, such as plastic surgeon and, of course, especially the dentist. In fact, Sadrhaghighi et al. (5) compared the smile elevation of orthodontist, general dentist, and dental students with artists and laypersons and determined that professional dental training affects aesthetic judgment. In the literature, although several studies evaluated the smile aesthetic perception of laypersons (6), dentists (7), and specialists (8), only few studies were conducted about dental students' perception (5,9,10). To the best of our knowledge, no study was performed among Yeditepe University dental students. Moreover, in most dental undergraduate education programs, aesthetic courses are monitored intradisciplinary by several dental departments, such as prosthodontics, restorative, and orthodontic departments, to help the students to gain perspectives in aesthetic evaluations (1,2). Only few of dental schools addressed aesthetic concerns in multi- or interdisciplinary case-based courses (11).

Dental students gain experience during their education about smile evaluation, including smile arch, presence of buccal corridor space, relationship between facial and dental midlines, tooth color, and occlusal plane inclination, as well as smile line (12). The smile line, defined as the position of the upper lip relative to the upper incisors and gingiva during natural smile, is commonly used to categorize pleasant and unpleasant smiles. In average (normal), high, and low smile lines, 75%–100%, 100%, and <75% of clinical crown are displayed, respectively. In addition to the full crown high, >2 mm gingiva is visible in high smile line cases (13). An additional smile line type is also present in addition to the three main classifications of the smile line, the asymmetric smile line. Passia et al. (14), in their systemic review, assessed the smile line for being a valid parameter to evaluate smile. They concluded that the smile line is a valid tool for aesthetic perception evaluation and may be applied universally by clinicians.

The purpose of the present study was to compare the perception of smile aesthetic between 3rd-, 4th-, and 5th-year dental students to identify if multidisciplinary courses in dental educational curriculums have an impact on the attitudes of students or not.

METHODS

Record Collection

The study design was approved by the ethics research committee of Yeditepe University. Informed consent was obtained from patients whose photographs were used in the present study. The photographs were selected from the routinely collected initial records of patients treated in the department of orthodontic clinic at Yeditepe University between 2016 and 2017. The records of the patients with the following characteristics were selected from the archive (Figure 1): normal smile line, high smile line, asymmetric smile line, and low smile line.

The records of patients with craniofacial syndromes and photographs with low quality were excluded from the groups. Thereaf-

Figure 1. a-d. Visual assessment form. Normal (a); high (b); asymmetric (c); and low smile lines (d)

ter, the fifth patient on the alphabetic written patient list (N=125, 71, 48, and 25 for Cases 1, 2, 3, and 4, respectively) was selected randomly for the study.

A visual form was constructed with the frontal extraoral smile photographs at onset stage of the four patients. The photographs were also cropped so that only the chin and nose were included, and other variables were eliminated. In addition, modifications were performed on the frontal photographs for alteration of color and tooth crown length using Digital Smile Design (DSD). First, the interpupillary line was used to establish the horizontal plane. Second, the facial midline was designed according to facial features, such as the glabella, nose, and chin, to find the best facial position. Thereafter, complementary lines, such as gingival line and smile arch, crossing among gingival zenith and incisal edges and canine tip, respectively, were drawn. The relative length-to-width ratio for the central incisor was measured, and the midline was confirmed by measuring the distance between the upper cuspids. Once the central incisor width was determined, the golden ratio was applied again to determine the lateral incisor width (62% of the central incisor width) and canine width (62% of the lateral incisor width). After finishing the canine–canine arch production, modifications, such as crown lengthening and color, were performed and inserted to the frontal extraoral photograph (Figure 2).

Intervention

Several educational courses at the dental faculty of Yeditepe University were based on either intradisciplinary (one discipline) or multidisciplinary (multiple disciplines) approaches, except the intradisciplinary course at the onset of the 5th year. The aim of the course is to produce students who are competent in evaluating and analyzing the aesthetic and functional requirements of individual cases and synthesizing and harmonizing their knowledge among different disciplines. Moreover, the students are competent to serve interprofessional health care to patients in their future practice. Therefore, they will be able to serve care with a variety of health care practitioners together in a cooperative, collaborative and integrative manner. The interdisciplinary course content also involves aesthetic smile concerns and the introduction of DSD. A case-based assessment was performed after the course, and only 5th-year dental students who passed the assessment were enrolled into the present study.

The four-case visual form was presented to 118 students who were in the 3rd-, 4th-, and 5th-year educational program at Yeditepe University (N=43, 43, and 32, respectively). All students scored the smile aesthetic of the cases using the Visual Analog Scale (VAS), with a 100 mm length scale starting with "0" (very unattractive) and finishing with "100" (very attractive). Each student was asked to mark along the VAS to reflect the smile aes-

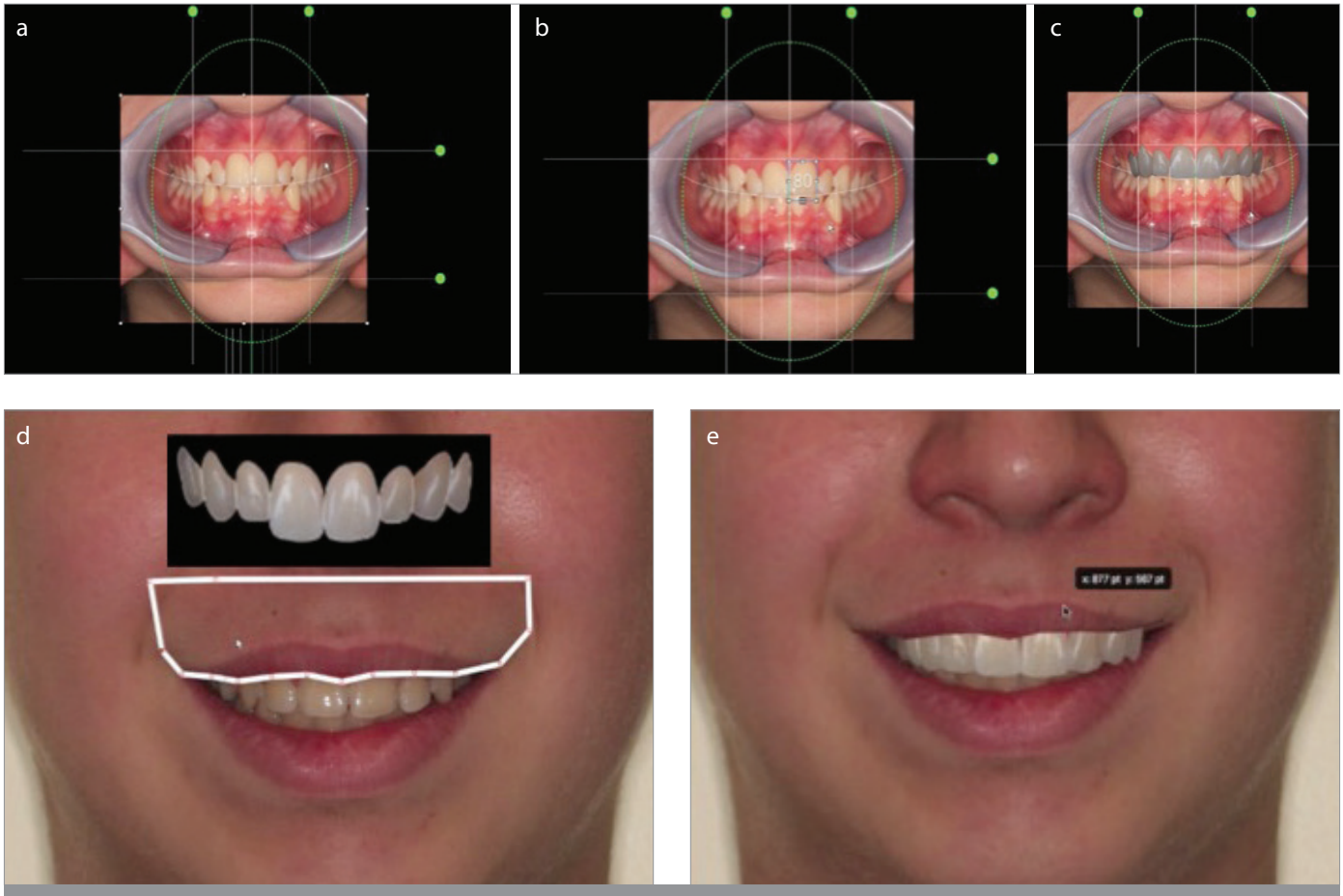

Figure 2. a-e. Modifications on frontal photographs using Digital Smile Design
Design of facial midline, gingival line, and smile arch (a); measurement of crown length-to-width ratio of central tooth (b); determination of lateral and canine according to golden ratio (c); insertion of the constructed canine-canine arch (d); final view (e)

Table 1. Comparison of case scores according to the educational year of students

	3rd year students N (43)		4th year students N (43)		5th year students N (32)		p N (116)
Cases	Mean	SD	Mean	SD	Mean	SD	
1	54.29	22.09	55.04	27.32	41.06	21.52	0.037(*)
2	45.44	18.28	47.44	20.68	39.35	21.79	0.023(*)
3	40.43	21.09	43.22	22.37	30.5	19.41	0.047(*)
4	47.79	22.71	45.47	26.93	39.79	23.51	0.006(**)

Descriptive statistics (mean and standart deviation (SD)) and Kruskal-Wallis test: $p<0.05$, (*) $p<0.01$, (**) $p<0.001$

thetic of each photograph. One week after the first evaluation, all students rescored the cases on the visual form to assess the intra-examiner reliability.

Statistical Analysis

Statistical analysis was performed using the Number Cruncher Statistical System (NCSS) 11 software (2016) (NCSS, LLC, Kaysville, UT, USA). Kolmogorov-Smirnov test was used to analyze descriptive statistical methods (mean value and standard deviation) and to determine the distribution of the sample. Kruskal-Wallis (one-way ANOVA) test was used to compare the groups. Intra-rater reliability was assessed by the Kuder and Richardson Formula 20 (KR-20: <0.7).

RESULTS

Comparing the first scores with the ones obtained a week later presented high internal reliability (KR-20: 0.801853). The 3rd-year students scored the normal smile line patient (Case 1) higher than the others (mean±SD: 52.09±22.09). On the other hand, the lowest scores were identified for the patient with asymmetric smile line (Case 3, mean±SD: 40.43±21.09). Although the high (Case 2) and low (Case 4) smile line patients were assessed with similar results, the former was rated as slightly more unattractive. The highest (Case 1) and lowest (Case 3) scores given by the 4th-year students were identical with the 3rd-year students. However, the scores for low and high smile lines were controversial. The 5th-year students also listed the cases in the same manner from the most attractive to the least attractive as Case 1, Case 4≅Case 2, and Case 3, respectively (Table 1).

Comparison of the 3rd-, 4th-, and 5th-year student scores for all four cases showed statistical differences ($p<0.05$). Although the scores of the 3rd- and 4th-year students were different, differences were found to be statistically insignificant ($p>0.05$). On the other hand, statistical differences between scores of 4th- and 5th-year students were found for Cases 1, 2, and 3 ($p<0.05$; $p=0.019$, 0.025, and 0.056, respectively) and Case 4 ($p<0.01$; $p=0.005$). Moreover, the 5th-year student scores were lower than the scores of the other two years.

DISCUSSION

In the literature, although several studies evaluated smile aesthetic (6-8), only few studies were performed regarding dental students' perception (5,9,10). Only one study compared the smile perception of the students according to the educational year degree. Espana et al. (10) considered the student year as an independent variable and assessed several characteristics of smile separately. They concluded that the ability to determine smile aesthetic does not improve as the student continues his/her education in a higher student year. However, no information about the educational curriculum or system at their university was presented in their paper. Espana et al. (10) also emphasized that no study is applied with Spanish students. In the same way, no study was stated about Yeditepe University dental students. Therefore, the aim of the present study was to compare the perception of smile aesthetic between 3rd-, 4th-, and 5th-year dental students to identify if interdisciplinary courses in dental educational curriculums have an impact on the attitudes of students or not.

Smile line is a valid tool for aesthetic perception evaluation (14). Therefore, in the present study, the photographs that are to be evaluated by the students were selected according to the differential smile line groups. Main concerns, such as the tooth color and the crown length-to-width ratio, were improved using DSD to eliminate possible distractions. Hence, the skills of the students to synthesize their scientific knowledge by not focusing on one criterion were evaluated. Truly, none of the photographs indicate "a perfect smile," an average smile line but a narrow dental arch display, a high smile line with buccal corridors, an asymmetric smile line with tooth malinclinations, and a low smile line with incompatible dental midlines for Cases 1, 2, 3, and 4, respectively. The results showed that the scores of all students regardless of their grade were <60, this may be due to the detection of the other present unpleasant factors on smiles.

The results in the present study showed that all students perceive asymmetric smile as the most unattractive. Kokich et al. (15) evaluated the perception of asymmetric aesthetic alterations. Although they assessed the asymmetries related to teeth, they concluded that each type of asymmetries makes the elevation more unattractive. Similarly, Fernandes and Pinho (16) mentioned in their study about the aesthetic evaluation of dental and gingival asymmetries that in the horizontal plane, dental asymmetries are considered as more unattractive than gingival asymmetries. However, the opposite was recorded for evaluation of vertical asymmetries. In the present study, the prominent asymmetry of Case 3 was the gingival vertical asymmetries, and this might explain the lowest aesthetic scores. Additionally, the low and high smile line cases were scored <50 points. The only scores >50 were recorded for Case 1, yet these were not considered as high as well. Overall, the 5th-year students assessed the cases as more unattractive than the other year students.

As the dental educational year of the students increases, their knowledge and skill also increase. One of the main domains at our university also involving intradisciplinary courses is to teach students how they may develop critical thinking skills to facilitate their active argumentation and reasoning and thereby making knowledge-related value judgment. Although the 5th-year students' scores were significantly different from the 3rd- and 4th-year students' scores, there were no statistical differences of the scores between the 3rd- and 4th-year students' scores. Interestingly, the only difference between the end of the 4th and the onset of the 5th year of the students was the participation to the interdisciplinary course. It may be concluded that the interdisciplinary course enhances the judgment skills of the students by gathering interdisciplinary knowledge with regard to these statistical findings.

The present study was the first step to evaluate the outcomes of the integrated interdisciplinary course. However, the individual performance of each student could not be assessed. Therefore, longitudinal studies, in which each student is assessed on the 3rd year to the 5th year, are planned at our university.

CONCLUSION

All students scored asymmetric smile as the most unattractive, whereas symmetric with normal smile line case was listed as the most attractive. All students were critical in the evaluation of smiles (mean scores <60). However, the 5th-year students were more critical than the 3rd- and 4th-year students in smile evaluation. The motivation for critical thinking, as well as case-based problem-solving served on the onset of clinical practice (3rd-year educational program) by the educational academic staff, enhanced the skepticism and the reliance on the students to improve treatment outcomes. The impact of interdisciplinary aesthetic courses was present according to the results of the present study. Hence, the students may improve their competency to assess the cases from different dental disciplinary views.

Ethics Committee Approval: Ethics committee approval was received for this study from the Ethics Committee of Yeditepe University Clinical Research (Approval Date: December 6, 2017; Decision No: 1375).

Informed Consent: Written informed consent was obtained from the subjects who participated in this study.

Peer-review: Externally peer-reviewed.

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