



Perception of smile aesthetics by dental specialists and patients

Percepción de la estética de la sonrisa por odontólogos especialistas y pacientes

Mireya Guzmán Mora,* María Eugenia Vera Serna,[§] Abigail Flores Ledesma^{||}

ABSTRACT

Introduction: The objective of this study was to know the perception of aesthetic parameters of the smile by dental specialists and patients attending the Department of Orthodontics DEPEI, UNAM. **Method:** A descriptive observational study was performed. Three series of five smile photographs were observed by 284 participants of both sexes, from which 144 were dental specialists and 140 patients. Both groups rated pictures of smiles that were modified with PhotoShop® program. **Results:** There is a level of agreement between the two groups of participants with respect to the parameters chosen as «nothing aesthetic»; however, in the parameters rated as «very aesthetic» the only agreement was in a midline without deviation. **Conclusion:** There are differences in the perception of smile esthetics between dental specialists and patients.

Key words: Smile, perception and aesthetics.
Palabras clave: Sonrisa, percepción y estética.

RESUMEN

Introducción: El objetivo del presente estudio fue conocer la percepción de los parámetros estéticos de la sonrisa, por odontólogos especialistas y pacientes que acuden al Departamento de Ortodoncia de la DEPEI, UNAM. **Método:** Se realizó un estudio observacional descriptivo en el que se observaron tres series de cinco fotografías de sonrisas por 284 participantes hombres y mujeres, de los cuales, 144 eran odontólogos especialistas y 140 pacientes. Ambos grupos calificaron fotografías de sonrisas que fueron modificadas con el programa PhotoShop®. **Resultados:** Existe un nivel de acuerdo entre los dos grupos de participantes con respecto a los parámetros elegidos como «nada estéticos»; sin embargo, en los valorados como «muy estéticos» sólo coinciden en el parámetro de línea media sin desviación. **Conclusión:** Existen diferencias en la percepción de la estética de la sonrisa entre los odontólogos especialistas y los pacientes.

INTRODUCTION

According to the *Spanish Language Dictionary*, the word «aesthetics» comes from the greek αισθητικός, which means «sensitive», belonging or relating to the perception or appreciation of beauty.¹ In 1936 Pilkington, defined dental aesthetics as the science of copying or harmonizing our work with nature.²

The aesthetics remains an impression of the mind motivated by its own perception; therefore beauty remains a subjective concept.³ The study of human beauty has occurred in all cultures throughout history.³ As Carrel said «The ability to discern and perceive what is beautiful is cultivated and developed just as scientific knowledge».⁴

The smile is an important part of the physical stereotype and the perception of the individual and in addition it is important in the assessment that others have of our appearance and personality. Thus, the symmetry in the smile has an important role in the perception of beauty.⁵

Orthodontics must incorporate various principles of smile analysis to achieve desirable results.⁶

It has been tried to establish parameters for determining if the patient presents an ideal harmonious smile or if it is altered. A esthetic smile depends on three key elements: lips, gums and teeth.⁵ There are three categories for the registration of the smile in Orthodontics: static (photographs), dynamic (videos) and directbiometric measurements.⁶ There are four elements of smile design: facial aesthetics, gingival aesthetics, microaesthetics and macroaesthetics.⁷ The need for aesthetics in dentistry is directly related to the sense of aesthetics of the individual in his or her world, a condition that must be analyzed carefully, since what may be aesthetically

* Graduate of the Specialty of Orthodontics.

§ Professor of the Specialty of Orthodontics.

|| Master's student.

Division of Postgraduate Studies and Research (DEPEI),
National Autonomous University of Mexico (UNAM).

This article can be read in its full version in the following page:
<http://www.medigraphic.com/ortodoncia>

pleasing to the professional, many times may have an inverse relationship for the patient. The face is a very important segment in an individual's aesthetic composition and the smile, in turn, assumes a fundamental role in facial aesthetics.

The concept of *beauty*, by its multidimensional nature, creates a challenge for those of us who are in contact with patients, in order to achieve symmetry, harmony, balance and proportion in the result of our work.⁸

To this day, there is not a single study that unifies or mentions the differences in the perception of the aesthetic parameters of the smile among dental specialists and patients attending the Department of Orthodontics at the DEPeI, UNAM.

To unify and measure the most important factors of smile aesthetics that, both patients who come to the DEPeI, UNAM, as well as dental specialists in this department, consider very aesthetic, in addition to the factors that the same groups noted as non-aesthetic, is therefore, of utmost importance to provide a diagnosis and treatment plan that unites both criteria and results in increased patient satisfaction.⁸

In view of the above, the overall objective of the present work is to know the perception of smile aesthetic parameters of dental specialists and patients of the Orthodontics Department at the DEPeI, UNAM.

MATERIAL AND METHODS

The way in which the present study was carried out is the following:

Two groups of participants were formed. The first group consisted of 144 dental specialists. The second group was formed by 140 patients.

A frontal photograph of a woman's smile with normal aesthetic parameters according to the literature was taken and cut leaving only the smile image with the help of the software Adobe PhotoShop® (*Figure 1*).

With the same program, four modifications for each parameter were designed, being as follows:

Midline: four images were designed with a deviation of the dental midline ranging from 1 mm up to 4 mm to the right. **Gingival margin:** four images were designed with differences in the height of the gingival margin between central and lateral incisors. The differences were: margin of the lateral incisors 2 mm below the margin of the central incisor, lateral incisor's margin at the same height as the central incisor's margin, margin of the lateral incisors 1 mm above the margin of the



Figure 1. Photograph of a smile with normal aesthetic parameters.

central and the lateral incisor's margin 2 mm above the margin of the central incisor.

Gingival exposure: Four images were designed with differences in gingival exposure from -2 to +2 mm vertically, taking as reference (0 mm) the zenith of the gingival margin of the upper central incisors.

The modifications can be seen in *figure 2*.

An album of 15 photographs was formed, each one of 7.27 x 4.12 cm in size, printed in three sheets of matte Couché paper ledger size. In each sheet a series of five pictures (series: «A», «B» and «C»), was printed. Within each, was the photo with normal parameters and its four modifications placed in random order, as seen in *Figure 3*.

288 sheets were printed with a section for personal data, instructions and spaces so that each participant would place the answers of their aesthetic perception for every smile.

Each participant was invited to number for a period of approximately 10 minutes the photographs of each series. Each participant was given a pen and a printed sheet.

The series of photographs «A» was shown to the participant for him or her to order them in a scale of 1 to 5 according to their aesthetic perception of every smile and record their answer on the sheet provided for it. The same was done with series «B» and «C».

The procedure was performed under the same conditions of light; the participants knew no information on the sequence or the specific modifications to the images.

STATISTICAL ANALYSIS

A database in Excel was produced under Windows 7®. For the statistical analysis the SPSS version 15 was



Figure 2. A) Modifications for «midline». B) Modifications for «gingival margin». C) Modifications for «gingival exposure».



Figure 3. Modifications for each parameter placed in random order. «A)» Midline. «B)» Gingival margin. «C)» Gingival exposure.

used. We compared the aesthetics perception between the two groups by means of the non-parametric Mann-Whitney test. The Kruskal-Wallis test was used to compare the perception among specialties. The level of significance was regarded as ≤ 0.05 .

RESULTS

In the present study, we had a total of 284 participants, of whom 144 (50.7%) were specialty students (SS)

and 140 (49.3%) were orthodontic patients (PX). The group of specialty students was composed of 28.5 % male participants and 71.5% of female participants. The group of patients was composed of 31.4% of male participants and 68.6% of females (Figure 4). The average age for both groups was 26.50 years.

In the tables it can be observed that there is a level of agreement between the two groups of participants regarding the variables selected as «non-esthetic»; however, in the those variables rated as «very

aesthetic» they agreed only in the non-deviated midline variable (Tables I and II).

It was observed that for the midline variable, both groups considered very aesthetic a smile without deviation, in this case there was no statistically significant difference between the perception of both groups ($p < 0.05$) (Table III).

For the gingival margin variable: the majority of the specialty students (35.4%) considered very aesthetic a gingival margin of -1 mm in the lateral incisors in relation to the central incisors, but only 20% of patients considered this same smile as very aesthetic, with a statistically significant difference between the perception of both groups ($p < 0.05$). For the majority

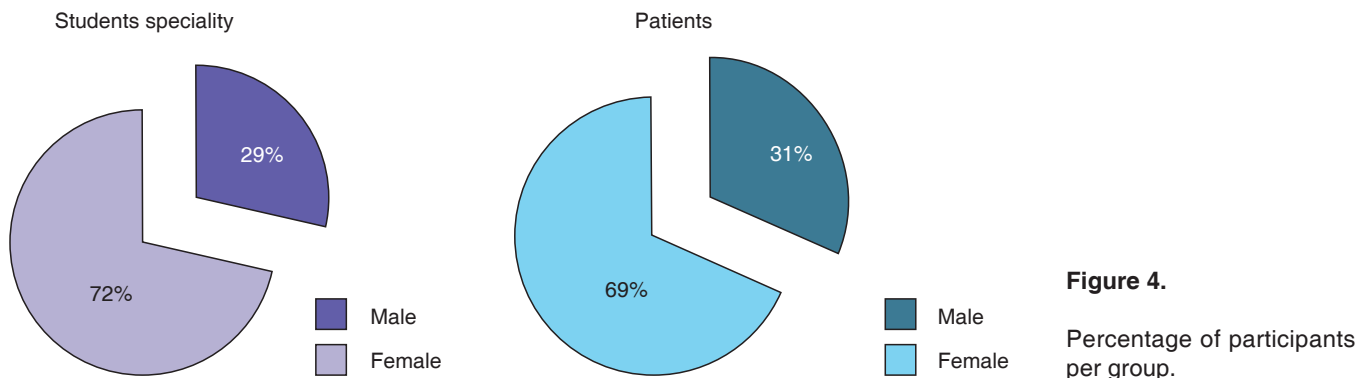


Figure 4. Percentage of participants per group.

Table I. Smile Aesthetics variables identified as: «very aesthetic» and «non-aesthetic».

Group	«Very aesthetic»	Percentage	«Non-aesthetic»	Percentage
SS*	Midline without deviation	77.8	4 mm midline deviation	56.3
PX*		71.4		71.5
SS	-1 mm gingival margin	35.4	+2 mm gingival margin	48.6
PX	+1 mm gingival margin	31.4		34.3
SS	0 mm gingival exposure	59.7	+2 mm gingival exposure	71.5
PX	-2 mm gingival exposure	37.1		65.7

* SS = Specialty students. PX = Patients.

Table II. Percentage of participants who identified each variable as «very aesthetic» according to the smile. Others parameters of perception were not taken into consideration.

	Midline				
	Without deviation	1 mm deviation	2 mm deviation	3 mm deviation	4 mm deviation
SS*	77.8	18.1	4.2	0.7	0
PX*	71.4	17.1	5.7	5.7	0
Gingival margin					
	-2 mm	-1 mm	0 mm	+1 mm	+2 mm
SS	24.3	35.4	14.6	20.1	5.6
PX	14.3	20.0	14.3	31.4	20.0
Gingival exposure					
	-2 mm	-1 mm	0 mm	+1 mm	+2 mm
SS	9.7	19.4	59.7	7.6	3.5
PX	37.1	22.9	22.9	8.6	8.6

* SS = Specialty students. PX = Patients.

of the patients (31.4%) a very aesthetic smile is that with a gingival margin of +1 mm in the lateral incisors in relation to the central incisors, but only 20.1% of the specialty students considered the same smile as very aesthetic. There was a statistically significant difference between the aesthetic perception of both groups ($p < 0.05$) (Table III).

For the gingival variable exposure: the majority of the specialty students (59.7%) consider very aesthetic a smile with a 0 mm gingival exposure but only 22.9% of patients considered this same smile as very aesthetic with a statistically significant difference between the perception of both groups ($p < 0.05$). For the majority of patients (37.1%) the very aesthetic smile is the one with a -2 mm gingival exposure, but only 9.7% of the specialty students consider this same smile as very aesthetic; there was a statistically significant difference between the aesthetic perception of both groups ($p < 0.05$) (Table III).

In the case of the variables considered as «non-aesthetic», both groups coincided in choosing: «4 mm midline deviation», «+2 mm gingival margin» and «+2 mm gingival exposure» (Table IV).

In table IV it can be observed that when comparing the aesthetic perception among groups, in the case of the smile with a +2 mm gingival exposure, the majority of both groups (71.5% of the specialty students and 65.7% of the patients), considered this variable as non-aesthetic without a statistically significant difference between the perception of both groups ($p < 0.05$). However, in the case of the smile with a 4 mm midline deviation, although the majority of the participants in both groups (56.3% of the specialty students and 51.4% of patients) considered this smile as non-aesthetic, there was a statistically significant difference between the perception of both groups ($p < 0.05$), which is due to the fact that a significant percentage of participants chose other photographs as non-aesthetic for this variable (Table V).

Something similar happened in the case of the smile with a +2mm gingival margin, where the majority of participants in both groups (48.6 % of specialty students and 34.3 % of patients) considered it non-aesthetic. There was a statistically significant difference between the aesthetic perception of both groups ($p < 0.05$), which is also due to the fact that a significant percentage of participants chose other

Table III. Variables identified as «very aesthetic». The Mann-Whitney U-test was used for comparison between groups: specialty students (SS) and patients (PX).

«Very aesthetic» variable	Group	Participants who consider the variable as «very a esthetic»	p
Midline without deviation	SS	77.8%	.162
	PX	71.4%	
-1 mm gingival margin	SS	35.4%	.002
	PX	20.0%	
+1 mm gingival margin	SS	20.1%	.000
	PX	31.4%	
0 mm gingival exposure	SS	59.7%	.000
	PX	22.9%	
-2 mm gingival exposure	SS	9.7%	.000
	PX	37.1%	

Table IV. Variables identified as «non-aesthetic».

«Non-aesthetic» variable	Group	Participants who consider the variable as «non-aesthetic»	p
4 mm midline deviation	SS*	56.3%	.017
	PX*	51.4%	
+2 mm gingival margin	SS	48.6%	.000
	PX	34.3%	
+2 mm of gingival exposure	SS	71.5%	.105
	PX	65.7%	

* SS = Specialty students. PX = Patients.

photographs as non-aesthetic for this variable (Tables IV and V).

In table VI it can be noted that there is a percentage of agreement between the two groups of participants with respect to the variables chosen as «non-aesthetic».

In the variables that were most selected as «very aesthetic» the Orthodontics specialty group coincides with the prosthetics group in choosing a -1 mm gingival margin; however, the Periodontics group selected the -2 mm gingival margin.

It was observed that for midline variable, the three specialties considered as very aesthetic a smile without deviation, in this case, there was no statistically significant difference between the perception of the three specialties ($p < 0.05$) (Table VII).

In the case of the gingival margin variable, the highest percentage of Orthodontics and Prosthetics students chose the smile with a gingival margin of -1 mm, differing from Periodontics students who chose a

Table V. Percentage of participants who considered as «non-aesthetic» each variable according to the smile. Others parameters of perception were not taken into consideration.

	Midline				
	Without deviation	1 mm deviation	2 mm deviation	3 mm deviation	4 mm deviation
SS*	0	5.0	5.0	33.5	56.5
PX*	0	17.1	2.9	28.6	51.4
Gingival margin					
	-2 mm	-1 mm	0 mm	+1 mm	+2 mm
SS	12.5	12.5	5.6	19.4	48.6
PX	22.9	14.3	17.1	11.4	34.3
Gingival exposure					
	-2 mm	-1 mm	0 mm	+1 mm	+2 mm
SS	16.0	2.1	0.7	9.0	71.5
PX	14.3	2.9	11.4	5.7	65.7

* AE = Specialty students. PX = Patients.

Table VI. Aesthetic variables identified with the parameters: «very aesthetic» and «non-aesthetic» for each specialty.

Specialty	«Very aesthetic»	Percentage	«Nothing aesthetic»	Percentage
OR*		75.0		52.8
PE*	Midline without deviation	80.0	4 mm midline deviation	68.6
PR*		81.1		51.4
OR	-1 mm gingival margin	36.1	+2 mm gingival margin	44.4
PE	-2 mm gingival margin	28.6		54.3
PR	-1 mm gingival margin	43.2		51.4
OR		58.3	+2 mm gingival exposure	77.8
PE	0 mm gingival exposure	60.0		65.7
PR		62.2		64.9

* OR = Orthodontics, PE = Periodontics and PR = prosthetics.

gingival margin of -2 mm; however it can be noted that there was no statistically significant difference for this variable ($p < 0.05$) (Table VII).

For the gingival variable exposure, the three specialties considered as very aesthetic a smile with a 0 mm gingival exposure. In this case there was also no statistically significant difference between the aesthetic perception of the three specialties ($p < 0.05$) (Table VII).

It was observed that for the midline variable, the three specialties considered as non-aesthetic the smile with a midline deviation of 4mm; in this case there was no statistically significant difference between the aesthetic perception of Orthodontics, periodontics and prosthetics students ($p < 0.05$) (Table VIII).

In the case of the gingival margin variable, the three specialties considered as non-aesthetic a smile with a gingival margin of +2 mm. There was no statistically significant difference between the perception of the three specialties ($p < 0.05$) (Table VIII).

For the gingival exposure variable, the three specialties considered as non-aesthetic a smile with a +2 mm gingival exposure, in this case there was also no statistically significant difference between the perception of the three specialties ($p < 0.05$) (Table VIII).

DISCUSSION

In 1996, Castiblanco conducted a study on the determination of parameters for smile assessment

Table VII. Variables identified as «aesthetic» by group of specialty students.

Variable «aesthetic»	Specialty	Participants who considered the variable as «aesthetic»	p
Midline without deviation	OR*	75.0%	.519
	PE*	80.0%	
	PR*	81.1%	
-1 mm gingival margin	OR	36.1%	.317
	PE	25.7%	
	PR	43.2%	
-2 mm gingival margin	OR	18.1%	.321
	PE	28.6%	
	PR	32.4%	
0 mm gingival exposure	OR	58.3%	.867
	PE	60.0%	
	PR	62.2%	

* OR = Orthodontics, PE = Periodontics and PR = Prosthetics.

Table VIII. Variables identified as «non-aesthetic» by the group of specialty students.

«Non-aesthetic» variable	Specialty	Participants who considered the variable as «non-aesthetic»	p
Midline without deviation	OR*	52.8%	.357
	PE*	68.6%	
	PR*	51.4%	
+2 mm gingival margin	OR	44.4%	.902
	PE	54.3%	
	PR	51.4%	
+2 mm gingival exposure	OR	77.8%	.516
	PE	65.7%	
	PR	64.9%	

* OR = Orthodontics, PE = Periodontics and PR = Prosthetics.

in orthodontics and their application in Colombian beauties. It was found that there are no statistically significant differences between the scores awarded by dentists of different specialties when assessing the smile aesthetics, which coincides with our results where it was noted that no statistically significant difference existed between the perception of smile aesthetics of Orthodontics, periodontics and Prosthodontics specialty students.⁹

In 1999, Kokich and Shapiro, like Thomas in 2003, agreed that «the appreciation of the aesthetics by specialists and patients decreases as the midline deviation increases».^{10,11} This statement coincides with the results of the present study, where the 4 mm midline deviation was selected as «non-aesthetic» by both groups.

In 1999, Kokich and Shapiro mentioned in his article that «orthodontists accept a 2 mm gummy smile and dentists and lay people accept a gingival exposure of 3 mm».¹⁰ This differs from our study where it was observed that a gingival exposure of 2 mm is considered as «non-esthetic» by both specialty students and patients.

In 2010, Medina et al. stated that the gummy smile is not accepted by specialists or patients when it is of 4 mm and more.⁸

In 2004, Roden mentions that «The aesthetics perception of orthodontists vary significantly from that of people without preparation regarding facial aesthetics».¹² Kokich in 2006 also mentions that «Specialists are more critical in the perception of smile aesthetics than patients».¹³ Something similar was referred by Medina et al., in 2010: «There is a difference in the perception of smile aesthetics between specialists and patients».⁸ which is in agreement with the results obtained in the present study, where specialty students show higher demands when assessing smile aesthetics because they selected smiles with variables closer to the parameters of ideal aesthetics (midline without deviation, gingival margin of upper laterals 1 mm below the upper central's gingival margin and 0 mm gingival exposure; however, patients show greater tolerance to variability of these parameters.

In 2013, Flores et al. mentioned in their article that «Gingival exposures of 0 mm and -2 mm received the highest scores»¹⁴ which is in agreement with the results obtained in our study where specialty students considered as very aesthetic a smile where the gingival exposure was 0 mm with respect to the zenith of the gingival margin of the upper central and patients prefer it to be of -2 mm.

CONCLUSIONS

- There are differences in the aesthetics perception of the smile between dental specialists and patients of the DEPeI, UNAM, period 2013-2014.
- Specialty students, as well as patients, considered as very aesthetic a smile without midline deviation.
- Specialty students considered as very aesthetic a smile where the gingival margin of the upper lateral incisor is -1 mm in relation to the gingival margin of the upper central; however, patients preferred the gingival margin of the lateral incisors to be 1 mm above the margin of the central.
- Specialty students considered as very aesthetic a smile where the gingival exposure was 0 mm with respect to the zenith of the gingival margin of the upper central incisor and patients preferred it to be at -2 mm.
- The smiles that both groups considered non-aesthetic were the ones with a 4 mm midline deviation, a smile with the gingival margin of the upper lateral incisor was more than 2 mm above the gingival margin of upper central incisor and a smile with gingival exposure of 2 mm.
- There was no statistically significant difference between the smile aesthetics perception of students from the different specialties (Orthodontics, periodontics and prosthodontics) of the DEPeI, UNAM, period 2013-2014.
- It is of utmost importance to know these results in order to provide a treatment plan that unifies the criteria for both groups and to provide optimum results that meet the demands and needs of both patients and specialists.

REFERENCES

1. *Diccionario de la lengua española*. 22ª edición, 2001.
2. Pilkington EL. Esthetics and optical illusions in dentistry. *Journal of the American Dental Association*. 1936; (23): 641-651.
3. Blanco DF. El arte en la medicina: las proporciones divinas. *Ciencia UANL*. 2004; VII (002): 150-156.
4. Cedeño BJ. *La cara, sus proporciones estéticas*. La Habana, Cuba.
5. Londoño BMA, Botero MP. La sonrisa y sus dimensiones. *Rev Fac Odontol Univ Antioq*. 2012; 23 (2): 353-365.
6. Singh VP, Sharma JN. Principles of smile analysis in orthodontics. A clinical overview. *Health Renaissance*. 2011; 9 (1): 35-40.
7. Chandrashekar BS, Sujit P, Ashok KJ. *Smile designing in orthodontics*. Department of Orthodontics Krishnadevaraya College of Dental Sciences. Bangalore, Karnataka India. Octubre, 2010.
8. Medina GCX, Gómez NS, Martínez RCM, Bermúdez JPC. Parámetros estéticos de la sonrisa aceptados por odontólogos especialistas y pacientes de ortodoncia. *Revista Colombiana de Investigación en Odontología*. 2010; 1 (2): 228-237.

9. Castiblanco GAA, Criado PC, López BCL. Determinación de parámetros para evaluar la sonrisa en ortodoncia y su aplicación a bellas colombianas. *Revista Latinoamericana de Ortodoncia*. 1996; 2 (3): 71-86.
10. Kokich VO, Kiyac HA, Shapiro PA. Comparing the perception of dentists and lay people to altered dental esthetics. *J Esthet Dent*. 1999; 11 (6): 311-324.
11. Thomas JL, Hayes C, Zawaideh S. The effect of axial midline angulation on dental esthetics. *Angle Orthod*. 2003; 73 (4): 359-364.
12. Roden-Johnson D, Gallerano R, English J. The effects of buccal corridor spaces and arch form on smile esthetics. *Am J Orthod Dentofacial Orthop*. 2003; 127 (3): 343-350.
13. Kokich VO, Kokich VG, Kiyac HA. Perceptions of dental professionals and laypersons to altered dental esthetics: asymmetric and symmetric situations. *Am J Orthod Dentofacial Orthop*. 2006; 130: 141-151.
14. Flores R, Meneses A, Liñán C. Influencia de la exposición gingival en la percepción estética de la sonrisa. *Rev Estomatol Herediana*. 2013; 23 (2): 76-82.

Mailing address:

C.D. Mireya Guzmán Mora

E-mail: mireyaguzmora@hotmail.com