

Esthetic Perception of Recurring Esthetic Dental Proportion in Different Lip Line Positions Among Lay People

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Abstract

Background and Aim: The proportion of smile is a useful tool for creating geometric smiles which are a critical aspect in esthetic dentistry. The aim of this study was to determine the effect of lip line position on acceptable Recurring Esthetic Dental (RED) proportion among lay people.

Materials and Methods: A photograph of pose smile of a young female was taken. The position of the lip was changed by Adobe Photoshop CS6 software within three positions (low, medium, and high). Then, we created three RED proportions (54%, 62%, and 70%) for each lip line position. The photographs were ranked from most to least attractive (one to nine) by 40 lay people (20 females and 20 males) with a mean age of 19.4 years. Data were collected and analyzed using Friedman test. Pairwise comparisons were made using Bonferroni correction. The impact of gender on the ratings was evaluated using repeated measures analysis of variance (ANOVA).

Results: In the medium lip line group, all three proportions had approximately the same preference rates. The 54% proportion was the least attractive one in the high lip line group (mean=6.819), and the 70% proportion was the least attractive one in the low lip line group (mean=6.881).

Conclusion: The acceptable RED proportion cannot be evaluated without consideration of other factors such as lip line position. Esthetics is the result of a harmonious balance between different elements.

Key Words: Dental Esthetic, Smiling, Dental Photography

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Introduction

The perception of beauty depends on cultural and regional factors and is strongly related to the unity in proportions [1]. Although esthetics has both objective and subjective dimensions [2], finding standards of beauty has always been one of the main objectives of artists. Scientists have put many efforts into finding desirable features of esthetics

by mathematical formulas and geometrical factors [3].

Nowadays, esthetics is one of the main demands of patients seeking dental treatment. Both mouth and eyes are the most important parts of social interactions [4,5].

The smile is a person's ability to express their feelings, which is influenced by the shape, size,

structure, and movement of the teeth and lips [6]. Different factors that influence the attractiveness of a smile include smile arc, lip line position, midline deviation, occlusion, gingival appearance, upper incisors proportion, and dental and gingival symmetries [7,8].

The perception of esthetics might be affected by ethnicity, gender, education, socioeconomic status, geographical location, and cultural factors [9,10].

The lips, gingivae, and teeth form the smile. One of the factors that scientists assess as an important aspect in the attractiveness of smile is "smile line". The smile line is the position of the upper lip relative to the maxillary incisors and gingivae during a natural full smile and is categorized into three groups: 1. High smile line: the clinical crowns and more than about 2 mm of contiguous maxillary gingiva are revealed during the smile; 2. Medium smile line: full length of crowns and the interdental papilla are exposed during a full smile; 3. Low lip line: less than 75% of the clinical crowns of maxillary incisors are exposed during a full smile [11].

Another important factor for clinicians to establish an esthetic smile design is the width of maxillary central incisors relative to maxillary lateral incisors as well as the length of the lateral incisor relative to the maxillary canine in the frontal view; this ratio is known as "Recurring Esthetic Dental" proportion (RED), which should remain constant [10]. Several studies have been performed to find a standard mathematical proportion that has a positive effect on the esthetics of anterior maxillary teeth, and different proportions have been accepted as an attractive preference [12-14]. The attractiveness of tooth proportion has been evaluated as a separate entity from its framework (lip line). As a rule, an optimal smile must have balance and harmony between its components. Therefore, smile esthetic components should not be assessed independently. Regarding anterior teeth proportion, Rosenstiel et al [15] revealed that their participants preferred the 80% proportion for short and very short teeth, and the golden ratio was accepted merely for very long teeth.

Since the general population is the main customer of esthetic treatments, finding their ideal range of acceptance has always been the researcher's interest. Identifying ideal esthetic factors from the

patients' point of view has a great value in treatment satisfaction [16].

The purpose of this study was to evaluate the correlation between lip line and the anterior maxillary teeth proportion according to the preference of lay people.

Materials and Methods

In this descriptive study, a frontal digital image of pose smile of a young female with normal dentition and oval arch form, without any attrition, restoration, space or orthodontic disorders, was taken (Nikon D40X digital SLR Camera, 10.2 megapixels; Nikon Corp., Tokyo, Japan).

Her head was in a natural position without any rotation, the head and shoulders were straight, and the Frankfort plane was parallel to the floor. The lens of the camera was parallel to the two central incisors and 8 inches away from the teeth. The pictures were cropped such that the images included only the lips, the nasal tip, and the mentolabial fold. The images were digitally altered by Adobe Photoshop CS6 Extended software (Adobe Systems Inc., San Jose, CA, USA) in three different central to lateral and lateral to canine ratios of 54%, 62%, and 70%.

In each ratio group, we made three types of lip line (high, low, and medium). Finally, nine pictures of smile were made. The images were printed on 10 cm×15 cm glossy papers with the resolution of 300×600 pixels.

Selection of raters and their demographics:

According to the study by Kattadiyil et al [17] and using power analysis by one-sample proportions tests ($\alpha=0.05$, $\beta=0.2$, $p=0.3$, and $d=0.2$), the minimum sample size was estimated to be 38 samples.

Forty raters (20 females and 20 males) were randomly selected from among Iranian lay people. The average age of the raters was 19.4 years. They were asked about any artistic background and if they were interested to be involved in the research.

Survey design:

The raters were asked to rank the pictures from one to nine in a manner that the most attractive smile was scored one, and the least attractive smile was scored nine. There was no time limit for their response.

Statistical analysis:

The obtained data of width ratio were submitted for statistical analysis with SPSS 16.0 software (Statistical Package for the Social Sciences; SPSS Inc., Chicago, IL, USA), and were reported as means and standard deviations (SD). For each gender, Friedman test was used to analyze the data, and pairwise comparisons were made by Bonferroni correction. The impact of gender on the ratings was analyzed by repeated measures analysis of variance (ANOVA). The level of significance was considered as 5%.

Results

Although the 54% and 70% proportions are both considered less attractive than the 62% proportion in the medium lip line, all three proportions had approximately the same preference rates in this group. The 54% proportion was the least attractive one in the high lip line group (mean±SD=6.819±0.213). The 70% proportion was the least attractive one in the low lip line group (mean±SD=6.881±0.249). Overall, the 62% proportion in the medium lip line group was identified as the most attractive smile in our study (mean±SD=3.088±0.136).

When evaluating the lip line, the medium lip line was the most attractive lip line in all width proportions. The low lip line was more attractive than the high lip line in the 54% proportion (mean±SD=4.856±0.253 versus 6.819±0.213), and the high lip line was more attractive than the low lip line in the 70% proportion (mean±SD=4.963±0.248 versus 6.881±0.249).

The gender of the evaluators had no significant effect on the rankings ($P=0.324$). Therefore, the total results collected from the surveys were analyzed.

Figure 1 shows the results of esthetic ratings of nine types of smile according to the two variables of lip line and width ratio.

Discussion

In the young population, smile esthetics is considered more important than the occlusion and function [17]. Studies have revealed that the preference of dentists, particularly specialist dentists, is different from that of lay people [17,18]. While dentists are not mindful of lay

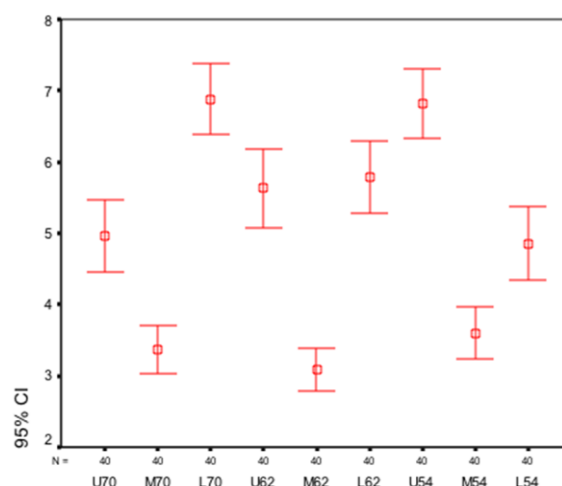


Figure 1. Error bar diagram of the results of rankings of nine types of smile. L=Lower lip line, M=Mid lip line, U=Upper lip line; 54, 62, and 70 are the width proportion percentages; CI=Confidence Interval

people's esthetic smile perception, the outcome of their treatment might not be acceptable [17].

The aim of the present study was to evaluate the esthetic preferences of young Persian lay people regarding the interaction of two important smile esthetic parameters i.e. lip line and anterior maxillary teeth proportions.

Based on the importance of the width ratio proportion of the anterior teeth in aesthetic smile reconstruction [19], this study focused on the attractiveness of three types of lip line with three different proportions.

The width ratios were selected in accordance with the acceptable range of RED proportion in other studies. Wolfart et al [19] suggested an acceptable golden range of 50%-74% for lay people and 56%-68% among dentists. This range was 53%-76% in lay people in research by Ker et al [14] and 60%-80% in a study by Ahmad [20] as the most attractive range, which is in accordance with other similar studies [15,21-23].

The results of the current study demonstrate that in the medium lip line group, which is the most prevalent and attractive lip line [14,23,24], the three percentages had the same acceptance, which is in accordance with the results of a previous

study that emphasized on repetitions of a constant width ratio in anterior maxillary teeth more than the presence of a specific proportion [22].

Ward [24] introduced the concept of RED proportion as the clinician's proportion choice that remains consistent as proceeding distally in the arch. Generally, the most useful values of the RED proportion are between 60% and 80% [15]. In the high lip line group, the 70% proportion was the most acceptable percentage, whereas the 54% proportion was the least attractive one. In the low lip line group, the 54% proportion was the most attractive one, while the 70% proportion was the least attractive one. The results of a study by Saha et al [25] revealed that a lower RED proportion is acceptable for longer teeth, and a wider RED proportion is acceptable for shorter teeth.

According to the results of a study by Azimi et al [23], the golden proportion in the range of 55%-64% existed in 19%-30% of the perceived width ratios of lateral incisor to central incisor and in 0.2%-3% of the width ratios of canine to lateral

incisor in the normal dentition. Additionally, the RED proportion was present in 13%-23% of the population, and the most recurring proportion in the subjects was the 73% proportion; [23] this means that the ratio alone is not an important factor in smile attractiveness.

In the present study, there was no difference in the preferences of males and females, which is consistent with the results of some previous studies [12,13,15], except for the study by Flores-Mir et al [26] that found significant differences between the preferences of males and females.

The analysis of the current study results revealed that the variables of lip line and width proportion cannot be assessed independently. Overall, none of the proportions had better ranking value than others and this was significantly dependent on the lip line. In conclusion, the factors affecting the smile should not be assessed individually since beauty is the result of balance and harmony among several components.

Conclusion

Considering the limitations of the present study, the results revealed that the RED proportion cannot be used as a constant ratio. The proportions might

be selected in accordance with other factors such as lip line.

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