



Effects of Visualized Tooth Display and Facial Width on Smile Attractiveness of Thai population

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Abstract

Nowadays, orthodontic treatment is one of the most viable options for achieving facial esthetic and smile enhancement. Additionally, orthodontic treatment can improve the patient's smile and attractiveness. Therefore, this study aimed to find the most attractive tooth display in relation to facial width and attain the golden ratios between them to increase satisfactory orthodontic treatment results. Using google survey, facial display sets of selected male and female models with five different sizes of buccal corridors (100%, 95%, 90%, 85%, and 80%) in three different facial types (brachyfacial, mesofacial, and dolichofacial) were rated by the subjects. Subjects were 759 Thai observations (368 dental professional and 391 laypeople) whose ages ranging from 20-80 years old from all geographic regions. The results indicated that Brachyfacial females and Brachyfacial males received the lowest rating from laypeople perception while Mesofacial females and Dolichofacial males received the highest rating. Dental professionals also had different perception towards attractive tooth display of different facial types. Mesofacial female and Dolichofacial female are perceived as more esthetic, in contrast with Dolichofacial male. Furthermore, there was a different perception between laypeople and dental professional towards every tooth display type. 95% posed smile width in all facial type was the most attractive in laypeople except Brachyfacial and Dolichofacial female that have the attractive posed smile width between 90-95%. 95% posed smile width in all facial types was the most attractiveness in dental professional except Brachyfacial and Dolichofacial male that have the attractive posed smile width between 90-95%. The facial width did not affect on smile attractiveness in both dental professional and laypeople perception of the smile attractiveness.

Keywords: Facial types, Orthodontics, Smile attractiveness, Tooth display

1. Introduction

Smile attractiveness in recent year has become a major focus for the public. Orthodontic treatment results can also boost an individual's self-esteem. There are several orthodontic devices that help space closure, improve tooth alignment, correct malocclusion and eliminate improper smile and speech problems. In essence, not only the outer appearance that is linked to self-confidence, but having a beautiful smile also plays a significant role.

Most beautiful and natural smiles are not necessarily symmetrical, uniform in color, or perfect by scientific standards. Consequently, they maintain a natural intrinsic beauty not by the virtue of perfection but rather through the subtle beauty of imperfection. The beauty is in the eye of the beholder (Davis, 2007). For these reasons, smile design guidelines that use a perfect model as a goal may not necessarily render the most beautiful and natural smile that satisfies both the dentist and the patient.

In spite of having perfect teeth alignment, some patients still felt dissatisfied with their smiles. There is no constant ratio between esthetic tooth display and facial width. Because each patient has unique facial structures, the perfect-for-all smile is not suitable to be regarded as a gold standard for the patient. The proper amount of tooth display that corresponds to each patient's facial type could give some guidelines for improving the smile esthetic and could also assist orthodontists in deliberating the treatment plans.

The aim of this study is to find an ideal tooth display in relation to facial width and attain the golden ratios between them in relation to smile attractiveness of the Thai population.

2. Material and methods

Image manipulation



The portrait pictures of ideal male and female models with a posed smile were created as a representative of Thai population using Zbrush (Pixologic Inc., CA, USA) measuring 1920 x 1080 pixels with 300 dpi resolution. The male and female models facial structures were altered into three facial types, including Brachyfacial female, Mesofacial female, Dolichofacial female, Brachyfacial male, Mesofacial male, and Dolichofacial male. Facial proportions were calculated by measuring from the Nasion (N) to Gnathion (Gn) anatomical landmarks, divided by the bizygomatic width, and measured from the right to the left Zygion (Zyr - Zyl) which were 0.950 in Dolichofacial, 0.875 in Mesofacial, and 0.800 in Brachyfacial.

In each facial type, posed smile widths (PSW) were calculated individually according to the study of Abraham et al, 2015. The posed smile width measuring the widest commissure to commissure were calculated from the average proportion between lower facial height (LFH) and posed smile width as 1.0016 in males and 1.0301 in females.

The models' posed smile width was altered according to the lower facial height which was designed to fit with each facial types. After facial images of the models were created, the sizes of the white area were modified into 5 images which were 100%, 95%, 90%, 85%, and 80% of posed smile width regarding the inter commissure width. The resulting 30 images were created consisting of 5 different tooth displays in each facial type.

The final images were added into the online survey Google form to collect the data and printed on A2 glossy photo papers for further use for rating by subjects.

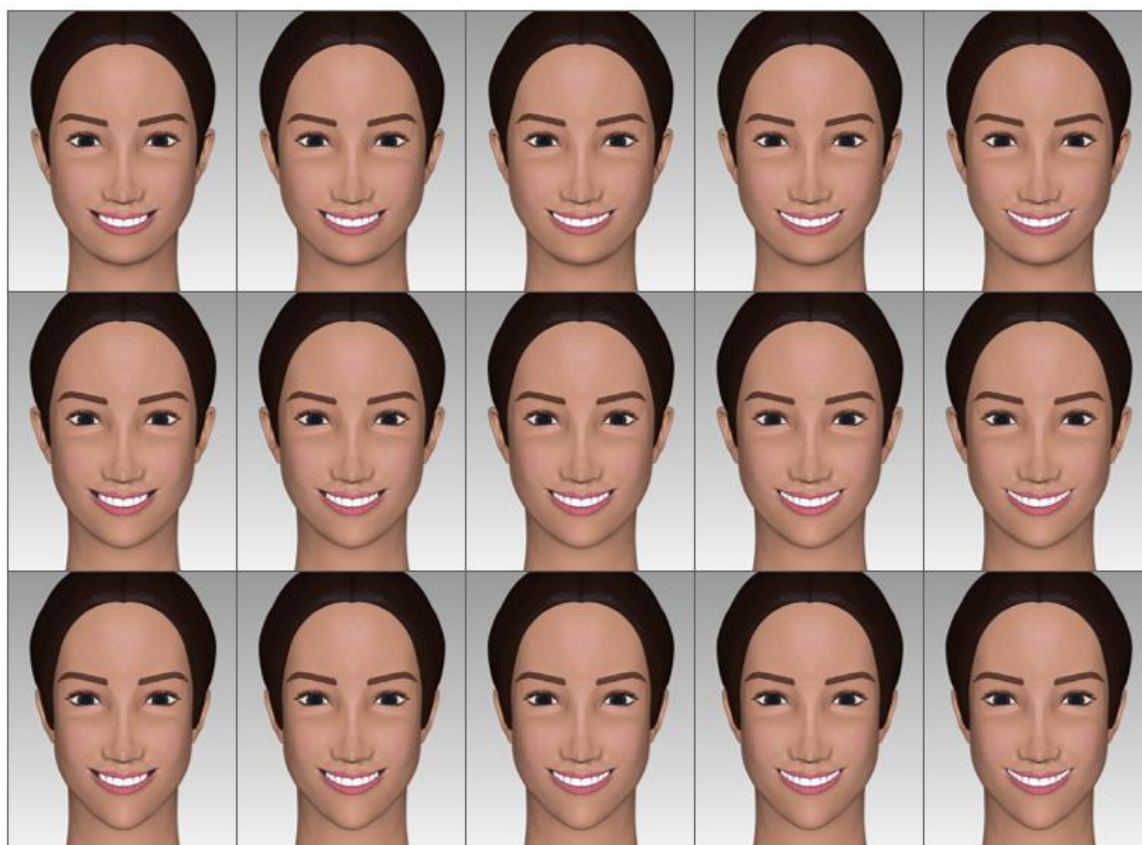


Figure 1 Female model in three facial types which were Brachyfacial (upper row), Mesofacial (middle row), Dolichofacial (lower row), were manipulated into five different tooth display 80% of PWS; 85% of PWS; 90% of PWS; 95% of PWS and 100% of PWS from left to right.



Figure 2 Male model in three facial types which were Brachyfacial (upper row), Mesofacial (middle row), Dolichofacial (lower row), were manipulated into five different tooth display 80% of PWS; 85% of PWS; 90% of PWS; 95% of PWS and 100% of PWS from left to right

Survey

The subjects in this study were 759 observations including 391 Thai laypeople and 368 Thai dental professionals. In a group of laypeople, the surveys were taken randomly with people in the different originated area in Thailand and had no history of dental training. Visual impairment, mental disability or working as a dental associated career were excluded from this group. In a group of dental professionals, the observations were required to be at least 3rd-year dental students who have been studying in Thailand. In addition, experienced dentists who have been working related to dental aesthetics field. Visual impairment or mental disability were also excluded from this study.

The data collections were online collected through the Google Form. The data including name, sex, age, hometown, the degree of education, income, occupation, and specialty in case of dental professionals. The subjects were asked to assess the attractiveness of the smile and scored each image from 1 – 5 which represent an interval measurement labeled from the least attractive (1) to the most attractive (5). Subjects were presented with sets of pictures of Brachyfacial, Mesofacial, and Dolichofacial categories for assessment respectively. The order of pictures of each facial type presented to the subjects was 80%, 85%, 90%, 95%, and 100% respectively. Subjects were allowed to hold the pictures to ensure the best vision of the pictures was provided to them. The subjects were thoroughly informed about the study, and they were allowed to refuse or quit from this study at any time. The subjects were requested to express their opinion about this study after the questionnaire.

3. Data analysis

The mean values were recorded and statistically analyzed by SPSS 17 (SPSS Inc, Chicago, Illinois) at 95% confidence level. The dependent variable in this research was the esthetic rating, which was an



interval measurement. Besides, data were collected from the same observations for five times per facial type which was called related samples. Therefore, One-way repeated ANOVA follow by Turkey's HSD test in hypothesis 1 and 2 and T-Test in hypothesis 3, 4, and 5; parametric test for related sample, was the most suitable statistics used to test difference of rating among five tooth display types to make sure that the selected tooth display types were significant enough to use for further analysis.

4. Results

The result described and compared values of dependent variables between dental professional and laypeople by using descriptive statistics. Dependent variables in this research referred to the rating of smile attractiveness according to each facial type. There were six facial types, with five different tooth display per type. Observations were asked to provide a score of the smile attractiveness of five tooth displays within the same facial type from score one to five, which score one represented the lowest smile attractiveness and score five represented the highest smile attractiveness.

Table 1 Descriptive statistics of smile attractiveness rating by facial type and smile type, comparing by dental and non-dental professional

Facial Types & tooth display	Dental professional			Laypeople		
	Minimum	Mean	Maximum	Minimum	Mean	Maximum
Brachyfacial female						
Picture 1: 100% PSW	1	3.39	5	1	2.52	5
Picture 2: 95% PSW	1	3.55	5	1	3.61	5
Picture 3: 90% PSW	1	3.99	5	1	3.60	5
Picture 4: 85% PSW	1	3.13	5	1	2.75	5
Picture 5: 80% PSW	1	1.90	5	1	2.06	5
Mesofacial female						
Picture 1: 100% PSW	1	2.54	5	1	3.44	5
Picture 2: 95% PSW	1	3.63	5	1	3.79	5
Picture 3: 90% PSW	1	4.10	5	1	3.57	5
Picture 4: 85% PSW	1	3.05	5	1	2.64	5
Picture 5: 80% PSW	1	1.83	5	1	2.02	5
Dolichofacial female						
Picture 1: 100% PSW	1	2.45	5	1	3.41	5
Picture 2: 95% PSW	1	3.57	5	1	3.74	5
Picture 3: 90% PSW	1	4.09	5	1	3.62	5
Picture 4: 85% PSW	1	3.12	5	1	2.64	5
Picture 5: 80% PSW	1	1.86	5	1	1.96	5
Brachyfacial male						
Picture 1: 100% PSW	1	2.56	5	1	3.46	5
Picture 2: 95% PSW	1	3.52	5	1	3.66	5
Picture 3: 90% PSW	1	3.99	5	1	3.41	5
Picture 4: 85% PSW	1	3.10	5	1	2.65	5
Picture 5: 80% PSW	1	1.87	5	1	1.94	5
Mesofacial male						
Picture 1: 100% PSW	1	2.76	5	1	3.58	5
Picture 2: 95% PSW	1	3.65	5	1	3.74	5
Picture 3: 90% PSW	1	4.03	5	1	3.49	5
Picture 4: 85% PSW	1	2.96	5	1	2.73	5
Picture 5: 80% PSW	1	1.83	5	1	1.90	5
Dolichofacial male						
Picture 1: 100% PSW	1	2.82	5	1	3.58	5
Picture 2: 95% PSW	1	3.80	5	1	3.78	5
Picture 3: 90% PSW	1	3.92	5	1	3.54	5
Picture 4: 85% PSW	1	2.94	5	1	2.68	5
Picture 5: 80% PSW	1	1.77	5	1	1.98	5



Table 1 compared smile attractiveness rating score of facial type and tooth display by dental professional and laypeople, found some similarities and disparities between 2 groups. Starting with resemblance, the lowest smile attractiveness rating score of all facial types were 80% PSW (mean score 1.77 in the dental professional group and 1.88 in the laypeople group)

On the other hand, the highest rating score was 90% PSW in the dental professional group, followed by 95% PSW as seen in Table 1. However, in the laypeople group, the results had shown that 95% PSW was the highest smile attractiveness rating score in all facial types, followed by 100% PSW of all facial type in the male and 90% PSW of all facial type in the female.

There was a different perception between laypeople and dental professional towards every tooth display type. 95% posed smile width in all facial type was the most attractiveness in laypeople except Brachyfacial and Dolichofacial female that have the attractive posed smile width between 90-95%. 95% posed smile width in all facial types was the most attractiveness in dental professional except Brachyfacial and Dolichofacial male that have the attractive posed smile width between 90-95%. The posed smile width in all facial type was the most attractiveness in dental professional except Brachyfacial and Dolichofacial male that have the attractive posed smile width between 90-95%. The facial width did not affect on smile attractiveness in both dental professional and laypeople perception of the smile attractiveness.

5. Discussion

Our results showed that mesofacial type was rated better than other groups. This finding was in agreement with Pithon et al., (2014) who found that mesofacial type was more attractive for their recruited evaluators. A similar finding was also reported by Varlik et al., (2010) who found that average facial height was more attractive. Additionally, facial attractiveness got significantly decreased as the deviation from the norm increased. Among all three facial types, the mesofacial face was regarded as the most attractive in laypeople perception. Dental professionals also had different perceptions of the attractiveness of facial types. Mesofacial female and Dolichofacial female were perceived as more esthetic. Tanusetiawan et al, 2016 found that the dental professional perception of facial attractiveness were influenced by educational background and specific professional training.

The finding of this study has suggested that the dental professional and laypeople who were a representative sample of the Thai population perceived the smile and white area of 90% and 95% smile width as the most attractive, respectively. In contrast, both groups agreed that the white area of 80% smile width was the least attractive. When comparing the results of male and female models, a similar preference of white area could be found.

Pithon et al. (2014), investigated the effect of buccal corridor sizes on smile attractiveness in three different facial types. The study found that smile with narrow buccal corridors (2% buccal corridor or 98% of white area) was rated highest in terms of smile attractiveness while the result from our study indicated that 90-95% white area in both of groups was the most attractive. This difference may result from the difference in ethnicity of the raters as well as the model. The study Pithon et al., (2014) used the Brazilian models which had different anthropometric facial structures compared to Asian people like Thai models used in this study.

However, when comparing the results of this study to Charoenpong et al., (2017) which found that the smile with 15% buccal corridors or 85% white area was rated highest in terms of smile attractiveness while the result from our study indicated that 90-95% white area was the most attractive. This could have been because Charoenpong et al., (2017) uses the picture of the real people which is different from this research. In contrast, computer-generated models were desired instead so that all other facial features, except the smiles, were identical to minimize an individual's bias.

Although preferences to the amount of buccal corridor vary among different studies, which have been conducted in different ethnic groups, similar findings have been shown that large buccal corridors or narrow tooth display (more than 20% buccal corridor or less than 80% smile width) is widely regarded as least attractive.



6. Conclusion

In conclusion, Brachyfacial female and Brachyfacial male receive the lowest rating from laypeople perception while Mesofacial female and Dolichofacial male receive the highest rating from laypeople. Dental professionals also have a different perception towards attractive tooth display of facial types. Mesofacial female and Dolichofacial female are perceived as more esthetic, in contrast with Dolichofacial male.

Furthermore, there is a different perception between laypeople and dental professional towards every tooth display type. 95% posed smile width in all facial types is the most attractiveness in laypeople perception except Brachyfacial and Dolichofacial female which are the attractive posed smile width between 90-95%. 95% posed smile width in all facial type is the most attractiveness in dental professional perception except Brachyfacial and Dolichofacial male which are the attractive posed smile width between 90-95%.

7. References

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