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Smile esthetics: A comparative study between dental students and laypersons using visual analogue scale

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Abstract

Introduction: The current study aims to assess the change in insight between dental students and laypersons to deviations in smile arc and buccal corridor. Dental students are the future dental specialists and objective assessment of their perception of smile is important and how it co relates with that of layperson i.e. future patients.

Material and methods: Two hundred and thirty people (118 Dental students, 112 laypersons) assessed the esthetics of sixteen digitally altered frontal smiling photographs with different variations of smile arc and buccal corridor ratios. The raters were requested to mark the overall look of the photographs by using visual analogue scale from 1 to 10. The scores were then compared to evaluate which smiles scored high or lower and which were the more preferred smile by dental students and laypersons.

Results: The dental students gave highest score to the female consonant smile arc whereas laypersons gave highest score to the male consonant smile arc. Dental students gave highest mean score for buccal corridor variations 0.92F, showing a preference for a broad smile with less buccal corridor ratio. The layperson group gave highest score to buccal corridor ratio 0.84F showing preference for slightly narrow smile with a significant buccal corridor ratio.

Conclusions: Both dental students and laypersons preferred consonant smile arc. Excessive buccal corridor ratio was rated as less appealing by dental students and more appealing by laypersons.

Keywords: Dental esthetics; dental students; visual analogue scale

Introduction

The modern day and age hold great regard to outward appearance. People with more esthetically pleasing appearances are at a social advantage in almost all walks of life.[1] Whether securing a job or being socially accepted, all is heavily dependent on being what we call attractive.[2] The face is reported to be the major determinant of esthetics, the mouth ranks highest after the eyes as that determinant.[3] Many components make up an esthetically pleasing smile. Along with the teeth the surrounding soft tissue i.e., gingiva, buccal corridors, smile arc, diastema and midline, all makeup the smile. An attractive smile contains a number of important elements. First, the smile arc must follow the incisal edges of the maxillary central incisors, lateral incisors, and tips of the canines and it must be parallel with the curve of the lower lip.[4]

Buccal corridor (BC) is well-defined variably as the space between the buccal faces of the maxillary teeth and the curves of the mouth during smile. BCs significantly affects the smile attractiveness. Orthodontic expansion is a very common treatment to improve smile

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attractiveness by reducing the buccal corridor space.[5,6]

Objective perception of smile esthetics can be expected from dental specialists, in particular orthodontists. Dental students however may have a different view of dental esthetics owing to the influence of varied knowledge from different final year subjects.[7,8] Laypersons tend to base their esthetic perceptions on societal norms, ethnic influence and influence from the media.[9] In order to execute satisfactory orthodontic treatment it is essential to understand the level of acceptability as to what is considered esthetically pleasing in the community.

Despite extensive research on facial esthetics, scarce literature is available that attempts to relate the dental students and layperson's perception of facial esthetics to objective facial and dental parameters in the Pakistani population. Therefore, the aim and objective of this study is to assess the effects of variations in smile arcs and buccal corridors and their interactions on the insights of smile attractiveness as judged by dental students and laypersons in local inhabitants.

Null Hypothesis: Dental students and laypersons have similar preferences with regards to smile arc and buccal corridor when evaluating smile esthetics.

Material and Methods

This was a cross-sectional observational study conducted as an online survey and was carried out at the College of Dentistry, Rawal Institute of Health Sciences Islamabad, Islamic International Dental Hospital Islamabad and Foundation University College of Dentistry Islamabad. The study period was from September 2021 to February 2022. Approval was obtained from Ethical Committee College of Dentistry, Rawal Institute of Health Sciences Islamabad (RIHS/IRB/21/012). A consecutive sampling technique was used. Out of a possible total of 150 dental students 118 responded. The online survey was distributed among various Non-Dental colleges of Islamabad and a total of 112 students responded. The questionnaire was distributed among the three final year batches of the above-mentioned dental colleges. Dental students, in particular final year, have been selected owing to the level of their dental education gained from different aspects of dentistry, may perceive dentofacial esthetics differently. Laypersons depends on societal beliefs and norms when it comes to assessing esthetics. Therefore it is important to understand the threshold of what community considers acceptable in terms of abnormal dentofacial aesthetic features. The laypersons group included respondents from well-educated and good socio-economic background, with at least a bachelor's degree in any field unrelated to dentistry, so that they have no knowledge of buccal corridors and smile arc. Those laypersons were excluded from the study who had previous orthodontic treatment or were undergoing orthodontic therapy. Dental assistants were also excluded.

After obtaining informed consent from the participants, a smiling photograph was taken from a female patient who reported to the Out Patient Dental Department of Rawal Institute of Health Sciences Islamabad. The photograph was taken with Canon EOS 90D (Japan) at a distance of five feet. It was digitally manipulated using Adobe Photoshop 7.0 (San Jose, California, USA) to create a set of sixteen photographs with different variations of the normal buccal corridors and smile arcs. This was done by altering the original smile (8% buccal corridors) so that the buccal corridors occupy 0%, 4%, 12% and 16% of the total oral commissures. This is two standard deviations above and below the original smile, where one SD is 4%.[10] In these photographs the original smile arc was kept consonant. The smile arc variations were created in the same manner by manipulating the ideal smile arc to create three photographs with reverse, flat and normal smile arcs. In these photographs the buccal corridor was kept constant (8%). Male counterpart photographs were created

from the same photograph as well so as to end up with a total of sixteen photographs (eight female and eight male photographs) (Figure I).

The photographs were uploaded in google document form (Google LLC 1600 Amphitheatre Pkway Mountain View, CA 94043 USA). The form had two parts, the first part had questions related to demographic details and the second part had questions in the form of the digitally altered pictures. The sixteen pictures were presented as questions and the respondents were requested to rate the general look of the smiles in each question using visual analog scale (VAS) ranging from 1 to 10 (1, worst; 10, very good).[11,12]

Statistical package for the social sciences (SPSS for windows version 22) was used for the statistical analysis. Frequencies and percentages are presented for age and gender. Means and standard deviations are obtained for all the numerical variables i.e. age of the respondents and score for smile arcs and buccal corridors for both laypersons and dental students. Independent samples t- test was used to compare the mean VAS for both groups for smile arc and buccal corridors. The p value less than 0.05 is reflected as statistically significant.

Results

Our sample size consisted of 118 dental students and 112 laypersons. Out of these 38.3% were male and 61.7% were female. (Figure II). Of the total dental students 33.9% were from RIHS, 56.8% from IIDH and 9.3% were from FUCD (Figure III).

Figure IV shows mean values given by dental students and laypersons for smile arc. The highest mean score for smile arc variations was given to slide 6 (Consonant smile arc female) by dental students and slide 1 (consonant smile arc male) by laypersons. This shows that both dental students and laypersons preferred an ideal or consonant smile arc (Figure IV). The minimum score for smile arc variations was given to slide 3 (Reverse smile arc male) by dental students and slide 4 (Reverse smile arc female) by laypersons. This reflects that any deviation from the ideal consonant smile arc was not preferred by both groups.

Table I shows the results for the comparison between dental students and laypersons for smile arcs. No significant difference was observed for the most preferred smile by dental students (Slide 6). Significant difference was found for Slide 3 and slide 5. Overall laypersons rated higher scores as compared to dental students.

Figure V shows the overall mean scores given by dental students and laypersons for buccal corridor ratio. The highest mean score for buccal corridor variations was given to slide 11(0.92 F) by dental students, showing that dental students preferred a smile with average buccal corridor space present, i.e. Neither a too broad nor a too narrow smile. The minimum score was given to slide 8 (0.84M) showing that a narrow smile with excessive buccal corridors was not preferred by dental students. The layperson group gave highest score to slide 7 (0.84 F) which shows that laypersons preferred a narrower smile with more buccal corridor ratio (Figure V). The minimum score was given to slide 10 (0.88M) showing that a broader smile with less buccal corridor space was not preferred by laypersons group.

Table II shows the results for the comparison between dental students and laypersons for buccal corridors. No significant difference was observed for both groups for the most preferred and least preferred smile ($p > 0.05$). Laypersons group rated the narrow buccal corridor smile (Slide 7) as the highest whereas the dental students group rated the average smile as the highest (Slide 11). Significant difference was found for Slide 12, 13 and 14. ($P < 0.05$). The laypersons group gave an overall higher mean score as compared to the dental students group.

Smile Arc Variations

Slide 1: Consonant Smile Arc Male

Slide 4: Reverse Smile Arc Female

Slide 2: Flat Smile Arc Male

Slide 5: Flat Smile Arc Female

Slide 3: Reverse Smile Arc Male

Slide 6: Consonant Smile Arc Female

Buccal Corridor Variations

Slide 7: BC 0.84 Female

Slide 12 BC 0.92 Male

Slide 8: BC 0.84 Male

Slide 13: BC 0.96 Female

Slide 9: BC 0.88 Female

Slide 14: BC 0.96 Male

Slide 10: BC 0.88 Male

Slide 15: BC 1.0 Female

Slide 11: BC 0.92 Female

Slide 16: BC 1.0 Male

Figure I: Buccal Corridor & Smile Arc Variations

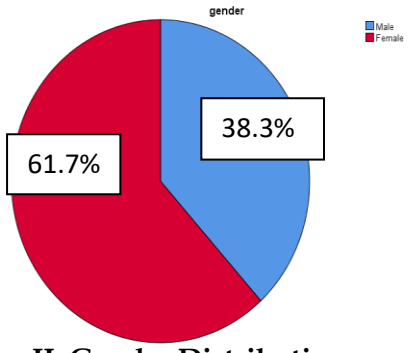

Figure II. Gender Distribution

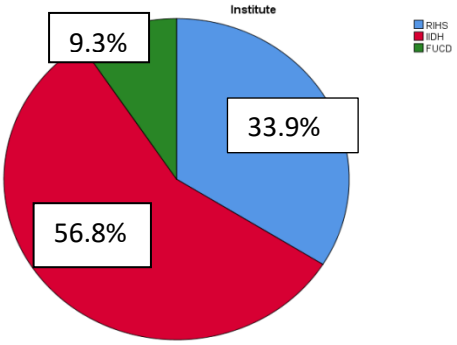

Figure III. Institute Distribution

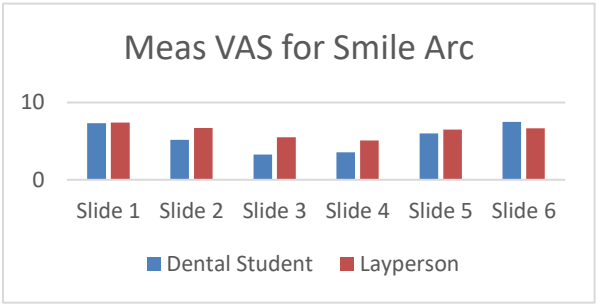

Figure IV. Mean VAS for Smile Arc Variations

Table I: Independent Samples Test for Smile Arc

Variable	Mean Difference	P Value
Slide 1: SAmNormal	-.081	.674
Slide 2: SAmFlat	-1.53	.065
Slide 3: SAmReverse	-2.22	**.000***
Slide 4: SAfReverse	-1.54	.868
Slide 5: SAfFlat	-.50	**.000***
Slide 6: SAfNormal	.79	.348

P value was determined using student T test.
**P* value considered significant.

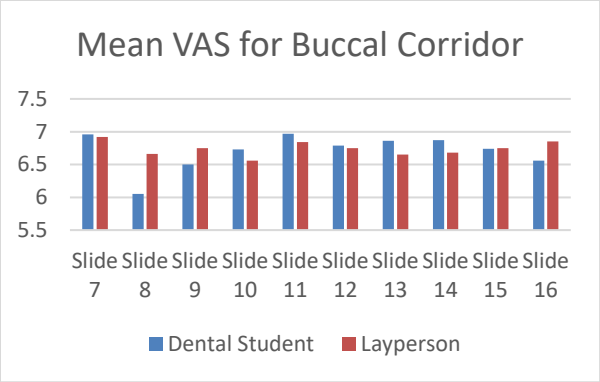

Figure V. Mean VAS score for Buccal Corridor variations

Table II: Independent Samples Test for Buccal Corridors

Variable	Mean Difference	P Value
Slide 7: BC0.84F	.037	**.001***
Slide 8: BC0.84M	-.62	.085
Slide 9: BC0.88F	-.25	.069
Slide 10: BC0.88M	.17	.139
Slide 11: BC0.92F	.12	.016
Slide 12: BC0.92M	.03	**.001***
Slide 13: BC0.96F	.21	**.000***
Slide 14: BC0.96M	.18	**.039***
Slide 15: BC1.0F	-.01	.149
Slide 16: BC1.0M	-.29	.722

P value was determined using student T test.
**P* value considered significant.

Discussion

The current study aimed to assess the difference in insight between dental students and laypersons to deviations in smile arc and buccal corridor. Dental students are the future dental specialists and objective assessment of their perception of smile is important and how it co relates with that of laypersons.

The first variable studied was smile arc. For this study it was defined as the relation of the curvatures of the incisal edges of maxillary incisors, canines and first premolars relative to the curvature of the lower lip. Orthodontic therapy often results in a flattened smile arc.[10] For smile arc variations overall the layperson group were more generous in their scoring than dental students however both groups gave a high score of 7.4 to the normal smile arc. There was no statistically significant difference in their response to most preferred consonant smile. The results of this study are in partial agreement with that of Krishnan et al.[24] Krishnan et al, quantified smile characteristics with regard to the smile arc and buccal corridor measurement and found that there was no difference in perception between laypersons and dental professionals. The results of this study are comparable to various studies that show dental students were able to correctly perceive deviations from normal smile.[11,12,13] Our results are in agreement with Magne et al. In their study they found that the lay persons were able to identify and correctly score dental abnormalities with similar frequency to that by dentists.[14] This reflects the fact that todays' layperson is a lot more educated and aware of beauty standards and are very well able to pick out the most pleasing smile. The results of our study also agreed with those of Parekh et al. in their study laypersons were able to perceive the difference between a consonant smile and non-consonant one, and preferred the consonant smile.[15]

The second variable assessed was the buccal corridor ratio. Buccal corridor size has been a controversial aspect of smile attractiveness. It is the space between buccal surfaces of maxillary teeth and the angles of the mouth during smile. Orthodontists often expand dental arches to relieve crowding, it is imperative to identify how variations in the number of tooth display while smiling affects facial allure. Various studies have been done that show a narrower smile to be more esthetic than a broader smile, hence, warranting extractions to relieve crowding rather than expansion.[16,17] In order to propose useful clinical guidelines, it is imperative to determine whether dental students and laypersons recognize buccal corridors in a different way.[18,19] Both groups had slightly different perception, dental students preferred the smile with average buccal corridors whereas laypersons preferred the

slightly narrow smile. The results of our study showing that narrow smile with more buccal corridor space was preferred by laypersons is in contrast with that of Moore et al 2005 who also evaluated smile esthetics and buccal corridors and found that laypersons preferred a broader smile with minimum buccal corridor.[20] They used full face slides and altered the maxillary dentition to 5 widths. The results of their study also showed that broader smiles were preferred. The results of this study partially agreed with that of Parekh et al, that both orthodontist and laypersons preferred consonant smiles arc with minimal buccal corridors.[15] Considerably lower ratings were obtained for smiles with flat smile arcs which is in agreement to this study. This study results partially corroborated with the one done by Martin et al who showed that orthodontists and laypeople rated smiles with small buccal corridors as significantly more attractive than those with large buccal corridors.[16]

Our results are similar to those of Roden-Johnson et al 2005.[5] Where by each smile was assessed twice, once with buccal corridors present and once without. Orthodontist, laypersons and dentist all evaluated the smiles differently. Our results are also in agreement with that of Abu Alhaija et al, who evaluated the role of buccal corridor and gingival show in smile esthetics based on the perspectives of laypeople and professionals. They found significant differences between the two groups of laypersons and dental professionals.[21]

Our results also agreed with those of Kokich et al, who found that laypersons, dentists, and orthodontists have different levels of detection of changes in smile characteristics, and that laypersons were the most forgiving.[22]

Although dental students and laypersons had similar tendencies for rating smile arc preferences, the laypersons preferred the slightly less broad smile in comparison to dental students. These results recommend that it is vital to consider the perception of laypersons in determining orthodontic treatment goals. If the orthodontists' perception of esthetics is not congruent with the patient's perception, the result might not be satisfactory to the patient. However, it does not mean that every patient be treated to broad smiles with broad arches. The original arch form should be taken into consideration in order to prevent post treatment relapse.[23]

The role of gender, both the patients and participants on preferences, has not been explored in this study and is a limitation. This aspect may be researched in future studies. Even though the photographs were in random order, it is likely that an order effect may exist. This could have been catered for by randomizing the order for each judge, which is practicable if an automated survey is used.

Conclusions

Excessive buccal corridors smile was rated as less appealing by dental students and more appealing by laypersons. Both laypersons and dental students preferred smiles with consonant smile arc.

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