



Research Article

ASSESSMENT OF PERCEPTION OF SMILE ATTRACTIVENESS – A VIDEOGRAPHIC STUDY

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ABSTRACT

Aim: The present study was done to assess and compare the perception of smile attractiveness among orthodontists, general dentists, and orthodontic patients through videographic assessment of different malocclusion.

Materials and methods: A video recording of 2 minute, of an individual with anterior 12,11,21,22 missing teeth, who was selected for the study and rehabilitated with 6 different types of removable partial dentures to create different types of malocclusion for different smile perception, i.e smile with midline diastema (type 1), smile with midline deviation (type 2), Gummy smile (G) (type 3), A smile with an inverted smile arc (type 4), smile with deviation from the long axis of the lateral incisors (type 5), smile with absence of any malocclusion in the upper anterior teeth (type 6), was recorded.

This video recording was evaluated esthetically by the study population (sample size=75) consisting of orthodontists, general dentists, and orthodontic patients, using a visual analogue scale (1-10).

Result: The study results showed that all the groups were able to identify normal smile (type 6) as the most attractive and esthetic smile and smile with midline diastema (type 1) as the least attractive. There is no variation in the rating scale awarded by the male and female participants with respect to different mouth video graphics framings (p value>0.5).

There was no statistically significant difference in the rating for the inverse smile arc (type 4) and deviation of lateral incisor (type 5) settings between the general practitioners and orthodontic patients.

Conclusion: Orthodontists were highly perceptive of different types of malocclusion and rated the different settings accordingly, with the lowest score for midline diastema and highest for normal smile. Regarding the background, age and sex, there was no significant difference in the ratings of the different types of malocclusion. The ideal smile was rated the highest and midline diastema the least.

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INTRODUCTION

The word 'esthetics' is derived from the Greek word meaning "perception". Beauty is a two-dimensional entity which has both objective and subjective dimensions. Facial appearance often plays a pivotal role in forming an impression to others especially during initial stages of acquaintance.¹

For a long time, orthodontic treatment was primarily based on occlusal relationship results. But in the current scenario, the orthodontic paradigm has shifted to obtaining a harmonious balance between soft tissue and occlusion.

Wylie emphasized that the goal of Orthodontic treatment should be to attain the best possible aesthetic result, both dentally and facially.

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He also stated that such qualities should be judged not only in repose but also in animation. The smile is what most laymen use to judge treatment success.²

The current concepts in diagnosis and treatment planning focus on the balance and harmony of various facial features and the treatment goals are geared towards the achievement of an overall skeletal, dental and soft-tissue balance.

Therefore, knowledge of the influence of orthodontic treatment on smile attractiveness is very important with more emphasis on midline position, axial midline angulations, buccal corridor and smile arc.³

Smile analysis and smile design have thus become an integral part of orthodontic diagnosis and treatment planning in the last decade. Digital videography is particularly useful in both smile analysis and doctor-patient communication.⁴

Most studies in literature seem to suggest smile standards, based on photographic analysis of posed and spontaneous

smile.⁵ As a smile is more of a dynamic than a static expression, the evaluations of such studies are subjected to bias. Therefore, the aim of this current study is to assess the attractiveness of smiles according to their variations from esthetic norms and perception of the smile by orthodontists, general dentists and orthodontic patients in videographic framing.

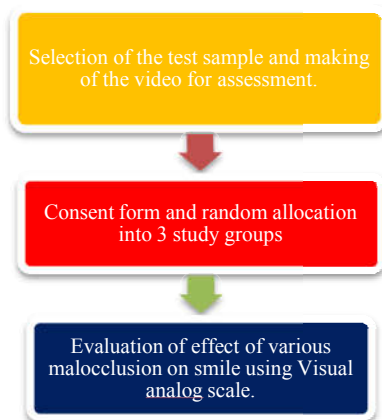
Aim

The aim of the present study is to assess and compare the perception of smile attractiveness among orthodontists, general dentists, and orthodontic patients through video graphic assessment of different malocclusion.

METHODOLOGY

An individual willing to participate in the study, of the age between 20 to 30 years with anterior 12,11,21,22 missing teeth was rehabilitated with 6 different types of removable partial dentures. And the posed smile of the individual was videographed into six video clippings of one-minute duration each using a digital camera (Canon EOS 1300 D), edited to total duration of 2 minutes and played on a laptop for evaluation.

After explaining the procedure and taking written consent, Orthodontists, general dentists and orthodontic patients in and around Tumkur, were chosen to evaluate videos of the individual with various smile forms. Each video contains 6 clippings of different malocclusion of 2 minutes duration. Evaluators were asked to rate the videoclip on a scale of 1 to 10 from least attractive (1) to the most attractive (10).The videograph was then uploaded to you tube for future reference (link –<https://youtu.be/ny0GhQArBjY>)

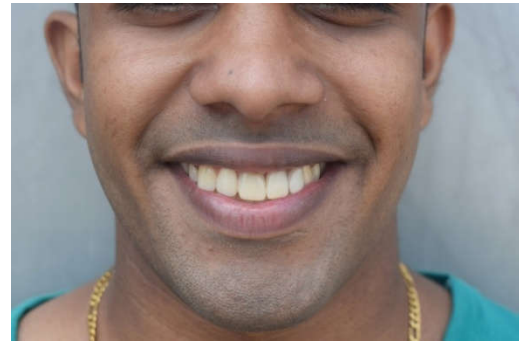


Facial Photographs



Type 1 A smile with midline diastema

A 1mm wide diastema was created between the maxillary incisors.



Type 2 A smile with midline deviation (MLD).

The dental midline was shifted about 4mm in relation to the patient's philtrum.



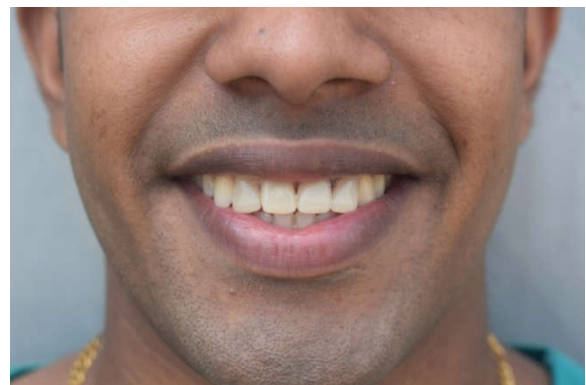
Type 3 A smile with deviation from the long axis of the lateral incisors (D2).

The long axis of the lateral incisors was inclined about 45 degrees distally in relation to their axis.



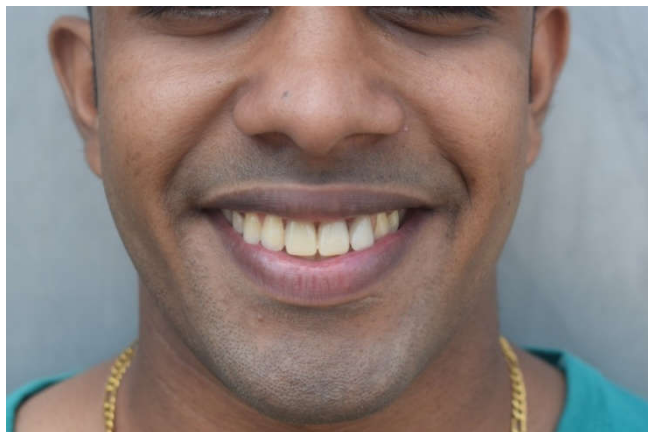
Type 4 Gummy smile (G).

About 4mm of maxillary gingival exposure was created.



Type 5 A smile with a reverse smile arc.

The maxillary central and lateral incisal borders were repositioned more apically.



Type 6 A normal smile (I) in a frontal pose, smiling with the head in a naturally relaxed position.

Table I

ANOVA Results for Midline Diastema					
Group	N	Mean	Std. Deviation	ANOVA F*	P value
Orthodontists	25	1.28	0.74		0
General dentists	25	1.68	0.95	14.851*	
Orthodontic patients	25	2.76	1.23		

*indicates P-value less than 0.05, hence there is a significant difference between groups on mean Midline Diastemascores.

Multiple Comparison Results for Midline Diastema

Groups		Mean Difference*	Confidence interval		P value
			Lower	Upper	
Orthodontists	General dentists	-0.4	-1.09	0.29	.477
	Orthodontic patients	-1.48*	-2.17	-0.79	0
General dentists	Orthodontic patients	-1.08*	-1.77	-0.39	.001

*indicates P-value less than 0.05. Results are adjusted for Bonferroni multiple comparisons. There is a significant difference between the mean Midline Diastemascores of Orthodontists versus orthodontic patients groups. Also, mean Midline Diastemascores of general dentists versus orthodontic patients group.

Table II

ANOVA Results for Midline Deviation					
Group	N	Mean	Std. Deviation	ANOVA F*	P value
Orthodontists	25	2.2	1		0
General practitioners	25	1.68	1.73	10.474*	
Orthodontic patients	25	3.28	0.89		

* indicates P-value less than 0.05, hence there is a significant difference between groups on mean Midline deviation scores.

Multiple Comparison Results for Midline Deviation

Groups		Mean Difference*	Confidence interval		P value
			Lower	Upper	
Orthodontists	General dentists	0.52	-0.35	1.39	.448
	Orthodontic patients	-1.08*	-1.95	-0.21	.010
General dentists	Orthodontic patients	-1.6*	-1.77	-0.39	0

*indicates P-value less than 0.05. Results are adjusted for Bonferroni multiple comparison. There is a significant difference between the mean Midline Deviation scores of Orthodontists versus orthodontic patients. Also, mean Midline Deviation scores of general dentists versus orthodontic patients group.

Table III

ANOVA Results for Gummy Smile,					
Group	N	Mean	Std. Deviation	ANOVA F*	P value
Orthodontists	25	3.76	0.78		
General dentists	25	5.96	1.46	26.296*	0
Orthodontic patients	25	5.16	0.9		

* indicates P-value less than 0.05, hence there is a significant difference between groups on mean gummy smile scores.

Groups		Mean Difference *	Confidence interval		P value
			Lower	Upper	
Orthodontists	General Dentists	-2.2*	-2.95	-1.44	.477
	Orthodontic Patients	-1.4*	-2.15	-0.65	.79
General dentists	Orthodontic Patients	0.80*	0.05	1.55	.281

Table VI

ANOVA Results for normal Smile					
Group	N	Mean	Std. Deviation	ANOVA F*	P value
Orthodontists	25	6.88	1.13		
General dentists	25	7.16	0.99	1.387	1
Orthodontic patients	25	6.68	0.95		

Note: Since the p-value is above 0.05 conclude that there is no significant difference between groups on mean normal smile scores.

Multiple Comparison Results for normal Smile

Groups		Mean Difference	Confidence interval		P value
			Lower	Upper	
Orthodontists	General dentists	-0.28	-0.99	0.43	1
	Orthodontic patients	0.2	-0.5	0.91	1
General dentists	Orthodontic patients	0.48	-0.23	1.19	.305

Statistical Analysis

Statistical analysis was done using Statistical Package for Social Sciences [SPSS] for Windows Version 22.0 Released 2013. Armonk, NY: IBM Corp was used to perform statistical analyses. One-way ANOVA test followed by Tukey’s post hoc analysis was used to compare the mean VAS scores for 6 different clippings between the three groups. The level of significance was set at P<0.05

RESULTS

The study was designed to evaluate the perception of different types of smiles and for this a study group of 75 individuals divided into 3 equal groups -Orthodontists (Group 1), General dentists (group 2) and Orthodontic patients (group 3) were selected.

The following were the results of the study:

Midline Diastema (type 1)

The entire study group rated poorly for this type of malocclusion. The mean scores for Orthodontists, general dentists and orthodontic patients were 1.28, 1.68 and 2.78 respectively. Both orthodontists and general dentists were critical of this malocclusion, hence have rated poorly. The orthodontic patients were more lenient in their assessment when compared to other groups. One-way analysis of variance (ANOVA) was used to compare Midline Diastema differences among the 3 groups. According to the one way ANOVA, mean

for Midline Diastema scores as evaluated by 3 groups for Orthodontists, General dentists and orthodontic patients were 1.28, 1.68 and 2.78 respectively differ statistically ($p < 0.05$) in mean. The difference in Midline Diastema scores between these three groups was not statistically significant ($p > 0.05$) refer table I and graph

Midline Deviation (type 2)

All the groups were perceptive of this malocclusion. The orthodontist and general dentist were highly critical of this type of malocclusion. However the orthodontic patient group gave a below average to average score (3-5) for this malocclusion. One-way analysis of variance (ANOVA) was used to compare smile differences among the 3 groups. According to the one way ANOVA mean for Midline Deviation scores as evaluated by 3 groups for Orthodontists, General dentists and orthodontic patients were 2.2, 1.68 and 3.28 respectively differ statistically ($p > 0.05$) in mean. The difference in Midline Deviation scores between these three groups was not statistically significant ($p > 0.05$) refer to table II and graph

Gummy Smile (type 3)

The general dentists and orthodontic patients have rated high for gummy smile. This could be due to the setting of gummy smile since vertical dimension of the maxilla could not be altered for the patient. However the orthodontist groups were able to identify the malocclusion and have rated accordingly with an average score. One-way analysis of variance (ANOVA) was used to compare smile differences among the 3 groups. According to the one way ANOVA mean for gummy smile scores as evaluated by 3 groups for Orthodontists, General dentists and orthodontic patients were 3.76, 5.96 and 5.16 respectively differ statistically ($p < 0.05$) in mean. The difference in smile scores between these three groups was statistically significant ($p < 0.05$) refer to table III and graph. One-way analysis of variance (ANOVA) was used to compare smile differences among the 3 groups. According to the one way ANOVA mean for Reverse smile arc scores as evaluated by 3 groups for Orthodontists, General dentists and orthodontic patients were 2.00, 3.32 and 4.16 respectively differ statistically ($p < 0.05$) in mean. The difference in smile scores between these three groups was statistically significant ($p < 0.05$) refer to table IV and graph

Deviated lateral incisors (type 5)

All the groups scored average for this type of malocclusion. The mean score for orthodontists, general dentists and orthodontic patients were 4.76, 4.12 and 4.68. One-way analysis of variance (ANOVA) was used to compare smile differences among the 3 groups. According to the one way ANOVA mean for Deviated Lateral scores as evaluated by 3 groups for Orthodontists, General dentists and orthodontic patients were 4.76, 4.12 and 4.68 respectively differ statistically ($p < 0.05$) in mean. The difference in Deviated Lateral scores between these three groups was statistically significant ($p < 0.05$) refer table V and graph.

Normal Smile (type 6)

All the study groups were able to identify the normal smile and have rated high accordingly. One-way analysis of variance (ANOVA) was used to compare smile differences among the 3 groups. According to the one way ANOVA mean for normal

smile scores as evaluated by 3 groups for Orthodontists, General dentists and orthodontic patients were 6.88, 7.16 and 6.68 respectively there's no difference statistically ($p > 0.05$) in mean. The difference in smile scores between these three groups was statistically significant ($p > 0.05$) refer to table VI and graph.

DISCUSSION

Smile esthetics is one of the primary causes of why patients with dental problems seek orthodontic treatment. The emergence of soft tissue paradigm in clinical orthodontics has smile analysis as a key component in diagnosis and treatment planning.⁶ The "art of smile design" lies in the orthodontist's ability to recognize the positive elements of beauty in each patient and to create a plan for improving those aspects that fall outside the parameters of the prevailing aesthetic concept. Various studies have been done in the past to evaluate the photographic analysis of posed and spontaneous smile.^{1,2,4}

The present research is focused on the smile attractiveness and the interplay between hard and soft tissue components of smile according to variations from esthetic norms and perception of smile by Orthodontist (G_1), General dentists (G_2) and Orthodontic patients (G_3) using videographic framing.

In the present study, midline diastema setting (type 1) was found to be unattractive by all the groups. But there was no statistically significant difference between the groups in their rating with the mean score of 2.3 (VAS). The finding of this study is concurrent with the findings of Sarver DM *et al* who stated that spacing in the midline was found to be aesthetically unpleasant to the general population. Findings of the study by Kokich *et al* also states that the presence of a diastema reduces the aesthetic appeal of a smile.⁷

In my study, assessment of dental midline deviation relative to facial midline (type 2) showed that midline was shifted to the left by 4mm. Among the groups, the orthodontists (G_1) were most critical of this type of malocclusion followed by general practitioners (G_1) and orthodontic patients (G_3) with an average score of mean 1.28, 1.68 and 2.78 (VAS) respectively (table -1.) These findings agree with those of Al Taki and Guidoum⁸, who observed similar perceptions in the facial aesthetic appearance between laypersons, dental students, general practitioners, and orthodontists. Findings of the study by Chris D. Johnston *et al* summarized that midline discrepancies of less than 2mm appear to have a less noticeable impact on facial esthetics.⁹ Although many factors are considered while treating malocclusion, the results of their study indicated that discrepancies of 2mm or more had a negative effect on overall facial esthetics.

All the groups were perceptive of deviation of lateral incisor in its long axis type of malocclusion (type 3). The orthodontists (G_1) and general practitioners (G_2) were highly critical of this type of malocclusion with ratings of 1.32 and 1.46 (VAS) respectively. However, the orthodontic patient group (G_3) gave a below-average score (mean 3.52) (VAS) for this malocclusion and there was no statistically significant difference between the groups. These findings were in accordance with findings reported by Betrine *et al*.¹⁰

An ideal smile arc is formed when the lower lip slightly touches the incisal edge without complete coverage. The study by Viga and Brundo *et al*¹¹ in 1978 emphasizes the influence

of curvature of smile arc which primarily depends on the juvenility, stating that the flatter smile arc results in a lesser youthful appearance of the smile. Similar results were obtained when the smile arc was evaluated in the present study. The orthodontist's group (G_1) being trained to identify esthetic parameters was highly perceptive of this type of smile and rated the reverse smile arc (type 4) poorly. The general practitioners gave a below-average score of mean 3.5(VAS). The orthodontic patients were not adequately sensitized to the issue and have given an average score (mean 5.2)(VAS). There was a statistically significant difference between the intergroup and intragroup assessment.

This is also consistent with the findings of previous studies by Saffarpour *et al* who indicated that laypersons did not differentiate between inverse smile arc and normal smile.¹²

In the present study, high scores were given for assessment of gummy smile setting by the general practitioners (G_2) and orthodontic patients (G_3) with a mean score of 6.5 and 7.1 respectively. There was no statistically significant difference between general practitioners (G_2) and orthodontic patients (G_3) in their scoring. This could be explained by the youthful appearance that gingival display provides, as stated by Kokich *et al* in their study.⁷

However, the orthodontists (G_1) were able to perceive the malocclusion and rated the malocclusion accordingly. There was a statistically significant difference between the scores given (mean score 3.1) VAS by this group when compared to general practitioners (G_2) and orthodontic Patients (G_3). This is in accordance with the findings of the studies by Caroline *et al*¹ and Kokich *et al*¹¹ which stated that the maximum of gingival exposure in a smile that is deemed acceptable is 3mm. This finding is concurrent with previous studies by Caroline *et al*.¹⁰ Other studies have found similar results.^{5,6}

There are some potential limitations to this study. In the present study, general practitioners (G_2) and orthodontic patients (G_3) have rated high scores for the gummy smile setting (6 & 7 mean score respectively)(VAS). This could be due to the setting of the gummy smile (type 3) for the study since the vertical dimension of the subject's maxilla could not be altered as the study was designed as seen in previous studies.^{6,7} This resulted in the amount of gingival display to be within the acceptable level of the study population.

CONCLUSION

In this study, the perceptions of orthodontists (G_1), general dentists (G_2), and orthodontic patients (G_3) about different types of malocclusions were evaluated.

The participants of the study population found midline diastema setting (type 1) to be least attractive among the groups inferring that a smile with diastema had a negative influence on the esthetic evaluation of a smile. The midline deviation setting (type 3) was found to be unattractive when the midline shift was more than 3mm. The orthodontists (G_1) and general practitioners (G_2) found deviation of the lateral incisor to be unaesthetic. However, the orthodontic patients group (G_3) found it to be within acceptable levels. The majority of respondents except for the orthodontist group (G_1) found gummy smile setting to be acceptable. This could be explained due to the youthful appearance provided by the gingival display. The normal smile was found to be universally most acceptable and esthetic among the groups.

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