Original Article

Evaluation of influence of altered lower vertical proportions in the perception of facial attractiveness

ABSTRACT

Objective: The study aimed to evaluate the perception of facial attractiveness by the laypersons and the orthodontist using a series of silhouettes of varying lower facial vertical proportion.

Materials and Methods: Sixty-three orthodontists and 63 laypersons judged the attractiveness of the series of seven silhouettes of the single person with the varying anterior lower facial height (LFH). The silhouettes were modified using the Corel software. The participants were asked to record their perception on a visual analog scale of 10 cm length. Independent *t*-test was performed to know the difference between the orthodontists and the laypersons, and the difference between female and male orthodontists and the lay persons.

Results: Significant difference was noticed for different vertical height modifications. The master silhouette followed by the 2 mm decrease in the LFH followed by the 2 mm increase in the LFH was most preferred profiles by both the orthodontists and the laypersons. The modified silhouette with 6 mm increase or decrease was considered to be the most unattractive profile. There existed a significant difference between male and female laypersons for the lower face decreased by 4 mm and 6 mm silhouettes.

Conclusion: The esthetic perception in relation to the vertical height by orthodontist and the laypersons in this particular population is similar, and the preferred profile is with average to the decreased LFH. It is recommended that the orthodontist keeps the LFH preference during the execution of the treatment.

Key words: Facial attractiveness; lay persons; lower vertical proportion; orthodontist; preference.

Introduction

The proportional relationship between the different craniofacial regions is the key to judge the individual attractiveness.[1] Many of the studies impressed the need of the set standards for the facial attractiveness.[2-7]

Nevertheless, the cliché in this assumption is the variation in the facial pattern for different ethnic groups around the world. Thus, the generalization of the ideal measurements of the face is not an acceptable norm.[8]

The concept of beauty is subjective, and it has evolved since from ages, what constituted as beautiful face in the past might not be judged beautiful by the present generation.[9] The requirement of the day is to check the perception of the beauty of the faces by the laypersons and the professionals dealing with the facial attractiveness in their day-to-day life.[3,6,10-12]

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The present study was taken up with the aim to evaluate the perception of facial attractiveness when the lower vertical proportion of face was altered using a series of silhouettes of varying lower facial vertical proportion among the Indian population.

Materials and Methods

In this cross-sectional study, the sample of 123 participants judged the total seven silhouette photographs with varying degree of lower vertical facial proportion. The sample included 63 laypersons and 63 orthodontists. All the professional orthodontists who either worked as a faculty in different dental colleges or were doing the private practice were selected. The laypersons were selected from the Outpatient Department of Orthodontics. For the profile photographs, dental students were evaluated manually for the vertical proportion, and inclusion criteria included a normal occlusion with minor or no crowding, all teeth present except third molars, and competent lips. Individuals who have undergone orthodontic treatment and any prosthetic replacement of teeth were excluded from the study. Individuals who fulfilled the selection criteria were informed about the purpose of the study, and a written inform consent was obtained for utilizing their cephalogram for the study. The ethical clearance was taken from the Institutional Ethical Committee.

The procured lateral cephalograms were traced, and the different soft and hard tissue measurements were made [Table 1]. The cephalogram which fell under the normal cephalometric reading was chosen for the study.

The selected cephalogram was converted into a profile silhouette using Corel software. This was considered as the master silhouette [Figure 1]. The same was calibrated and was subjected to manipulation. The master silhouette was manipulated as per the recommendation of the previous study,[13] keeping SN and ME' as reference points. The lower vertical proportions were reduced and increased by 2, 4, and 6 mm which generated a total of seven profile silhouettes [Figure 2]. These seven profile silhouettes were coded as 1–7 in sequence which only the principal investigator knew.

The profile silhouettes were randomly arranged on a Microsoft PowerPoint which were shown to a group of laypersons and the orthodontists. Each slide was displayed for a span of 20 s. They were asked to record their perception on a visual analog scale of 10 cm length with 1 cm denoting as least attractive and 10 cm as most attractive score. After recording the perception score, the data were subjected to statistical analysis. Independent *t*-test and paired *t*-test were used to determine the difference between the scores of various profile silhouette photographs and difference of perception among laypersons and orthodontists, respectively. The *P* value equal or less than 0.001 was considered as statistically significant. For the gender-wise difference the *P* value equal to or less than 0.05 was considered as statistically significant.

Table 1: Frequency distribution of gender among laypersons and orthodontists

	Groups		Total (%)	*P*
	Laypersons (%)	Orthodontist (%)		
Sex				
Male	33 (52.4)	35 (55.6)	68 (54.0)	0.721
Female	30 (47.6)	28 (44.4)	58 (46.0)	
Total	63 (100.0)	63 (100.0)	126 (100.0)	

P>0.001

Results

Table 1 shows the characteristics of the study population. Overall of 54% were males and 46% were females. Among laypersons and orthodontists, males were more in comparison to females who judged the profile silhouette. However, there was no significant difference observed for the gender distribution in both the laypersons and orthodontists group.

Comparison for the different modified profiles by the orthodontist is depicted in Table 2. There existed a significant difference for all the pairs of silhouettes except for the pair 2, pair 3, and pair 4.

Table 3 represents the data of comparison of different silhouette pairs by the laypersons. There was a significant difference for all the pairs except for the pair 2 where the

Figure 1: Master silhouettes

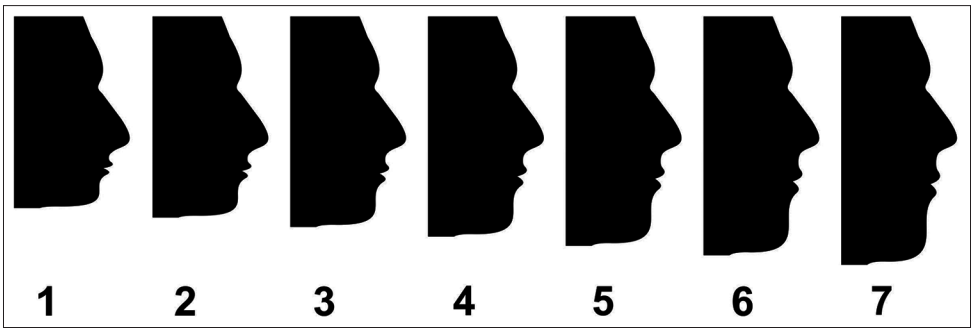

Figure 2: Various silhouette profiles by increasing or decreasing lower facial height

Table 2: Comparison of various profile silhouettes by orthodontists

	Paired differences					*t*	Df	*P*
	Mean	SD	SEM	95% CI of the difference				
				Lower	Upper			
Pair 1								
Decreased 6 mm-increased 2 mm	−1.36508	1.72553	0.21740	−1.79965	−0.93051	−6.279	62	0.000*
Pair 2								
Decreased 6 mm-increased 4 mm	−0.22222	1.54966	0.19524	−0.61250	0.16805	−1.138	62	0.259
Pair 3								
Decreased 6 mm-increased 6 mm	0.44444	1.83846	0.23162	−0.01857	0.90745	1.919	62	0.060
Pair 4								
Decreased 4 mm-increased 2 mm	−0.14286	1.80373	0.22725	−0.59712	0.31141	−0.629	62	0.532
Pair 5								
Decreased 4 mm-increased 4 mm	1.00000	1.94273	0.24476	0.51073	1.48927	4.086	62	0.000*
Pair 6								
Decreased 4 mm-increased 6 mm	1.66667	2.17018	0.27342	1.12011	2.21322	6.096	62	0.000*
Pair 7								
Decreased 2 mm-increased 2 mm	0.65079	1.60803	0.20259	0.24582	1.05577	3.212	62	0.002
Pair 8								
Decreased 2 mm-increased 4 mm	1.79365	2.05692	0.25915	1.27562	2.31168	6.921	62	0.000*
Pair 9								
Decreased 2 mm-increased 6 mm	2.46032	2.03062	0.25583	1.94891	2.97172	9.617	62	0.000*

*P>0.001. SD: Standard deviation, SEM: Standard error of mean, CI: Confidence interval

comparison was for the anterior lower facial height (ALFH) decreased by 6 mm with the ALFH increased by 4 mm, and pair 4 where the comparison was between the ALFH increased by 4 mm with ALFH decreased by 2 mm.

Comparative data for the judgment between orthodontists and the laypersons are depicted in Table 4. Statistically significant difference was noted for the normal profile, where normal profile was preferred more by the layperson than the orthodontist.

The difference between male and female judgment for the different modifications of the profile is shown in Tables 5 and 6. There existed no significant difference in judgment between male and female orthodontists. However, there existed a significant difference between male and female laypersons for the lower face decreased by 4 mm and 6 mm silhouettes when the *P* value was set for $P = 0.05$.

Discussion

The facial attractiveness is subjective, and setting a particular norm is a difficult task.[5] However, the attempts have been made by various researchers to establish the norms for a normal facial form for the various groups of individuals with clinically normal or acceptable occlusions and good facial appearance.[14] The efforts of earlier investigators were in vain owing to the ethnic and racial factor involvement. Instead of setting the norm for the particular class, it's better to give an ideal proportion, which can be followed in any of the ethnic group. Moreover, the earlier literature also backs the use of proportional analysis as it removes the variation associated with the linear measurements.[5]

Table 3: Comparison of various profile silhouettes by laypersons

	Paired differences					*t*	df	*P*
	Mean	SD	SEM	95% CI of the difference				
				Lower	Upper			
Pair 1								
Decreased 6 mm-increased 2 mm	−1.22222	1.70809	0.21520	−1.65240	−0.79205	−5.680	62	0.000*
Pair 2								
Decreased 6 mm-increased 4 mm	−0.12698	1.67035	0.21044	−0.54766	0.29369	−0.603	62	0.548
Pair 3								
Decreased 6 mm-increased 6 mm	0.57143	1.84666	0.23266	0.10635	1.03650	2.456	62	0.017
Pair 4								
Decreased 4 mm-increased 2 mm	−0.33333	1.65588	0.20862	−0.75036	0.08369	−1.598	62	0.115
Pair 5								
Decreased 4 mm-increased 4 mm	0.76190	1.75714	0.22138	0.31937	1.20444	3.442	62	0.001*
Pair 6								
Decreased 4 mm-increased 6 mm	1.46032	1.98239	0.24976	0.96106	1.95957	5.847	62	0.000*
Pair 7								
Decreased 2 mm-increased 2 mm	0.61905	1.47483	0.18581	0.24762	0.99048	3.332	62	0.001*
Pair 8								
Decreased 2 mm - increased 4 mm	1.71429	1.68894	0.21279	1.28893	2.13964	8.056	62	0.000*
Pair 9								
Decreased 2 mm - increased 6 mm	2.41270	1.80175	0.22700	1.95893	2.86646	10.629	62	0.000*

*$P \geq 0.001$. SD: Standard deviation, SEM: Standard error of mean, CI: Confidence interval

Table 4: Comparison of judgment of profile silhouettes by orthodontists and the laypersons

Silhouette	Group	*n*	Mean	SD	*P*
Decreased 6 mm	Expert (Orthodontists)	63	4.5079	1.34252	0.499
	Respondents (laypersons)	63	4.6667	1.28264	
Decreased 4 mm	Expert (orthodontists)	63	5.7302	1.47239	0.491
	Respondents (laypersons)	63	5.5556	1.36521	
Decreased 2 mm	Expert (orthodontists)	63	6.5238	1.41258	0.946
	Respondents (laypersons)	63	6.5079	1.18965	
Normal	Expert (orthodontists)	63	6.7778	1.59074	0.006
	Respondents (laypersons)	63	7.4603	1.13344	
Increased 2 mm	Expert (orthodontists)	63	5.8730	1.22464	0.941
	Respondents (laypersons)	63	5.8889	1.16551	
Increased 4 mm	Expert (orthodontists)	63	4.7302	1.38198	0.793
	Respondents (laypersons)	63	4.7937	1.33391	
Increased 6 mm	Expert (orthodontists)	63	4.0635	1.54370	0.905
	Respondents (laypersons)	63	4.0952	1.43363	

SD: Standard deviation

This present study aimed to set the acceptability of the different lower anterior facial height modifications by the laypersons and the orthodontists. The modified profile silhouettes were judged using visual analog scale (VAS). VAS was chosen as the tool for judgment as it is more precise, rapid, easy, and readily accepted tool for scoring the attractiveness.[15] As it is acknowledged in the earlier studies, the colored or the normal facial photographs can have a profound influence on the genuine judgmental abilities; the current study utilized the black and white facial silhouettes so as to eliminate the bias.[13,16-18]

Both orthodontists and laypersons chose the most favored profile as normal profile having a well-proportioned vertical proportion of face. Our observations were in accordance with observations made in earlier literature conducted in Western countries, where the straight facial profile with average lower facial vertical proportion was rated as to be most attractive.[12]

It was observed that normal vertical height followed by decreased by 2 mm profile silhouette photograph was recognized as the most attractive profile by most of the orthodontists and the laypersons. However, the normal profile silhouette was given a greater grade on the VAS scale by laypersons than the orthodontists, and the difference was statistically significant. While the silhouette, where the vertical proportion was increased by 6 mm followed by decreased by 4 mm was considered as the most unattractive

Table 5: Gender-wise comparison of judgment of profile silhouettes by orthodontists

Silhouette	Sex	*n*	Mean	SD	*P*
Decreased 6 mm	Male	35	4.3429	1.41302	0.279
	Female	28	4.7143	1.24297	
Decreased 4 mm	Male	35	5.5714	1.53940	0.343
	Female	28	5.9286	1.38587	
Decreased 2 mm	Male	35	6.3143	1.47072	0.190
	Female	28	6.7857	1.31535	
Normal	Male	35	6.7429	1.59674	0.847
	Female	28	6.8214	1.61138	
Increased 2 mm	Male	35	5.7429	1.33599	0.350
	Female	28	6.0357	1.07090	
Increased 4 mm	Male	35	4.7714	1.47699	0.793
	Female	28	4.6786	1.27812	
Increased 6 mm	Male	35	4.1714	1.74028	0.539
	Female	28	3.9286	1.27450	

SD: Standard deviation

Table 6: Gender-wise comparison of judgment of various profile silhouettes by Laypersons

Silhouette	Sex	*n*	Mean	SD	*P*
Decreased 6 mm	Male	33	4.3636	1.19421	0.048*
	Female	30	5.0000	1.31306	
Decreased 4 mm	Male	33	5.2121	1.29319	0.035*
	Female	30	5.9333	1.36289	
Decreased 2 mm	Male	33	6.3030	1.21153	0.153
	Female	30	6.7333	1.14269	
Normal	Male	33	7.4242	0.96922	0.793
	Female	30	7.5000	1.30648	
Increased 2 mm	Male	33	5.9697	1.01504	0.568
	Female	30	5.8000	1.32353	
Increased 4 mm	Male	33	4.6667	1.38444	0.433
	Female	30	4.9333	1.28475	
Increased 6 mm	Male	33	4.1515	1.43878	0.747
	Female	30	4.0333	1.44993	

*P=0.05. SD: Standard deviation

profile by orthodontists. Even the laypersons judged the silhouette with increased vertical proportion by 6 mm as unattractive, but the second most unattractive profile according to their judgment was the modification involving 6 mm decrease in the vertical facial proportion. Nevertheless, the difference was not statistically significant.

Similar findings were also reported in the earlier study involving the photographs of the Caucasian male and female dental students, where the trend toward the increase in the ALFH was judged to be less attractive for the females, and in the males, the opposite was true. The clinician showed no particular trend in judging the ALFH.[11] However, the present study utilized the silhouettes of males only.

Concurrent findings were also reported for the frontal image attractiveness with modified lower anterior facial height, and it was also noted that the 75% of the laypersons wished to have the treatment for ±4 mm change in the ALFH.[18] On the other hand, it is reported that there existed no difference whether the LFH was decreased or increased.[19]

Contrastingly, in a study on the Turkish population, it was noted that the orthodontist judges the adult photographs with increased lower anterior facial height to be more attractive. Moreover, the increase in the mandibular plane angle in these adults was statistically significant.[20]

In one of the studies, profile changes mimicking the orthognathic surgeries were judged by the orthodontists and the laypersons. Interestingly, both orthodontists and the laypersons were less sensitive to the changes in the vertical maxillary position.[21] Unlike the present study, both the orthodontist and the laypersons were equally sensitive to the lower anterior facial changes.

The pairwise comparison of the different profile images showed no significant difference between the different modified images for the laypersons. Contrasting findings were reported in the earlier study of similar nature. The earlier study also explored the preference of treatment for such modified profiles by the laypersons and profile with reduced LFH were significantly less likely to be judged as needing treatment than their counterparts with increased LFH.[5] Even the surgical correction of the chin height was most likely sought in cases where the lower anterior facial height was >50%.[22]

The sexual dimorphism for the profile alteration was not statically significant in case of orthodontist group; however, in the laypersons group, the profile alteration by 6 mm and 4 mm decrease in the vertical height showed statistically significant difference between the male and female, with female laypersons preferring these profiles more than the male laypersons. Nevertheless, the previous literature lacks such kind of evidence.[5,6,23]

In the present investigation, the age-wise comparison of the judges for the modified image was not performed, but in the previous study, it was noted that the age of the judge also played a role in the preference of the ALFH, with the more casual attitude of the older judges toward the critical evaluation of the modified ALFH.[23]

Conclusion

- Both the orthodontists and the laypersons considered the normal ALFH was most attractive
- The increased ALEH was considered least attractive by both the laypersons and the orthodontists

- There was a significant difference between female and male laypersons in judging the ALFH.

The results of the present study will help the clinician to consider the patient preference of the facial profiles in the vertical dimension and to plan the treatment accordingly.

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Conflicts of interest
There are no conflicts of interest.

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