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# Preference of lip profile in varying mandibular sagittal Position

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**Abstract:**

Aim: The purpose of this study was to determine the preference of different mandibular sagittal position on the preferred lip position in profile. Materials and methods : Five androgynous silhouette profiles differing in mandibular retrognathism and prognathism ($-25^0$, $-18^0$, $-11^0$, $-4^0$ and $+3^0$ Facial convexity angles) were created. The lips were positioned at -4mm, -2mm, 0mm, +2mm and +4mm relative to Ricketts E-plane. Evaluators included 25 Orthodontists, 25 Plastic Surgeons, 25 General dentists and 25 Patients of Indian origin. Results: A mixed-model repeated-measure ANOVA showed: Effects of individual evaluators, 5 mandibular position and interaction of both have statistically significant effect of lip position preference. Sex factor and its interaction with trials of mandibular position were not significant. Repeated Measures showed that the 5 mandibular positions are differently significant from each other. There is no difference between lip profile preference of male and female facial profile. Conclusion: There are significant differences of preferred lip position with varying mandibular positions, there are significant differences in lip profile preferences among evaluators and there is no significant difference of lip profile preference of male and female facial profiles.

Keywords: Orthodontics, Lips, Profile, Preference

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**Introduction:**

Facial form may be abstracted into two planes of space- frontal and sagittal. The mid-sagittal plane produces an outline which commonly is referred to as the profile. Mainly the studies emphasize on integumental profile not because the frontal plane is unimportant, but because many dentofacial malformation as well as therapy changes are more evident on this plane of space.[1]

Dental professionals should understand which facial aspects are considered attractive by patients. Treatment planning should be based on the clinical evaluation of esthetics, function and stability as well as on what actually disturbs the patient.

The concept of facial esthetics is bound in many aspects on subjective judgement. Facial attractiveness might be related to several factors: ethnic group, age, sex, region and professional background.[2]

People, in general, have a fairly definite opinion on how different parts of the face should look in order to give a harmonious unity.[3] It is important to consider the perception of non orthodontists in determining the most pleasant profile because the goals of orthodontic treatment are not only to achieve a functional occlusion, but also to create an esthetic profile.[4] It may be remarked that lateral headfilms which form a 2-D image represent only a limited aspect of facial beauty.[3] Similarly photographs can influence the individual concept of beauty by extrinsic (hair style, make up) and intrinsic(skin complexion, emotional expression)factors.[5] Thus several studies have considered the facial silhouettes for rating profile rather than facial photographs to avoid subjective considerations.

Edward H Angle considered the mouth as a most potent factor in marring the character of the face, with the form and beauty of the mouth depending on the occlusal relation of the teeth. His chief concern was finding or establishing a harmonious relationship between the mouth and the other features[6]. With increasing internationalization, it is easily conceivable that the future orthodontic community will consist of orthodontists, patients, and their significant others of different races or ethnicities in many countries of the world.[7]

Historically, orthodontists have focussed on horizontal lip position as an important feature in determining beauty. [8] In man, the lower face not only serves in the interest of digestion, speech and respiration but it also influences to a larger extent the social appearance and psychological well-being of the individual.[1] Therefore the appearance of the lips that occupy largely the lower one third of the face is of primary importance to the face.

**Aims and objectives:**

1. To evaluate lip fullness preferences with the change in mandibular sagittal positioning's.
2. To understand the lip fullness preferences among Orthodontists, Plastic Surgeons, General Dentists and Patients.
3. To evaluate lip profile preferences between males and females.

**Materials and Methods:**

The Cephalometric soft tissue profile of a male patient was traced (Fig 1). The Cephalogram displayed a Class I skeletal and dental pattern with vertical and sagittal measurements within the range of normal. Following the recommendations of Foster [9] and Czarnecki [10], the profile was changed to a black androgynous silhouette by tracing the profile and cutting it out of black paper and scanning the profile on a computer to reduce the influence of any distracting or sex-defining features (Fig 2). As in Czarnecki's study all vertical relationships were unaltered in order to evaluate only the sagittal aspects of the profile.

To create a range of sagittal mandibular positions representative of what might be encountered in clinical practice, the area from subnasale to soft tissue B point was erased (Fig 3),and the mandibular portion of the silhouette from soft tissue B point to soft tissue menton was cut out. To establish a middle "normal"

mandibular position, the mandibular cut-out was positioned sagittally to create a Facial convexity angle (G-Sn-Pg) of -11°. From this point, the mandible was moved horizontally differing in 7° to create a series of profiles with Facial convexity angles of -25°, -18°, -4°, and +3°, representing moderate and severe Class II profiles, and moderate and severe Class III profiles respectively.

Using Ricketts' E-plane as reference, upper and lower lips were drawn for each profile at -4mm, -2mm, 0mm, +2 mm and +4mm from Ricketts' E-plane. The images for each profile were scanned and prepared on a computer using Adobe Photoshop©. The upper and lower lips were positioned together from the most retruded to the most protruded positions. A hard copy was generated for the evaluators to give their opinion. Evaluators were of Indian origin which included: 25 Orthodontists, 25 Plastic Surgeons, 25 General Dentists and 25 Patients.

The profiles were presented individually in two sets to the evaluators. The first set of profiles was of a female and the second set was that of a male. The profiles were arranged from severe Class II to severe Class III based on Facial convexity angle ($-25^0$, $-18^0$, $-11^0$, $-4^0$ and $+3^0$ ) on five successive pages. With each facial profile, five varying lip fullness profiles were created based on Ricketts' E-plane (-4mm, -2mm, 0mm, +2mm and +4mm) on a single page, thereby, creating 25 female and 25 male profiles for the evaluators. Each evaluator had to visualize the profiles and select one profile from each page which he/she felt was the most pleasing appearance.

To evaluate the examiner reliability, evaluators from each group, i.e. Orthodontists, Plastic Surgeons, General Dentists and Patients were again assigned to re-evaluate for the preferred profile.

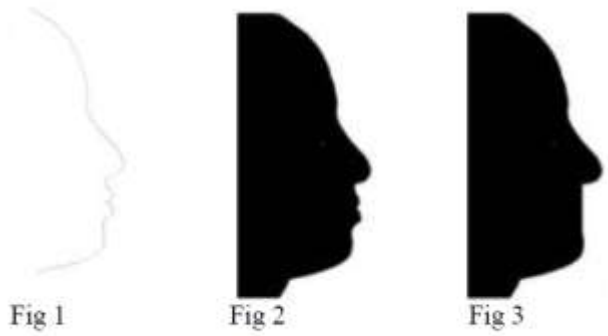


Fig 1 Fig 2 Fig 3

**Statistical Analysis:**

A mixed-model repeated-measures ANOVA was used to determine differences in lip fullness preferences with changes in mandibular position among various groups.

Between-subject factors considered are

A. Evaluator group – Orthodontists, Plastic Surgeons, General Dentists and Patients
B. Evaluators lip preference for males and females.

Interactions considered were between evaluator group, mandibular position and gender preference. The Tukey HSD test was used to determine differences between the 5 profiles with lip positions. A significance threshold of $P<.05$ (5% Level of significance) as well as $P<.01$ (1% Level of significance) was used for all analysis. Repeated-measures ANOVA were used to check the examiner reliability. Frequency study was done to know the evaluator preference for various factors (mandibular positions, lip fullness and gender).

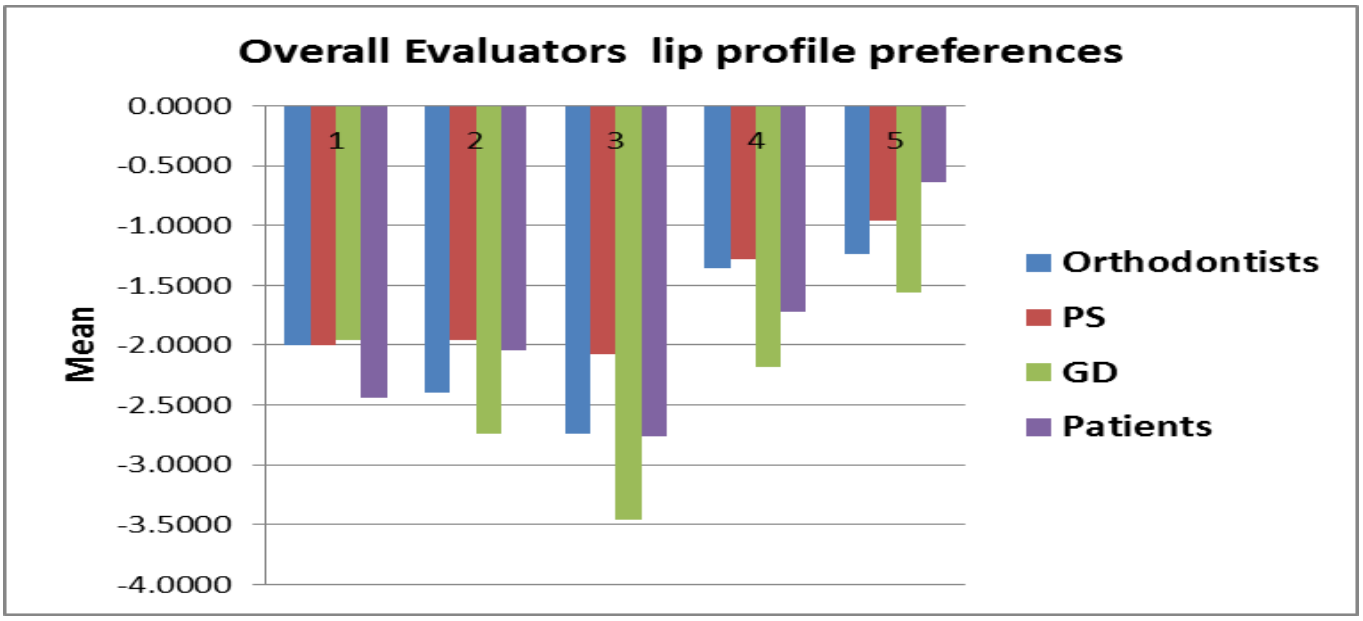
**Results:**

The results of means of the lip profiles preferences among various groups are given in the Table. I and Graph I

**Table I. Means of Lip profile with different factors**

| Facial Angle | Orthodontists | | Plastic Surgeons | | General Dentists | | Patients | | Over All | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Male | Female | Male | Female | Male | Female | Male | Female | Male | Female |
| $-25^0$ | -1.9200 | -2.0800 | -1.9200 | -2.0800 | -2.0800 | -1.8400 | -2.4800 | -2.400 | -2.1000 | -2.1000 |
| $-18^0$ | -2.2400 | -2.5600 | -1.8400 | -2.0800 | -2.6800 | -2.8000 | -2.2400 | -1.840 | -2.2500 | -2.3200 |
| $-11^0$ | -2.8000 | -2.6800 | -2.2400 | -1.9200 | -3.4000 | -3.5200 | -2.8800 | -2.640 | -2.8300 | -2.6900 |
| $-4^0$ | -1.6000 | -1.1200 | -1.6800 | -0.8800 | -1.8000 | -2.5600 | -1.7600 | -1.680 | -1.7100 | -1.5600 |
| $+3^0$ | -1.5200 | -0.9600 | -1.4400 | -0.4800 | -1.7600 | -1.3600 | -0.0800 | -1.200 | -1.2000 | -1.0000 |

**Graph 1*:* Overall evaluators selection for lip profiles in 5 trials**

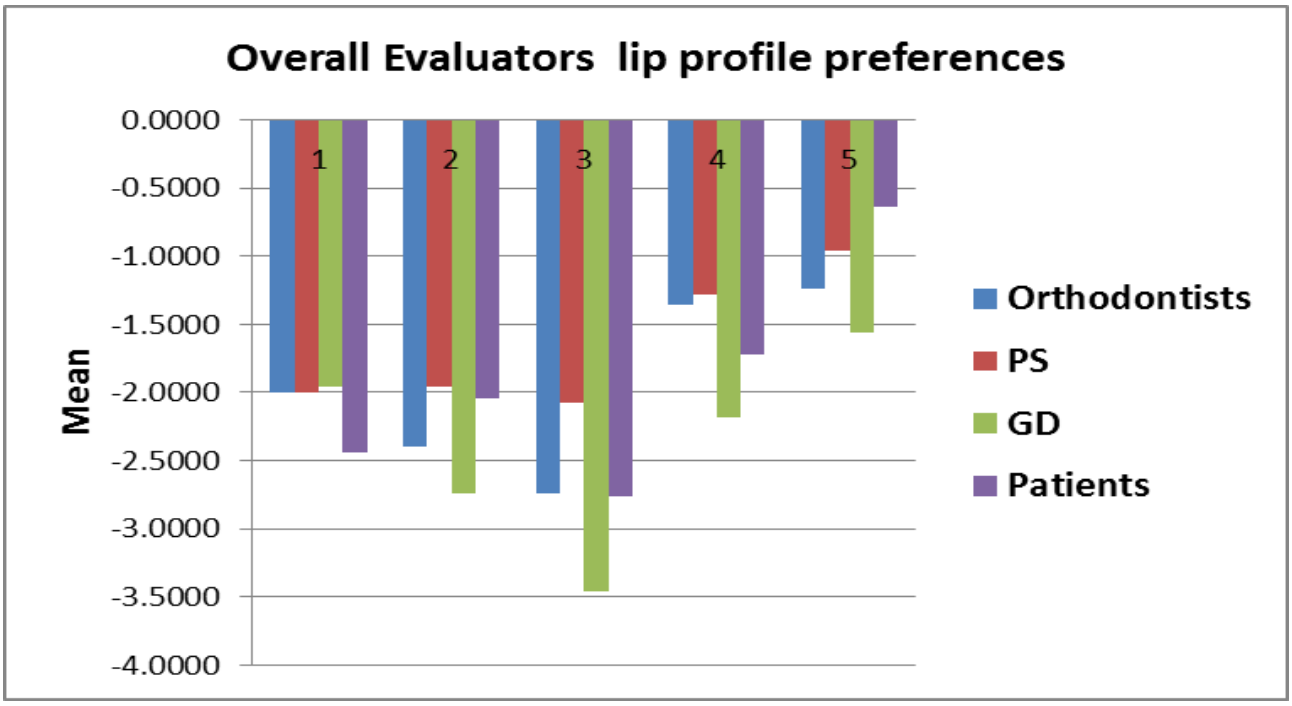



A Repeated measures ANOVA showed that sex factor and its interaction with trials of mandibular positions was not significant (P>.5). Table II

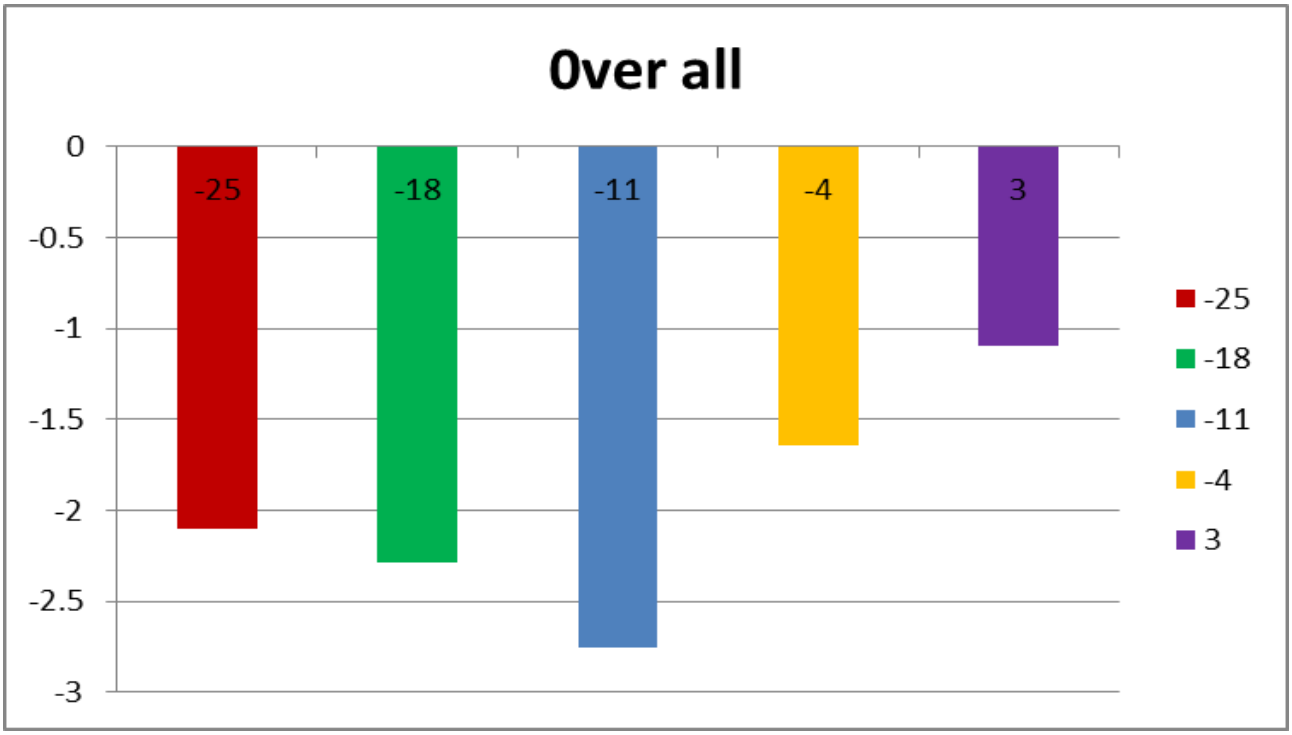
**Table II. Males and Females Mean output for different mandibular positions**

| SEX | $-25^0$ | $-18^0$ | $-11^0$ | $-4^0$ | $+3^0$ |
|---|---|---|---|---|---|
| Female | -2.1000 | -2.3200 | -2.6900 | -1.5600 | -1.0000 |
| Male | -2.1000 | -2.2500 | -2.8300 | -1.7100 | -1.2000 |

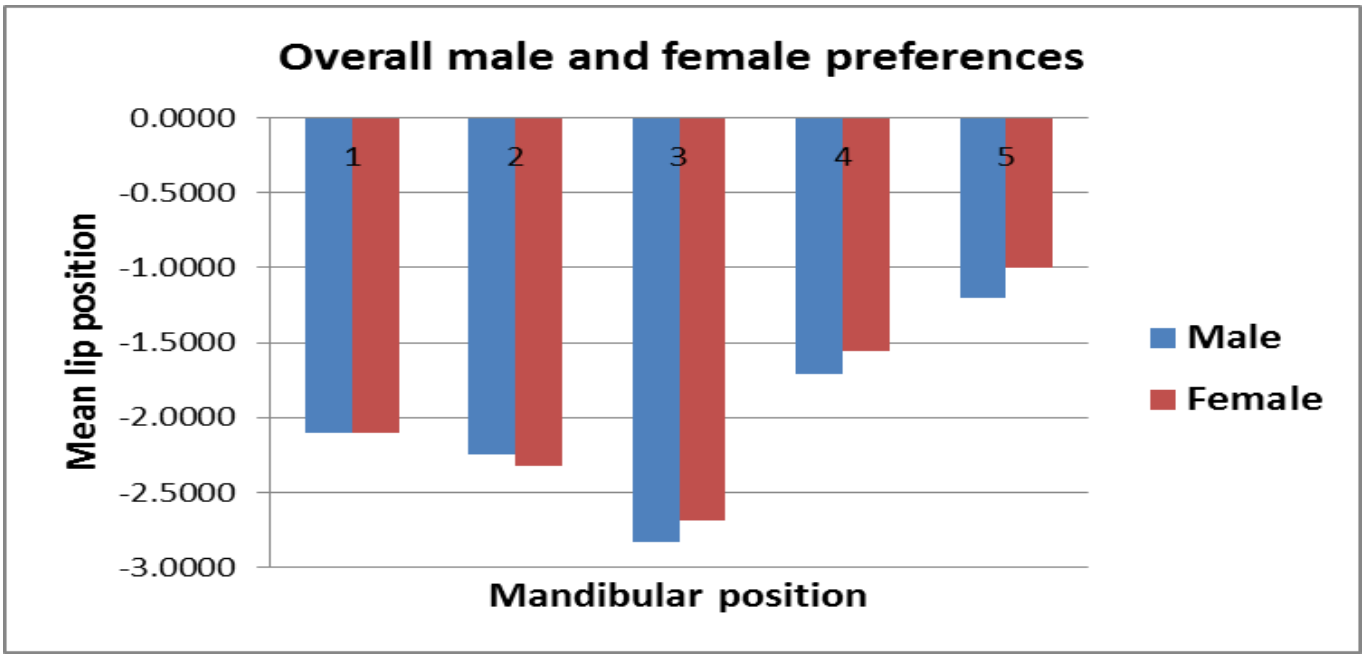
**Graph 2. Overall evaluator's selection for lip profiles in 5 mandibular positions**




**Graph 3. Overall lip preferences with varying mandibular positions (in degrees)**

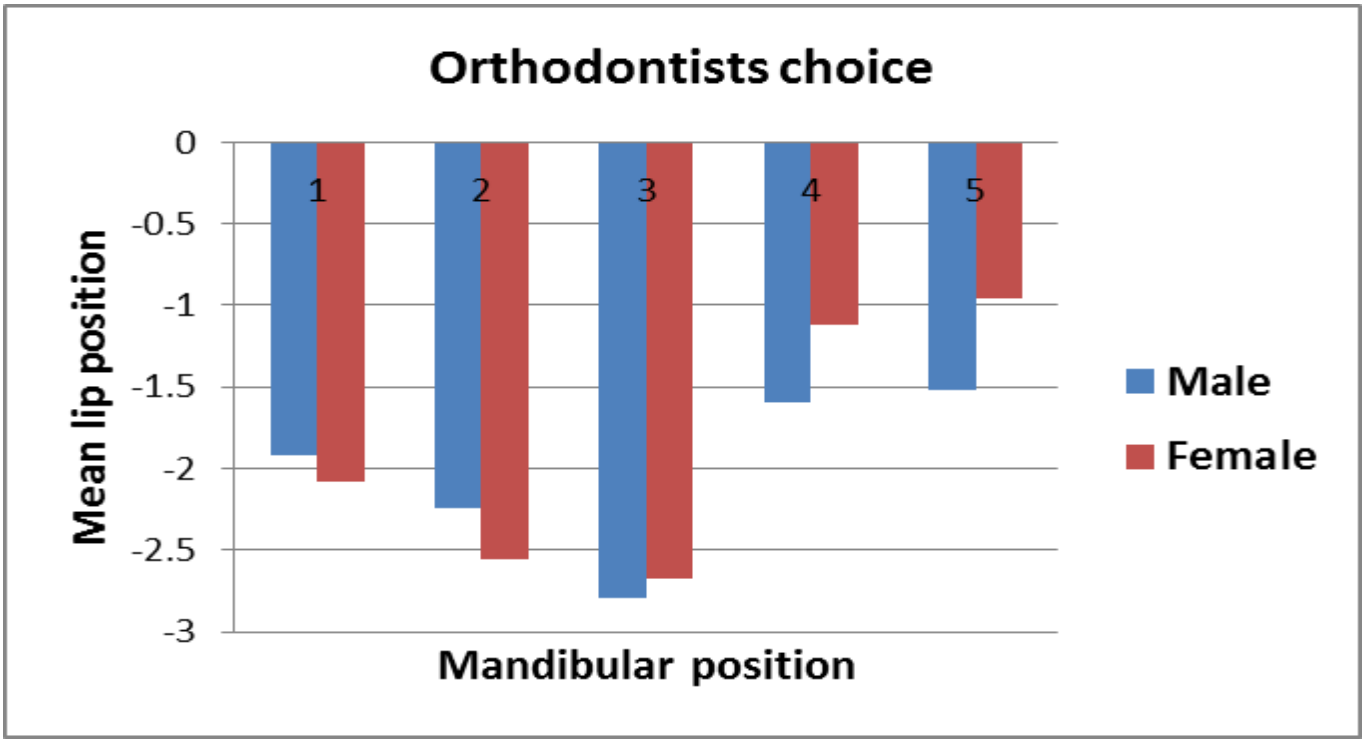


**Graph IV. Overall Female and Male lip preference**

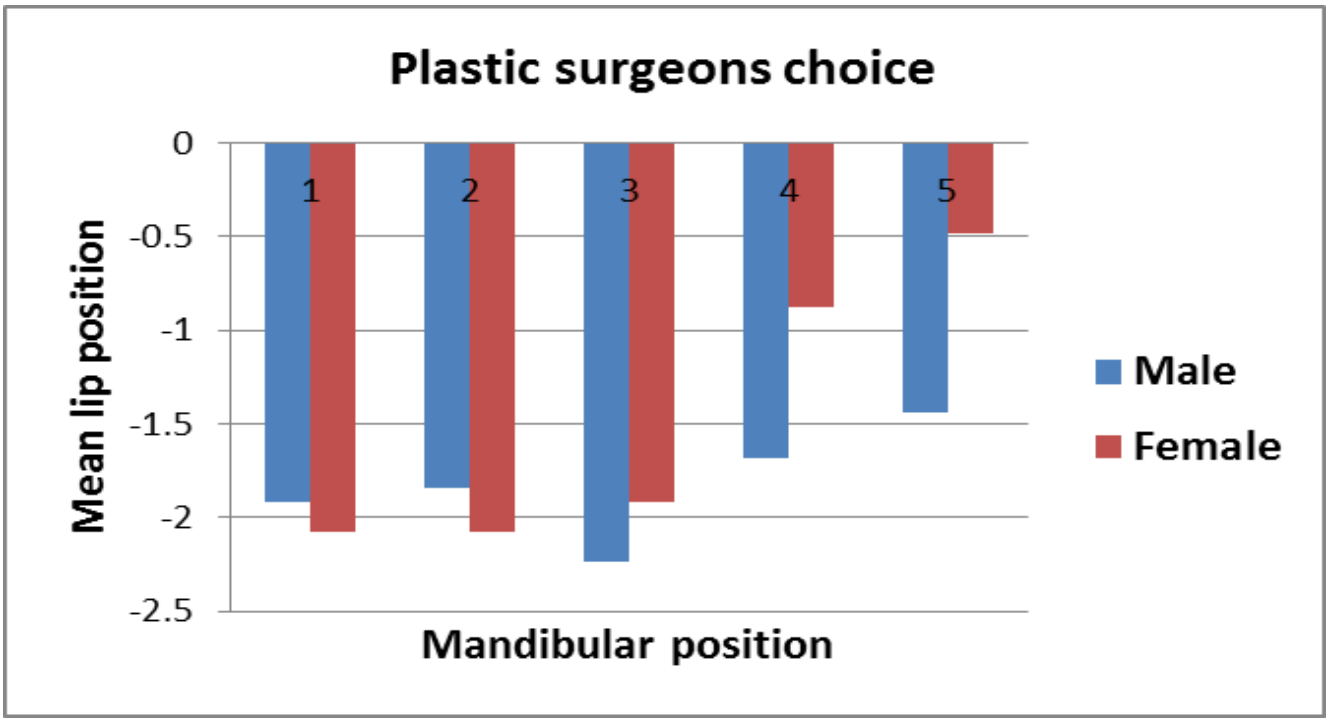



Comparison of lip preferences at various mandibular positions for each evaluator group is given in Graph V, VI VII and VIII.

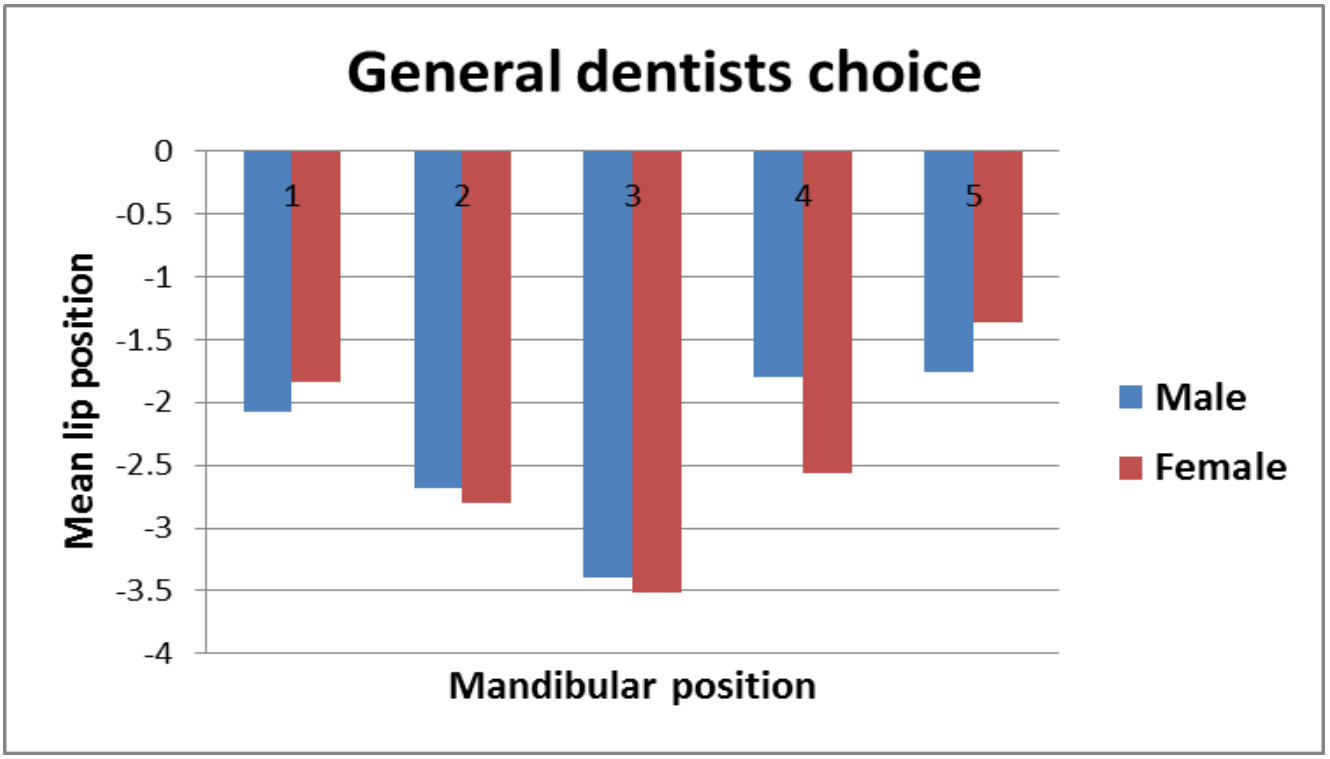
**Graph V. Orthodontist preferred mean lip position for different mandibular sagittal position**



**Graph VI. Plastic Surgeons preferred mean lip position for different mandibular sagittal position**




**Graph VII. General Dentists preferred mean lip position for different mandibular sagittal position**



**Graph VIII. Patients preferred mean lip position for different mandibular sagittal position**

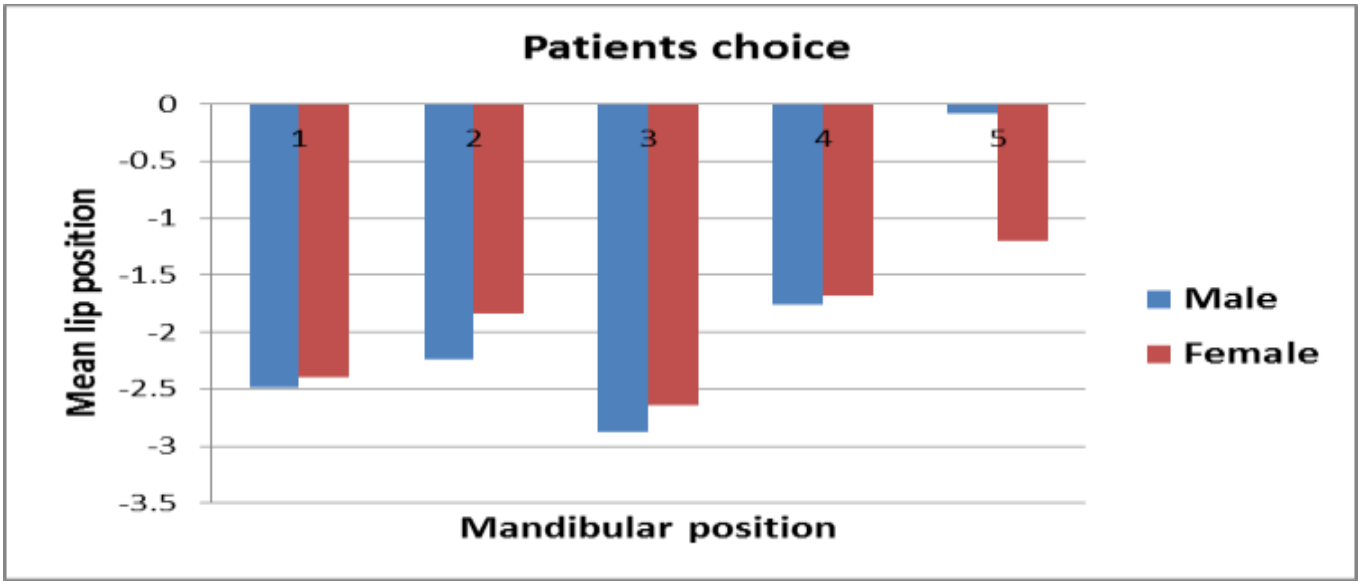



**Fig 4. Preferred lip position for females and males with respective mandibular positions**

| Mandiular positions | $-25^0$ | $-18^0$ | $-11^0$ | $-4^0$ | $+3^0$ |
|---|---|---|---|---|---|
| females |  -2mm lip position |  -2mm lip position |  -4mm lip position |  0mm lip position |  -2mm lip Position |
| males |  -2mm lip position |  -2mm lip position |  -4mm lip position |  -2mm lip position |  -2mm lip position |

**Results:**

1. As a whole involvement of factors effect, i.e, 4 group of evaluators, 5 mandibular positions and their interactions have statistically significant effect on lip position preference.
2. Preference of profile for males and females and its interaction with different mandibular position was not significant. Retrusive lips were preferred in all the mandibular positions. The evaluators preferred fuller lips compared to average profile when there was change in facial convexity and concavity.
3. The preferred lips for various mandibular positions were significantly different. In case of females at $-25^0$, $-18^0$, $-11^0$, $-4^0$ and $+3^0$, the preferred lip positions were -2mm, -2mm, -4mm, 0mm, and -2mm respectively. Similarly in case of males at $-25^0$, $-18^0$, $-11^0$, $-4^0$ and $+3^0$, the preferred lip positions were -2mm, -2mm, -4mm, -2mm and -2mm respectively.

**Discussion:**

Orthodontists encounter a wide range of mandibular positions in the patient population. Moderate to extreme retrognathic and prognathic mandibular positions are often found, treatment decisions must be made to maximize the esthetic and functional benefits to each patient. In cases where surgical intervention is not a viable option, compromises in the orthodontic treatment plan must be considered. Positioning of the lips is one of the most important factor affecting overall facial balances in attempts to maximize facial esthetics, especially when jaw position cannot be altered.[11]

Lip preferences vary with ethnic groups, skeletal morphology and with gender. Hence orthodontists have to be realistic in understanding the desired lip preferences for their population. As the ethnic preferences vary among populations, many studies have shown significant differences between black and white subjects regarding adipose tissue distribution and amount, skin thickness and flexibility; muscle density and weight. Studies have shown that black have greater incisal inclination and a more protrusive soft tissue profile. A protrusive profile is more readily accepted in black population, as evidenced by profile and aesthetic line comparisons. [12] Previous studies by Coleman et al [11] has been done to determine the influence of chin prominence on preferred lip position in profile for white population but such results cannot be extrapolated to people of other ethnic origin.

In this study, evaluators of Indian origin have been taken to evaluate for lip profile preference for different mandibular sagittal positions. The influence of lip positions on varying mandibular sagittal position was specifically investigated. Black Androgynous silhouette profiles differing only in degree of mandibular retro- or prognathism are to be created and upper and lower lips together are positioned to Ricketts'-E plane. Androgynous silhouettes for evaluation of profiles have been advocated by previous authors [9,10] because this eliminates other possible esthetic variables such as hair, complexion, and eyes.

*Overall lip preferences*

In this study, there was significant difference seen in the average lip positions for different mandibular positions. Overall preferred lip position was retrusive to Ricketts' E-plane. Profiles representing average lip positions of -2 mm were the most preferred by the evaluators followed by -4mm, 0mm, +2mm and the least preferred was +4mm relative to E plane.

Ioi H et al [13] found for Japanese profiles that both Orthodontists and dental students rated the most-favored Japanese profiles as slightly more retruded than the average for both male and female. In their study Orthodontists preferred -1mm of lip retrusion for males and -2mm of lip retrusion for females. The dental students regarded as -2mm of lip retrusion as

best profile for males and -4mm of lip retrusion for females.

*Groups*

There were significant differences in the lip position preferences among the Orthodontists, Plastic Surgeons, General Dentists and the Patients, unlike the study by Cox and Van der Linden[14] and Coleman[11] where there was a significant relationship between Orthodontists and the Patients. In this study Plastic Surgeons preferred a more protrusive lip position compared to the other group of evaluators with a mean protrusion of -1.66 mm and this was also statistically significant with other group of evaluators. General Dentists preferred a statistically significant retrusive lips with a mean of approximately -2.4mm.

*Differences among Profiles with Varying Mandibular Positions*

The lip position gave significant difference between the various mandibular positions. The average preferred position did not differ between the -25° (Severe Class II) and -18° (Moderate Class II) profiles. Comparatively, fuller lips were preferred for Class II and Class III profile when compared with Class I. Also fuller lips were preferred in severe Class III than moderate Class III. But fuller lips were preferred in moderate Class II than severe Class II. A possible explanation for this trend is that evaluators were attempting to compensate for or distract from larger skeletal discrepancies in the profiles by making the lips more full. This is supported by study of Coleman et al.[11]

Since there is a balance between the lips, nose, and chin relationships, it is extremely important for those clinicians who treat malocclusions to observe the favored variations. For example, with a relatively larger chin, a more protrusive dentition and fuller lips are admissible for harmonizing the face.[10]

*Differences between Male and Female Profiles*

There was no significant difference between the male and female lip fullness. Fuller lips were preferred for females except at mandibular position of $+3^0$. This data is supported by Czarnecki's study.[10]

*Examiner Reliability*

The examiner reliability of the evaluators from each group (Orthodontists, Plastic Surgeons, General Dentists and Patients) and the differences in all the 5 mandibular positions ($-25^0$, $-18^0$, $-11^0$, $-4^0$ and $+3^0$) were analyzed. There was no significant difference. It was seen that most of the variations occurred among Orthodontists who preferred more retrusive lip positions and Plastic Surgeons preferring more protrusive lip positions.

**Conclusion:**

This study concluded that

1. There are significant differences of preferred lip position with varying mandibular positions.
2. There are significant differences in lip profile preferences among evaluators.
3. There is no significant difference of lip profile preference of male and female facial profiles.

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