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Effect of change in Mesiodistal Angulation of the Maxillary Central Incisors on mean attractiveness score of the Smile in Frontal view in local Population

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Abstract

Introduction: This study explored how changing the mesio-distal inclination of the maxillary central incisors influence the perceived smile attractiveness, as assessed by orthodontic residents and laypersons .

Methodology: Four Smile simulations based upon mesio-distal inclination were created at (-4^o), ($+4^o$ and $+8^o$) and control image (0^o). 102 orthodontists/orthodontic residents and 102 laypersons assessed these images by rating them from 0–100 attractiveness scale (0 = very unattractive; 100 = very attractive). Photographs were printed and distributed with questionnaires for evaluation.

Results: Attractiveness scores declined progressively with greater mesiodistal inclination. No statistically significant differences were found between orthodontists, trainees, and laypersons. Lay participants were less likely to detect subtle changes, while orthodontic trainees demonstrated higher accuracy, particularly with lower facial third views compared to full-face views.

Conclusions: Alterations in mesiodistal angulation of maxillary central incisors did not significantly influence smile attractiveness perception across genders or between professional and non-professional evaluators ($p > 0.05$).

Keywords: Attractiveness perception, Mesiodistal angulation, Maxillary central incisors, Smile aesthetics.

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Introduction

Smiling is among the most universal facial expressions, often conveying warmth, agreement, and social acceptance.[1] Enhancing smile esthetics is a central motivation for many individuals seeking dental treatment and is a fundamental aim of both orthodontic and prosthodontic interventions.[2] Studies suggest that up to 80% of adults pursuing orthodontic care-either for themselves or their children—are primarily motivated by esthetic improvement, irrespective of functional concerns.[3]

Esthetics, however, is a multifaceted concept influenced by cultural, social, and professional perspectives.[4] Maxillary incisors and canines contribute significantly to smile attractiveness as precieved by layperson and dental professionals. Minor inclination change can effect the symmetry and hence the the attractiveness on smile.[5] Labiolingual inclination and anteroposterior positioning of incisors have been linked with smile esthetics previously and thus has been researched[6,7]

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however,[6,7] the role of mesiodistal angulation remains less clear.

Anterior aesthetics and transition is dependent on three components, labio-lingual angulation. Measio-distal inclination and labio-lingual positioning of maxillary anterior teeth; mesio-distal inclination being pivotal. Improver mesio-distal inclination not only compromises aesthtics but also affection theposterior occlusion.[8] Photographic evaluation has always been used as reliable proxies for real-life judgments.[9] Among photographic framings, full-face and lower facial third images are commonly utilized as they corresponds to minimal distraction.[10] Age, gender-based differences and cultural impacts on aesthtics have also been reported.[11]

It has been found that dentists and patients /layperson often have divergent views on aesthetics and as per Peck and Peck orthodontists recognize esthetic values are ultimately shaped by upon societal perception and professional judgment.[12] Aesthetic appreciation varies by individual experience and environment, and even treatments meeting all professional criteria may fail to achieve patient-perceived esthetic satisfaction.

Methodology

This cross-sectional study was carried out at ABC Hospital between November 2018 and May 2019. A sample size of 204 participants was determined using the formula $N_0 = t^2pq/d^2$, with a 95% confidence interval, d = 1%, and an expected mean attractiveness score of 79.54 ± 11.47 for a 0^o angulation of maxillary central incisors, based on orthodontist assessment. Non-probability consecutive sampling was employed.

Inclusion criteria included orthodontic postgraduate trainees with at least one year of training and laypersons aged 18–50 years of both genders. Exclusion criteria were individuals with impaired vision and those unwilling to participate. The layperson group (n = 102) visiting the dental hospital's clinic were selected. Informed consent was obtained before participation.

Frontal smiling photographs of a woman and a man were selected based on the following selection criteria: permanent dentition without retained deciduous teeth, Class I occlusion, hard and soft tissues within normal. Informed consent was taken before taking the photographs. Four photographic simulations of these photographs were produced: -4^o mesial inclination, $+4^o$ and $+8^o$ distal inclinations, and 0^o control. These were evaluated by 102 orthodontists/trainees and 102 laypersons. Photographs were printed on photographic paper, and attractiveness was rated using a visual analogue scale from 0 (least attractive) to 100 (most attractive).

Statistical Analysis:
Data were analyzed using SPSS version 20. Frequencies and percentages were calculated for demographic variables. Paired t-tests compared perceptions across framing (full-face vs. lower third), profession (orthodontists vs. laypersons), and gender (male vs. female subjects). Independent sample t-tests assessed differences among angulation variations. Statistical significance was set at $p \leq 0.05$.

Result

The study included 204 participants aged 18–50 years, with a mean age of 31.97 ± 7.96 years. Of these, 106 (52.2%) were male and 98 (47.8%) were female. (Table-I)

Analysis demonstrated a reduction in attractiveness scores with increasing mesiodistal angulation. Orthodontic trainees consistently identified changes more effectively than laypersons, particularly in lower third facial views.

However, statistical testing revealed no Signi-ficant differences in perception between professionals and lay person, or between male and female smiles, across the range of inclinations (p> 0.05) (Tables II–IV).

	Range	Mean ±S.D
Age	18-50	31.97±7.957
	Male	Female
Gender	106 (52.2%)	98 (47.8%)

Table-I: Descriptive Statistics of age and Gender

	Orthodontic Post Graduate	Lay Person	
Images	**Mean± S.D**	**Mean± S.D**	**P value**
Image 1 (male, full face 0◦)	78.54 ±7.089	80.61±5.802	0.293
Image 2 (male, full face -4◦)	75.07 ±6.943	76.21±6.448	0.546
Image 3 (male, full face +8◦)	66.49 ±8.041	68.65±6.613	0.631
Image 4 (male, full face +4◦)	72.44±7.067	72.4±6.357	0.235
Image 5 (male, lower facial third 0◦)	79.63±7.152	80.17±6.208	0.242
Image 6 (male, lower facial third -4◦)	74.64±7.525	73.59±6.927	0.490
Image 7 (male, lower facial third +8◦)	63.85±8.371	66.16±7.699	0.936
Image 8 (male, lower facial third +4◦)	61.01±10.681	67.51±7.797	0.675
Image 9 (female, full face 0◦)	80.02±7.190	80.68±5.286	0.458
Image 10 (female, full face -4◦)	75.20±7.946	75.79±6.403	0.869
Image 11 (female, full face +8◦)	71.06±9.838	71.15±6.805	0.676
Image 12 (female, full face +4◦)	73.85±7.772	74.94±6.461	0.699
Image 13 (female, lower facial third 0◦)	77.34±7.505	79.44±10.258	0.869
Image 14 (female, lower facial third -4◦)	74.16±7.074	73.56±6.705	0.648
Image 15 (female, lower facial third +8◦)	66.42±9.582	66.33±7.003	0.210
Image 16 (female, lower facial third +4◦)	71.0±9.453	73.14±5.721	0.537

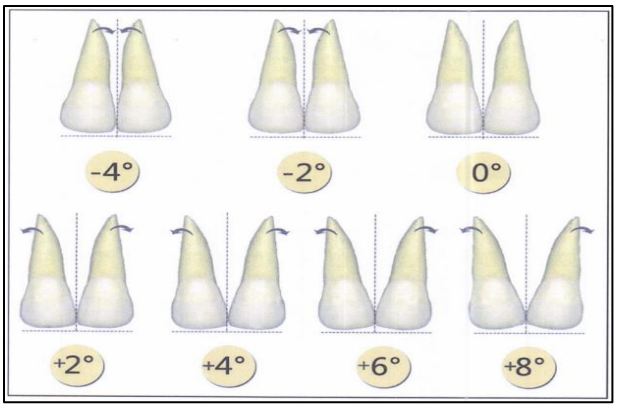
Table-II: Comparison of mean attractiveness score of incisor angulation between Orthodontic Post-Graduate and Lay Person (n = 204)

	Orthodontic Post-Graduate	Lay Person
Images	**Mean± S.D**	**Mean± S.D**
Image 1 (male, full face 0◦)	78.54 ±7.089	80.61±5.802
Image 9 (female, full face 0◦)	80.02±7.190	80.68±5.286
P value	**0.162**	**0.92**
Image 2 (male, full face -4◦)	75.07 ±6.943	76.21±6.448
Image 10 (female, full face -4◦)	75.20±7.946	75.79±6.403
P value	**0.908**	**0,664**
Image 3 (male, full face +8◦)	66.49 ±8.041	68.65±6.613
Image 11 (female, full face +8◦)	71.06±9.838	71.15±6.805
P value	**0.056**	**0.073**
Image 4 (male, full face +4◦)	72.44±7.067	72.4±6.357
Image 12 (female, full face +4◦)	73.85±7.772	74.94±6.461
P value	**0.193**	**0.271**
Image 5 (male, lower facial third 0◦)	79.63±7.152	80.17±6.208
Image 13 (female, lower facial third 0◦)	77.34±7.505	79.44±10.258
P value	**0.081**	**0.515**
Image 6 (male, lower facial third -4◦)	74.64±7.525	73.59±6.927
Image 14 (female, lower facial third -4◦)	74.16±7.074	73.56±6.705
P value	**0.607**	**0.975**
Image 7 (male, lower facial third +8◦)	63.85±8.371	66.16±7.699
Image 15 (female, lower facial third +8◦)	66.42±9.582	66.33±7.003
P value	**0.671**	**0,874**
Image 8 (male, lower facial third +4◦)	61.01±10.681	67.51±7.797
Image 16 (female, lower facial third +4◦)	71.0±9.453	73.14±5.721
P value	**0.053**	**0.067**

Table-III: Comparison of mean attractiveness score of incisor angulation (male vs. female) for Orthodontic Post-Graduate and Lay Person (n = 204)

	Orthodontic Post-Graduate	Lay Person
Images	**Mean± S.D**	**Mean± S.D**
Image 1 (male, full face 0◦)	78.54 ±7.089	80.61±5.802
Image 5 (male, lower facial third 0◦)	79.63±7.152	80.17±6.208
P value	**0.267**	**0.617**
Image 2 (male, full face -4◦)	75.07 ±6.943	76.21±6.448
Image 6 (male, lower facial third -4◦)	74.64±7.525	73.59±6.927
P value	**0.686**	**0.417**
Image 3 (male, full face +8◦)	66.49 ±8.041	68.65±6.613
Image 7 (male, lower facial third +8◦)	63.85±8.371	66.16±7.699
P value	**0.067**	**0.071**
Image 4 (male, full face +4◦)	72.44±7.067	72.4±6.357
Image 8 (male, lower facial third +4◦)	61.01±10.681	67.51±7.797
P value	**0.082**	**0.068**
Image 9 (female, full face 0◦)	80.02±7.190	80.68±5.286
Image 13 (female, lower facial third 0◦)	77.34±7.505	79.44±10.258
P value	**0.82**	**0.287**
Image 10 (female, full face -4◦)	75.20±7.946	75.79±6.403
Image 14 (female, lower facial third -4◦)	74.16±7.074	73.56±6.705
P value	**0.336**	**0.546**
Image 11 (female, full face +8◦)	71.06±9.838	71.15±6.805
Image 15 (female, lower facial third +8◦)	66.42±9.582	66.33±7.003
P value	**0.078**	**0.055**
Image 12 (female, full face +4◦)	73.85±7.772	74.94±6.461
Image 16 (female, lower facial third +4◦)	71.0±9.453	73.14±5.721
P value	**0.057**	**0.087**

Table-IV: Comparison of mean attractiveness score of incisor angulation (full face vs. lower facial third) for Orthodontic Post-Graduate and Lay Person (n = 204)



Annexure No. I: Changed Mesio-distal Inclination Change

Visual Analogue scale: is a measurement instrument that tries to measure a characteristic or attitude that is believed to range across a continuum of values and cannot easily be directly measured.

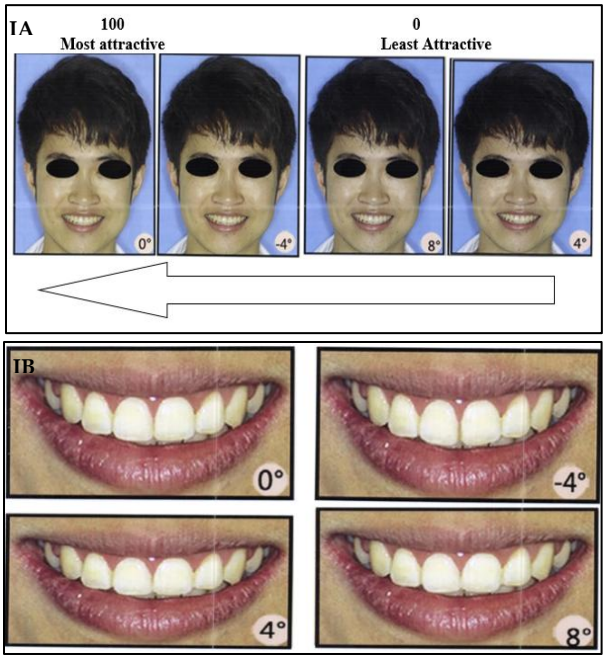


Fig. IA: **Image 1**- male full face (0◦), **Image 2**-male full face (-4◦) on the right side, **Image 3**-male full face (+8◦) on the left side, **Image 4**-male full face (+4◦)

Fig. IB: **Image 5**-male lower third face (0◦), **Image 6**-male lower third face (-4◦), **Image 7**-male lower third face (+8◦), **Image 8**- male lower third face (+4◦)

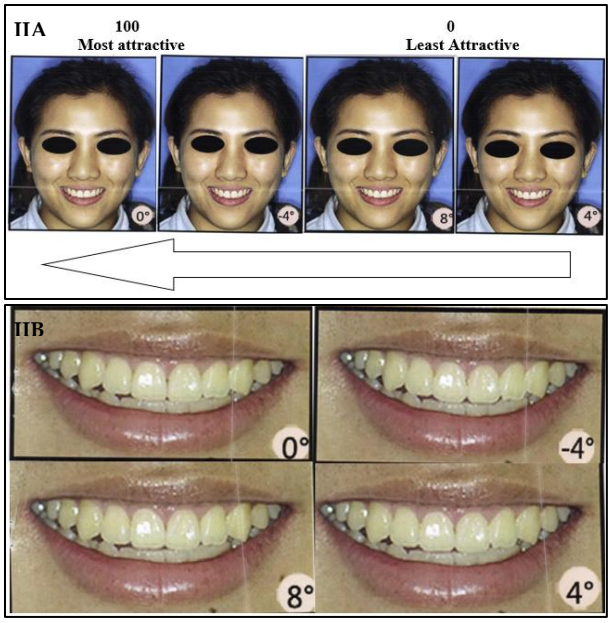


Fig. IIA: Image 9- female full face (0◦) on the upper left side, **Image 10**-female full face (-4◦), **Image 11**-female full face (+8◦), **Image 12**-female full face (+4◦) on the right side.

Fig. IIB: **Image 13**-female lower third face (0◦), **Image 14**-female lower third face (-4◦), **Image 15**- female lower third face (+8◦), **Image 16**-female lower third face (+4◦)

Discussion

This study examined the influence of mesiodistal angulation of maxillary central incisors on smile esthetics as perceived by orthodontic trainees and laypersons. A total of 204 participants were included, with demographic distributions reflecting both genders and a broad age range.

Results indicated that attractiveness scores declined as mesiodistal angulation deviated from 0^{o}. Orthodontists and trainees were better able to recognize subtle differences, particularly in lower third views, while many laypersons did not perceive these changes. Despite these observations, statistical analysis confirmed no significant differences across groups or genders.

Previous research supports the finding that a 0^{o} angulation is most esthetically acceptable.

Mean attractiveness scores reported in earlier studies align with those of the present investigation, showing a decrease as angulation deviates in either direction.[12] Similar studies by Geron and Atalia,[13] as well as Beyer and Lindauer,[14] also reported that moderate angulation variations are tolerated, with no marked sex differences at small deviations. However, as angulation becomes more pronounced, overall unattractiveness dominates judgments, reducing the role of gender-based differences. Notably, women's dental attractiveness is often judged more critically, which may explain slight variations observed in certain conditions.[15]

From a clinical perspective, orthodontists should recognize that esthetic evaluations are shaped differently by professionals and the public.

Conclusion

Increasing mesiodistal angulation of maxillary central incisors were associated with lower attractiveness ratings; however, statistically insignificant differences were identified between male/female and between orthodontic resident and layperson. These findings suggest that small changes in mesiodistal inclination may not substantially impact perceived smile esthetics. Orthodontists should therefore balance clinical standards with patient esthetic expectations when planning treatments.

Ethical Approval

The study was approved by the Ethical Review Board of de' Montmorency College of Dentistry, No: 849/DCD.

Disclaimer

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Conflict of Interest

It is declared that the authors don't have any conflict of interest.

Authors' Contribution

ZA: Study design, manuscript writing
AS: Statistical analysis and critical review
MI: supervision, Manuscript editing, proof reading
FS: Data collection
HAJ: Writeup

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