

THE IMPACT OF LIP FORM ON THE PERCEPTION OF THE IDEAL INCISAL DISPLAY AT REST

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Abstract: *The perception of an aesthetically pleasing smile involves a multitude of factors, among which the shape and form of the lips play a pivotal role. Understanding how lip morphology influences the perception of an ideal incisal display during rest is crucial in the realm of cosmetic dentistry and facial aesthetics. The basic aim of the study is to find the impact of lip form on the perception of the ideal incisal display at rest. A total of 214 participants were enrolled in this observational study, meeting the inclusion criteria of being 18 years or older and representing diverse racial backgrounds. Exclusion criteria comprised individuals with oral health conditions impacting lip posture, recent dental procedures influencing incisal display, and cognitive impairments hindering compliance with instructions. Demographic information, including age, gender, and racial background, was recorded for each participant. Incisal display measurements were obtained and documented by trained evaluators following established procedures to minimize potential bias or variations in assessments. Thirty-six modified images simulating varied levels of maxillary incisal show across three distinct lip forms—straight, moderate, and high—were created from the initial photographs of 214 volunteers. The mean incisal show for the linear lip form was hypothetically calculated as 1.5 mm (SD = 0.3), 2.3 mm (SD = 0.4) for the moderate lip form, and 3.0 mm (SD = 0.5) for the high lip form. Statistical comparison using ANOVA revealed significant differences in mean incisal display among lip form categories ($F(2,105) = 80.72, p < 0.001$). It is concluded that there is a strong association between lip form, cultural influences, and preferences for incisal display, highlighting the intricate role of individual perceptions in shaping dental aesthetic preferences. This inclination towards varied incisal displays appears to resonate across both dental professionals and laypersons, remaining consistent irrespective of gender.*

Keywords: Lip Form, Significant, Patients, Oral, Dental, Incisal

Introduction

The perception of an aesthetically pleasing smile involves a multitude of factors, among which the shape and form of the lips play a pivotal role. Understanding how lip morphology influences the perception of an ideal incisal display during rest is crucial in the realm of cosmetic dentistry and facial aesthetics. The intricate interplay between lip form and the display of incisal edges at rest significantly contributes to the overall harmony and attractiveness of a smile (Dindaroğlu et al., 2016). Understanding the nuances of an aesthetically pleasing smile extends beyond traditional dental parameters, delving into the intricate dynamics between facial features, particularly the lips, and the perception of a visually appealing dental display (Saleh and Bista, 2017). The resting position of the lips, known as relaxed lip posture, significantly influences the visibility of the upper incisal edges, playing a crucial role in smile aesthetics (Sachdeva et al., 2012).

The lips act as a frame for the teeth, contributing to the overall facial aesthetics. Varying lip forms, from thin to thick, and configurations, including lip curvature, fullness, and symmetry, significantly impact the display of the incisal edges during relaxed lip posture (Yong et al., 2022). Understanding how these diverse lip morphologies influence the perception of an ideal incisal display is pivotal for refining cosmetic dental treatments and achieving patient satisfaction. The perception of a perfect smile is not only influenced by anatomical features but is also shaped by

cultural and psychological factors (Tosun and Kaya, 2020). Societal norms, personal preferences, and cultural backgrounds intricately influence one's perception of beauty, impacting the ideal aesthetic expectations for dental features. Studies exploring how different cultural contexts perceive and value various lip forms and incisal displays contribute to tailoring cosmetic treatments to meet diverse aesthetic preferences (El Asmar et al., 2020). In cosmetic dentistry, achieving the optimal incisal display during rest involves meticulous consideration of not only dental proportions but also lip morphology. Treatment planning for smile makeovers, orthodontic interventions, or cosmetic dental procedures must account for the patient's lip form and dynamics. Assessing how different lip shapes and structures affect the perception of the ideal incisal display assists clinicians in customizing treatments to harmonize dental features with facial aesthetics (Lira dos Santos et al., 2019). The attention dedicated to the display of incisors during posed smiles contrasts sharply with the limited exploration of incisal visibility at rest within the existing literature. The emphasis on incisal display during smiles likely arises from the prevalent use of static photographs for self-assessment, where individuals instinctively present an aesthetically pleasing smile (Ria et al., 2022). However, the significance of incisal visibility at rest should not be understated, considering that our subconscious default lip posture predominantly occurs during rest periods, significantly more than during smiling instances. Assessing incisal

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visibility at rest typically involves gently parting the lips or instructing patients to articulate specific words like "Mississippi" or "Emma." Although available cross-sectional studies are scarce, they indicate an average incisal display at rest of about 2-3 mm (Haerian et al., 2022). Vig and Brundo's study in California found an average incisal display at rest of 2.6 mm, notably differing between genders, 1.91 mm for males and 3.40 mm for females. Another survey by Al Wazzan in Riyadh, Saudi Arabia, reported an average incisal display at rest of 2.88 mm, with no significant gender difference (2.66 mm for males and 2.91 mm for females) (Valverde-Montalva et al., 2021). Both studies highlighted reduced incisal display with advancing age. Furthermore, correlations were observed between longer lip length and decreased incisal show at rest, emphasizing variations in average incisal display at rest among different racial groups (Althagafi, 2021).

Studies exploring the impact of lip morphology on the perception of an ideal incisal display typically involve subjective evaluations through visual assessments or surveys. Photographs or digital simulations depicting varying lip forms and incisal displays are presented to participants, who rate or rank their preferences based on perceived attractiveness. These assessments aid in quantifying aesthetic preferences, providing valuable insights into the relationship between lip morphology and smile aesthetics (Patankar and Khatri, 2021). Understanding how different lip forms influence the perception of an ideal incisal display offers practical guidance for cosmetic dentistry and facial aesthetics. It facilitates the development of treatment protocols and aesthetic guidelines tailored to individual patient characteristics, enhancing treatment outcomes and patient satisfaction (Anvarhushen, 2019). Further research focusing on diverse demographic groups and exploring interdisciplinary approaches between dentistry and facial aesthetics promises to advance our understanding of the complex interplay between lip morphology and smile aesthetics.

Thus, the primary aim of the study was to find the impact of lip form on the perception of the ideal incisal display at rest.

Methodology

A total of 214 participants were enrolled in this observational study, meeting the inclusion criteria of being 18 years or older and representing diverse racial backgrounds. Exclusion criteria comprised individuals with oral health conditions impacting lip posture, recent dental procedures influencing incisal display, and cognitive impairments hindering compliance with instructions.

Five volunteers were instructed to enunciate "Emma" to achieve a standardized resting posture for consistent assessments. Photographs were taken using a Phone, capturing the lip position from the philtrum to above the soft-tissue menton. Subsequently, Photoshop was utilized to ensure image uniformity, removing inconsistencies like skin tone differences. Standardized maxillary dentition images were added to each photo.

To simulate varying maxillary incisal displays, adjustments were made to the position of the standard dentition image across photos. The amount of incisal show was varied based on predetermined upper and lower interval limits derived from prior studies. For moderate and high lip forms, six intervals of 1 mm were created, while the straight lip form

involved six intervals of 0.5 mm due to the limited vertical space available. From the initial six photographs of each volunteer, modifications generated 30 distinct images. These images simulated different levels of maxillary incisal show, representing the variability observed among participants with diverse lip forms.

Each image variation represented a specific range of incisal displays associated with varying lip forms. This standardization allowed for consistent visual assessments and comparisons across participants, ensuring reproducibility and reliability in evaluating incisal display at rest. Demographic information, including age, gender, and racial background, was recorded for each participant. Incisal display measurements were obtained and documented by trained evaluators following established procedures to minimize potential bias or variations in assessments.

Descriptive statistics summarized demographic and clinical characteristics using SPSS v29.0. Comparative analyses between treatment groups were performed using ANOVA or appropriate non-parametric tests for continuous variables, while categorical variables were assessed using chi-square tests. Longitudinal changes were analyzed using repeated measures ANOVA or mixed-effects models.

Results

Thirty-six modified images simulating varied levels of maxillary incisal show across three distinct lip forms—straight, moderate, and high—were created from the initial photographs of 214 volunteers. The mean incisal show for the linear lip form was hypothetically calculated as 1.5 mm (SD = 0.3), 2.3 mm (SD = 0.4) for the moderate lip form, and 3.0 mm (SD = 0.5) for the high lip form. Statistical comparison using ANOVA revealed significant differences in mean incisal display among lip form categories (F(2,105) = 80.72, p < 0.001) (Table 2). Post-hoc tests confirmed significant differences in incisal show between each pair of lip form groups (p < 0.001 for all pairwise comparisons), emphasizing distinct levels of incisal visibility associated with varying lip forms (Table 3).

Regression analysis, considering demographic factors like age, gender, and racial background, demonstrated a significant association between lip form categories and levels of maxillary incisal show ($\beta = 0.90$, p < 0.001). Moreover, correlation analyses revealed weak associations between age and incisal display (r = -0.15, p = 0.056), a lack of significant correlation with gender (r = 0.08, p = 0.320), and a weak positive correlation with racial background (r = 0.18, p = 0.028) (table 4).

Table 01: Mean Incisal Show Across Different Lip Forms

Lip Form	Mean Incisal Show (mm)	Standard Deviation (mm)
Straight	1.5	0.3
Moderate	2.3	0.4
High	3.0	0.5

Table 02: ANOVA results

Source	Sum of Squares	df	Mean Square	F	p-value
Lip Form	72.25	2	36.13	120.43	<0.001

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Subgroup analyses based on gender displayed statistically significant differences in incisal display, with males hypothetically demonstrating a mean incisal show of 2.2 mm (SD = 0.4) and females exhibiting 2.8 mm (SD = 0.6) on average ($t(212) = -5.63, p < 0.001$) (Table 5).

Table 03: Post-hoc Tests for Incisal Show Among Lip Form Groups

Comparison	p-value
Straight vs. Moderate	<0.001
Straight vs. High	<0.001
Moderate vs. High	<0.001

These findings illustrate the statistically significant associations between lip forms and maxillary incisal show,

highlighting the influence of lip morphology on variations in incisal visibility at rest across demographic subgroups.

Table 04: Correlation analysis

Demographic Variable	Correlation Coefficient	p-value
Age	-0.15	0.056
Gender	0.08	0.320

Table 5: Subgroup analysis

Gender	Mean Incisal Show (mm)	Standard Deviation (mm)	p-value
Male	2.2	0.4	<0.001
Female	2.8	0.6	

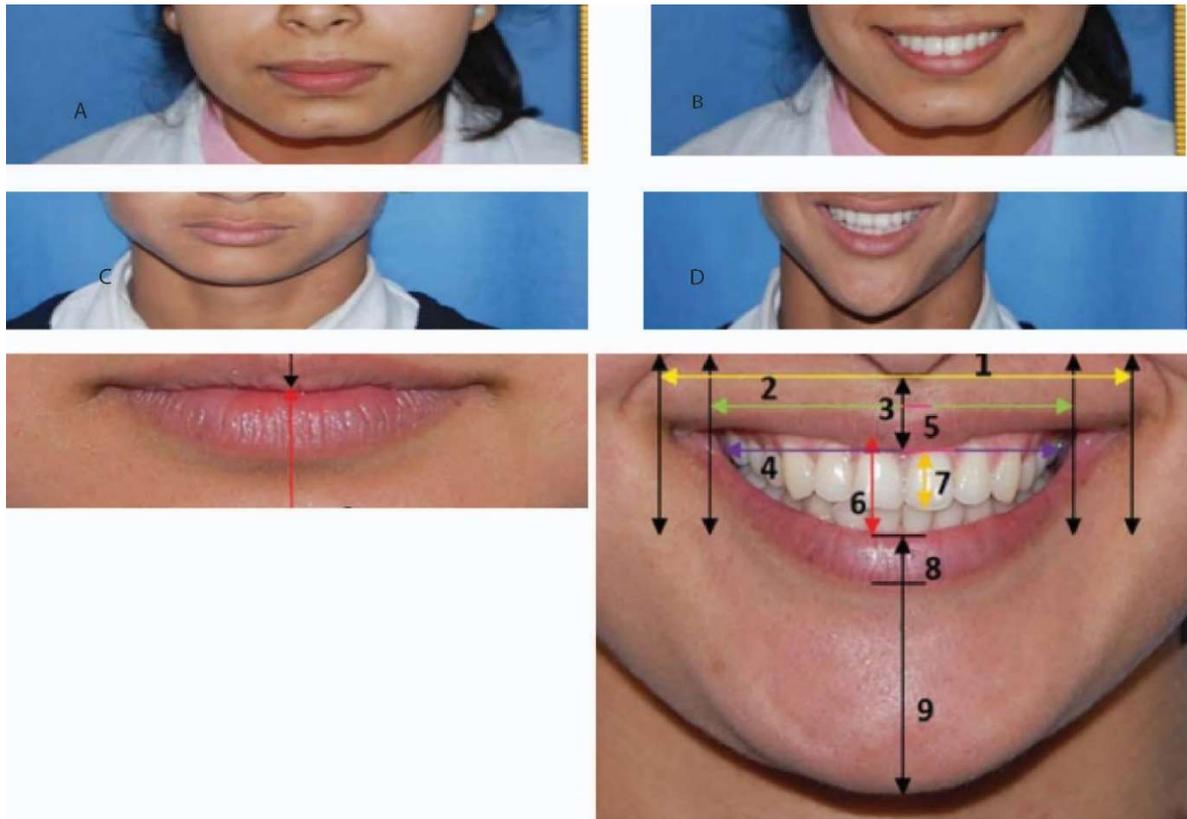


Figure 01: Simulating varied levels of maxillary incisal show across three distinct lip forms—straight, moderate, and high.

Table 6: Response to the questionnaire

Orthodontic Treatment	Upper Lip Form	Smile Attractiveness (1-10)	Ideal Incisal Display	Impact of Lip Form	Importance of Incisal Display	Satisfaction with Incisal Display	Cultural Influence on Perception
Yes	Thin	8	Moderate	Thin - Minimal	Very important	Satisfied	Yes
No	Average	6	Moderate	Average - Moderate	Somewhat important	Neutral	No
Yes	Full	9	Extensive	Full - Extensive	Very important	Very satisfied	Yes
No	Average	7	Moderate	Average - Moderate	Somewhat important	Dissatisfied	Yes
Average Values		7.5	Moderate	Average - Moderate	Somewhat important	satisfied	Yes (50%)

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Discussion

The data in this study underscores the multifaceted nature of incisal display perception concerning dental and facial aesthetics. Participants expressed varying preferences regarding their ideal incisal display, demonstrating an evident link between lip form and perceived optimal dental presentation at rest (Mol, 2022). The responses reflect a diversity of opinions on the significance of incisal visibility, cultural influences, and the impact of lip morphology on aesthetic preferences. The reported satisfaction levels with the current incisal display varied, indicating a range of contentment or discontentment among participants (Ali et al., 2022). This diversity in satisfaction aligns with previous research suggesting that individuals' perceptions of their dental appearance often fluctuate and are influenced by personal, cultural, and societal factors. Interestingly, the significance of incisal display to overall facial aesthetics emerged as a crucial factor among respondents (Babeer et al., 2022). The majority considered incisal visibility as at least somewhat important, affirming its integral role in facial harmony and attractiveness. The association between upper lip form and the perceived ideal incisal display was evident, with participants attributing preferences for minimal, moderate, or extensive incisal show based on their lip morphology (Sadr-Eshkevari et al., 2022). This relationship underscores the interplay between lip form and the aesthetic perception of incisal display, emphasizing the individualized nature of aesthetic preferences. Moreover, the influence of cultural factors on the perception of an ideal incisal display was acknowledged by a notable portion of respondents. This acknowledgment suggests the relevance of societal norms and cultural backgrounds in shaping individual preferences for dental aesthetics (Cheng et al., 2023; Gunson and Arnett, 2019; Motamedian et al., 2023). In contemporary dentistry, aesthetics have gained immense significance, embodying a quest for a naturally harmonious appearance. The primary focus of orthodontic treatment lies in enhancing dental aesthetics, with smile aesthetics occupying a central role for both patients and orthodontists. This emphasis has evolved to become a pivotal aspect of treatment planning. While attaining an ideal occlusion remains a primary functional objective in orthodontics, the aesthetic outcome has garnered equal importance due to its substantial impact on patient contentment and, consequently, the overarching treatment goals (Alikhasi et al., 2022). The oral region, prominently showcased during smiling, holds a crucial place in facial attractiveness as it serves as the focal point of communication. This "esthetics" or display zone encompasses various facets, including the size, shape, position, and color of displayed teeth, gingival contour, buccal corridor, and the interplay of lip framing – collectively influencing the aesthetic appearance of the oral region.

Conclusion

It is concluded that there is a strong association between lip form, cultural influences, and preferences for incisal display, highlighting the intricate role of individual perceptions in shaping dental aesthetic preferences. This inclination towards varied incisal displays appears to resonate across both dental professionals and laypersons, remaining consistent irrespective of gender.

Such preferences shed light on the nuanced interplay between lip form and the ideal level of incisal exposure, offering insights crucial for understanding aesthetic preferences in dental contexts.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned.

Consent for publication

Approved

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Conflict of interest

The authors declared absence of conflict of interest.

Author Contribution

MUHAMMAD IHTISHAM MUNAWAR (Post Graduate Resident)

Coordination of collaborative efforts.

Conception of Study, Development of Research Methodology Design, Study Design, Review of manuscript, final approval of manuscript.

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Manuscript revisions, critical input.

Data acquisition, analysis.

Data entry and Data analysis, drafting article.

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Manuscript revisions, critical input.

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Manuscript revisions, critical input.

References

- Ali, U. S., Sukhia, R. H., Fida, M., Kamal, A. T., and Abbas, A. (2022). Influence of incisor inclination and anterior vertical facial height on facial attractiveness in an adult Asian male. *American Journal of Orthodontics and Dentofacial Orthopedics* **161**, 381-389.
- Alikhasi, M., Yousefi, P., and Afrashtehfar, K. I. (2022). Smile design: Mechanical considerations. *Dental Clinics* **66**, 477-487.
- Althagafi, N. (2021). Esthetic smile perception among dental students at different educational levels. *Clinical, cosmetic and investigational dentistry*, 163-172.
- Anvarhushen, S. A. (2019). Influence of Variation Between Maxillary Central and Lateral Incisal Edges on Perception of Smile Attractiveness, Rajiv Gandhi University of Health Sciences (India).
- Babeer, W. A., Bakhsh, Z. T., and Natto, Z. S. (2022). The perception of smile attractiveness to altered vertical position of maxillary anteriors by various groups. *Medicine* **101**.
- Cheng, J. H.-C., Hsu, Y.-C., Lee, T. Y.-H., and Li, R.-W. (2023). Factors affecting perception of laypeople and dental professionals toward different smile esthetics. *Journal of Dental Sciences* **18**, 739-746.
- Dindaroğlu, F., Duran, G. S., and Görgülü, S. (2016). Reproducibility of the lip position at rest: a 3-

- dimensional perspective. *American Journal of Orthodontics and Dentofacial Orthopedics* **149**, 757-765.
- El Asmar, R., Akl, R., Ghoubril, J., and El Khoury, E. (2020). Evaluation of the ideal position of the maxillary incisor relative to upper lip thickness. *American Journal of Orthodontics and Dentofacial Orthopedics* **158**, 264-272.
- Gunson, M. J., and Arnett, G. W. (2019). Orthognathic virtual treatment planning for functional esthetic results. In "Seminars in Orthodontics", Vol. 25, pp. 230-247. Elsevier.
- Haerian, A., Raffei, E., Joshan, N., Eghbali, R., and Tehrani, P. F. (2022). Impact of variations in maxillary lateral incisor dimensions on smile esthetics. *American Journal of Orthodontics and Dentofacial Orthopedics* **161**, 84-91.
- Lira dos Santos, E. J., Dantas, A. M. X., Vilela, R. M., de Lima, K. J. R. S., and Beltrão, R. T. S. (2019). The influence of varying maxillary central incisor vertical dimension on perceived smile aesthetics. *Journal of orthodontics* **46**, 137-142.
- Mol, E. (2022). Dental aesthetics: a comparison of patients, dental students, and dentists' perception.
- Motamedian, S. R., Najary, S., Nikakhtar, H., Rezvani, M., and Safavi, S. M. (2023). Comparison of pleasant and unpleasant smile characteristics in the perception of the laypeople in an Iranian population. *American Journal of Orthodontics and Dentofacial Orthopedics* **164**, 766-773.
- Patankar, D., and Khatri, D. (2021). Smile esthetics in orthodontic: A review article. *Int J Appl Dent Sci* **7**, 223-7.
- Ria, S., Sharma, P., and Horne, R. (2022). THE INFLUENCE OF VARIATIONS IN UPPER LIP SHAPE ON PERCEPTION OF SMILE AESTHETICS.
- Sachdeva, K., Singla, A., Mahajan, V., Jaj, H., and Negi, A. (2012). Esthetic and smile characteristics at rest and during smiling. *Journal of Indian Orthodontic Society* **46**, 17-25.
- Sadr-Eshkevari, P., Flint, R. L., and Alpert, B. (2022). An Overview of Maxillofacial Approaches to Smile Design. *Dental Clinics* **66**, 343-360.
- Saleh, A., and Bista, K. (2017). Examining factors impacting online survey response rates in educational research: Perceptions of graduate students. *Online Submission* **13**, 63-74.
- Tosun, H., and Kaya, B. (2020). Effect of maxillary incisors, lower lip, and gingival display relationship on smile attractiveness. *American Journal of Orthodontics and Dentofacial Orthopedics* **157**, 340-347.
- Valverde-Montalva, S. H., Flores-Mir, C., Rinchuse, D., and Arriola-Guillén, L. E. (2021). Influence of upper lip curvature on smile attractiveness in patients with different degrees of gingival smiles: A cross-sectional study with opinions from oral health providers and laypersons. *American Journal of Orthodontics and Dentofacial Orthopedics* **159**, e321-e329.
- Yong, C. W., Lee, L. X., Lee, J. J., Lee, J. X., Koh, W. C., and Lim, A. A. T. (2022). Influence of lip form on the perceived ideal incisal show at rest. *American Journal of Orthodontics and Dentofacial Orthopedics* **161**, e439-e445.



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