



EVALUATING THE EFFECT OF VARIED OVERJETS ON SMILE CHARACTERISTICS AMONG YOUNG ADULTS IN THE AGE GROUP OF 18-25 YEARS - A CROSS-SECTIONAL STUDY

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ABSTRACT One of the main priorities in Orthodontic treatment planning is an aesthetic smile, which has a major impact on facial attractiveness.¹ Several factors contribute to a natural smile of an individual and these include smile line, smile arc, smile design, upper lip curvature, labiodental relationship, teeth display, buccal corridor and position of incisal edge. A lot of research has been done on the factors that affect smiles in Western populations but not as many have been done on these aesthetic norms in South Asian population. Malocclusion in the sagittal plane with increased overjet is the most common type around the world with a prevalence of 15 to 30%.¹ Such malocclusions have a direct or indirect effect on the smile of an individual. This study investigates the effect of overjet variations on smile characteristics in young adults in the age group of 18-25 years who are increasingly concerned with their appearance.

KEYWORDS : Smile characteristics, Increased Overjet, Young adults, Orthodontics.

INTRODUCTION

Nonverbal communication is the most immediate and noticeable method of expression. Humans often show their emotions, consciously or non-consciously through non-verbal channels, including facial expressions and gestures. Smiling is the most common facial expression. A smiling face conveys happiness, gratitude, politeness, friendliness and therefore kindles positive social reactions. A smiling face is viewed as more attractive compared to a non-smiling one.¹ At a neuronal level, its image elicits an increased response by the medial orbitofrontal cortex. For most of the patients, an improvement in facial and smile attractiveness are the main motivating factors for receiving Orthodontic treatment.

In Orthodontics, facial and smile esthetics are largely taken into consideration during the diagnosis and treatment planning and have been the focus of extensive Orthodontic literature.² According to neurological control, smile can broadly be divided into involuntary (spontaneous) and voluntary (posed) smile. An involuntary smile is related to emotion, whereas the posed (social) smile is intentional and usually not related with emotion. There are a number of parameters that constitute the natural smile of an individual. These include smile line, smile arc, smile design, upper lip curvature, labiodental relationship, teeth display, buccal corridor, and position of incisal edge. In addition, dental-facial midline, symmetry, gingival display and gingival zenith position also play an important role in the aesthetic appraisal of smile.³ All these factors must be taken into account while designing a smile makeover.

Analysis of smile is imperative in the diagnosis and treatment planning phases of aesthetic dentistry. There are abundant data regarding the factors contributing to the smile in the Western populations but there is an insufficient data regarding these aesthetic norms among South Asian population. Dental appearance has an impact on facial beauty, social interaction and psychological well-being particularly among adolescents.⁴ Malocclusion in the sagittal plane with increased overjet is the most common type around the world with a prevalence of 15 to 30%. Therefore, the purpose of the current study was to determine whether or not Overjet has an impact on smile attractiveness. This study was conducted among young adults who are increasingly self-conscious about their appearance. This study aimed to evaluate the components of smiles in different subjects to obtain adequate results in oral rehabilitation.

MATERIALS AND METHODS

Source Of Data: Outpatients reporting to the Department of Orthodontics and Dentofacial Orthopaedics, Best Dental Science College and Hospital, Madurai.

Study Design: Cross-sectional study

Study Period: From July 2024 to September 2024

Place of Study: Best Dental Science College, Madurai, Tamil Nadu

Sampling Method: Convenient Sampling Method

Method Of Sample Determination: Sample size was calculated based on the data obtained from previous study conducted by Mehwish Khan et al⁵ "Analysis of different characteristics of smile"

Sample size software = G power 3.1

The Alpha Value = 0.05

Power = 0.80

Effect Size = 0.253

Attrition rate = 1%

Sample size collected using G power analysis = 123

Total Sample Size = 123

Sample Size per group = 41 (3 groups)

Method Of Collection Of Data:

Materials/ Study Tools (Armamentarium)

1. Canon-EOS camera (1500D with 18-55 mm lens).

2. Adobe Photoshop PS 2022 version

METHODOLOGY

The study was conducted on 123 subjects. The procedure was clearly explained and a written informed consent was obtained from the participants. The subjects were classified into three groups according to their Overjet - (Group 1: 0-2mm, Group 2: 2-4mm and Group 3: > 4mm) and each group had 41 subjects.

Natural smile photographs with participants seated in natural head position (with eye level parallel to the floor) using a Canon-EOS camera (1500D) with 18-55 mm lens (ISO 400, f 4.5, exposure time 1/200) were taken and each image was assessed using Adobe Photoshop PS 2022 version 23.5.2. by the principal investigator.

CRITERIA FOR SAMPLE SELECTION

Inclusion Criteria:

Young adults of age group 18-25 years were included in the study.

Individuals with healthy natural dentition.

Individuals with Skeletal Class I and Class II.

Individuals with Dental Class I and Class II div I

Exclusion Criteria:

Subjects with the history of any previous Orthodontic treatment or any

aesthetic surgery (eg. lip lengthening, frenectomy).
 Subjects with severe tooth wear, congenital defects, facial asymmetry, maxillofacial trauma.
 Individuals with Skeletal and Dental Class II div 2 and Class III.
 Individuals with impacted and missing tooth.

Smile characteristics were evaluated using the Smile Index 6 - Smile line, smile arc, smile design, upper lip curvature, labiodental relationship and number of teeth displayed.

CHARACTERISTICS OF SMILE

Smile line or Lip line

Extent of vertical tooth display in smiling or elevation of the upper lip in relation to the maxillary incisors.⁷ Three types have been described, high, average and low. High smile that shows the maxillary anterior teeth along with a significant amount of gingiva. Average smile showing maxillary anterior teeth with only interproximal gingiva. Low smile that shows less than two-third of the maxillary anterior teeth.



Figure 1: a. High Smile, b. Average Smile Line, c. Low Smile



Figure 2: a. Consonant, b. Straight, c. Reverse Smile Arc

Smile Arc

Smile Arc is the relationship between the curvature of the maxillary anterior teeth and upper border of the lower lip.⁷ Smile arc was defined by drawing a line along the maxillary central incisal edges to the cusp tips of maxillary canines, which was related to another line drawn across the superior border of the lower lip. In subjects whose maxillary teeth were covered by lower lip, smile arc was designated as "not available".

There are three categories of Smile Arc. **"Parallel to the teeth"** when the two lines follow the same curvature also called as a **consonant smile**. If the two are not parallel, it is called a **non-consonant smile**. A non-consonant smile can be **"Straight"** with flatter curvature of the teeth in relation to the lower lip. A non-consonant smile can be **"Reverse"** when maxillary teeth form a reverse curve in relation to lower lip.



Figure 3: a. Commissure b. Cuspid c. Complex Smile Type

Smile Design Or Smile Type

Three basic patterns have been identified. **The Commissure smile** is the typical pattern that can be imagined as a Cupid bow. In this pattern, the maxillary first molars lie few milli-meters above the incisal edges of the central incisors. In **the Cuspid smile type**, the shape of the lips can be demonstrated as a diamond, the rise of the upper lip resembles a window shade. In this design, the position of the maxillary molars is inferior to or at the level of the central incisors. In **the Complex smile**, the shape of the lips is visualized as two parallel chevrons, displaying all the upper and lower teeth. The upper lip moves superiorly with the lower lip moving inferiorly during smile.



Figure 4: a. Upward b. Straight c. Downward Upper lip curvature

A straight line was drawn through the midpoint of the inferior border of

the upper lip and its relationship with the corners of mouth was evaluated. Three categories are identified. Upward (the corners of the mouth lie above the horizontal line). Straight (the corners of the mouth at or within 1 mm of the line). Downward (the corners of the mouth lie below the horizontal line).



Figure 5: a. Lower lip slightly the maxillary anterior teeth
 b. Not-touching labiodental relationship
 c. Maxillary anterior teeth covered by lower lip

Labiodental Relationship Of The Lower Lip And Maxillary Anterior Teeth

Identified by evaluating the distance between the superior border of the lower lip and inferior border of the maxillary anterior teeth.⁹ The relationship may be divided into lower lip **"slightly touching"** the lower border of maxillary anterior teeth, lower lip **"not touching"** the teeth and lower lip **"covering"** the anterior teeth



Figure 6: a. Teeth displayed upto canines
 b. Teeth displayed upto first premolars
 c. Teeth displayed upto second premolars
 d. Teeth displayed upto first molars

Number Of Teeth Displayed

Smiles were categorized as displaying teeth up to the canines, first premolars, second premolars, or the first molars.⁹ A tooth was counted when more than half of its surface was visible.

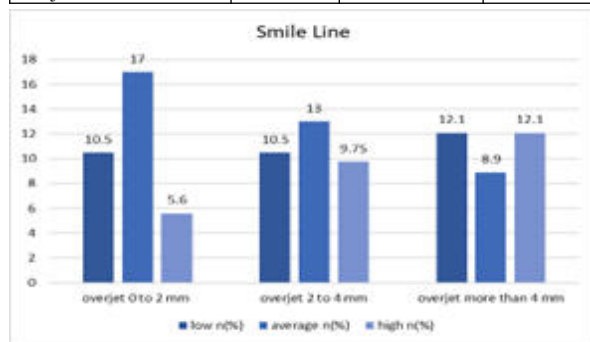
Statistical Analysis

Frequency distribution of the parameters of smile was determined and Pearson Chi-square test was used to determine if there is any statistically significant difference between these categories. Level of significance was kept at 0.05.

Statistically there is a significant difference between overjet and smile line, smile arc, smile type, upper lip curvature and labiodental relationship. No statistical association has been found between overjet and teeth displayed. Hence, except for teeth displayed variable, all the smile parameters are associated with overjet.

Table 1:

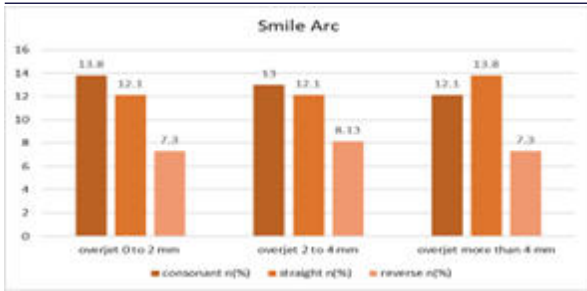
Smile Line			
overjet	low n(%)	average n(%)	high n(%)
overjet 0 to 2 mm	10.5	17	5.6
overjet 2 to 4 mm	10.5	13	9.75
overjet more than 4 mm	12.1	8.9	12.1



Graph 1:

Table 2:

Smile Arc			
overjet	consonant n(%)	straight n(%)	reverse n(%)
overjet 0 to 2 mm	13.8	12.1	7.3
overjet 2 to 4 mm	13	12.1	8.13
overjet more than 4 mm	12.1	13.8	7.3

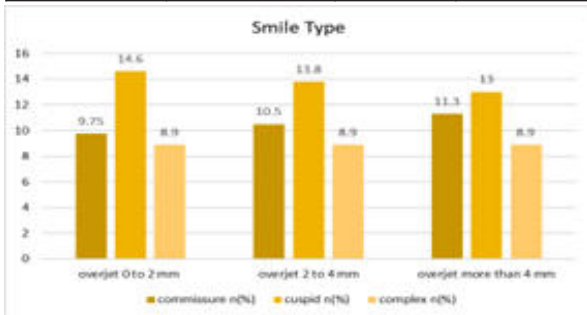


Graph 2:

From the above two result Tables: 1 & 2, Average smile line and Consonant smile arc are predominantly seen in less overjet groups.

Table 3:

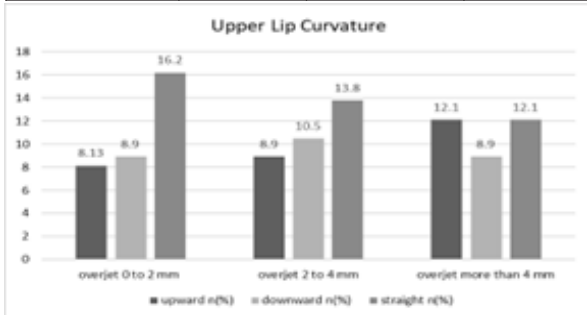
Smile Type			
overjet	commissure n(%)	cuspid n(%)	complex n(%)
overjet 0 to 2 mm	9.75	14.6	8.9
overjet 2 to 4 mm	10.5	13.8	8.9
overjet more than 4 mm	11.3	13	8.9



Graph 3:

Table 4:

Upper Lip Curvature			
overjet	upward n(%)	downward n(%)	straight n(%)
overjet 0 to 2 mm	8.13	8.9	16.2
overjet 2 to 4 mm	8.9	10.5	13.8
overjet more than 4 mm	12.1	8.9	12.1

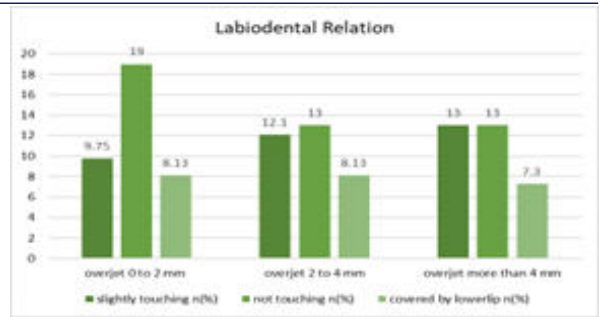


Graph 4:

From the above two result Tables 3 and 4, Cuspid smile type and Upper Lip curvature are predominantly seen in less overjet groups.

Table 5:

Labiodental Relation			
overjet	Lower lip slightly touching n(%)	Lower lip not touching n(%)	Maxillary anterior teeth covered by lower lip n(%)
overjet 0 to 2 mm	9.75	19	8.13
overjet 2 to 4 mm	12.1	13	8.13
overjet more than 4 mm	13	13	7.3

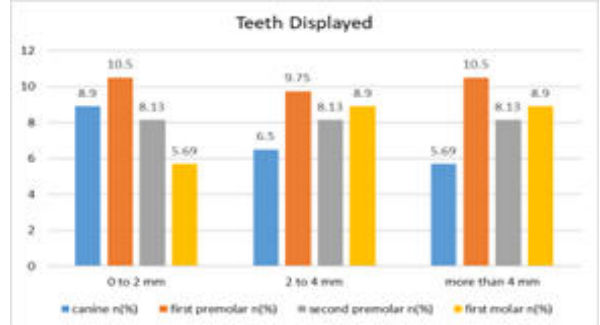


Graph 5:

From the above Table 5, Labiodental relation – Lower Lip not touching maxillary anterior teeth are predominantly seen in less overjet groups.

Table 6:

Teeth Displayed				
overjet	canine n(%)	first premolar n(%)	second premolar n(%)	first molar n(%)
0 to 2 mm	8.9	10.5	8.13	5.69
2 to 4 mm	6.5	9.75	8.13	8.9
more than 4 mm	5.69	10.5	8.13	8.9



Graph 6:

As per Table 7, no statistical association has been found between overjet and teeth displayed.

A large proportion of the subjects in the present study have the following balanced smile components and it co-relates with other studies too.

- Average smile line
- Consonant smile arc
- Cuspid smile type
- Straight upper lip curvature
- Not touching labiodental relationship

CONCLUSIONS

Within the limitations of this study, it can be concluded that overjet has an influence on the smile components. As an overjet of 0-2mm is considered ideal for a pleasing profile, the following balanced smile components can be incorporated before beginning the aesthetic treatment. These concepts of smile esthetics are not new, but are too often overlooked in Orthodontic treatment planning. Today's patients, more than ever are highly aware of smile aesthetics. So, these smile components should be considered as artistic guidelines to treat individual patients desiring an attractive smile.

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