Correlation between Dentofacial Esthetics and Mental Temperament: A Clinical Photographic Analysis Using Visagism

Abstract
Background: “Visagism,” a proposed novel concept, makes it possible for the patients to express the desirable emotions and personality traits, through their smile. According to this concept, clinicians can design a smile that blends with the patient’s physical appearance, personality, and desires. Aim: To establish a relation, if any, between the smile pattern (dentofacial esthetics determined by three parameters, i.e., tooth form, long axes of maxillary anterior teeth, and connection line between embrasure) and the personality traits (four mental temperaments) through the concept of visagism. Settings and Design: A total of 190 participants aged between 20 and 38 years from a dental college were selected for the study. Materials and Methods: The temperaments of the participants were identified using a self-reporting questionnaire. The photographs of frontal view of teeth in centric occlusion of the participants were captured, and their tooth forms, long axes, and embrasure lines were drawn using photograph editing software. The type of temperament obtained from the questionnaire for each participant was compared with that obtained from photographic evaluation. Statistical Analysis Used: The obtained data were statistically analyzed by applying Kappa statistics for kappa measure of agreement. Results: There was no agreement between temperaments derived through questionnaire and those temperaments obtained from the photographic analysis. Conclusion: Although the concept of combining the principles of smile design and mental temperaments through visagism is an appreciable idea, it lacks a practical approach to create a personalized smile for each patient by including mental temperaments at present stage.

Keywords: Correlation, dentofacial esthetics, smile design, temperament, visagism

Introduction
Smile, a person’s ability to express a range of emotions with the structure and movement of the teeth and lips, can often determine how well a person can function in the society. It is assumed that having a harmonious smile may increase the levels of self-esteem in adolescents and hence their ability to interact appropriately in the society. Facial attractiveness influences personality development and social interaction, wherein an individual’s smile as an important facial expression can draw one’s attention.

Dentofacial appearance is an important part of facial attractiveness, wherein the mouth is used as the prime organ, in social interactions. Literature suggests that dental esthetics can have a remarkable impact on subject’s social and psychological well-being which can affect their self-confidence. Regardless of age, women consider their appearance to be more important and find it more interesting to modify it, than men.

Dentogenic concept considers gender, personality, and age in harmonizing shapes of teeth with the face. Among these parameters, personality is unique for an individual and the most difficult to determine. Unveiling the personality traits, desires of the patient and translating them into natural tooth shapes to maintain the psychodentofacial harmony poses a major challenge to the clinician in designing an esthetic smile.

With the advances in dental materials and techniques, esthetic dentistry has been effective in restoring tooth form and function using a minimally invasive approach. Computer design software serves as a useful tool to show patients the possibilities of modifying their smile. Such an approach, which does not harmonize the smile design and

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personality traits, is entirely mechanical and the patient’s desires, expectations of an esthetic smile may not be met.[14]

Visagism is a novel concept that applies the principles of visual art to the composition of a customized smile proposed by Paolucci et al. in 2012.[11]

Visagism proposes a relationship between emotions and personality traits, determined by a questionnaire and dentofacial esthetics, which are determined by three parameters, i.e., tooth form, the long axis of maxillary anterior teeth, and the connection line between embrasures.

According to Hippocrates, an individual’s personality is formed by a unique combination of four types of temperaments:[13]

1. Choleric/strong temperament
2. Sanguine/dynamic temperament
3. Melancholic/sensitive temperament
4. Phlegmatic/peaceful temperament.

Paolucci et al. proposed the concept of combining the esthetic smile designs in relation to the four temperaments.[11]

Due to the availability of only a single study,[14] in the literature regarding the concept of visagism, a need was felt to investigate whether it could be applicable to dentate individuals of different age groups, education levels, similar profession, and socioeconomic status in both the genders.

This clinical study aimed to establish a relation, if any, between the dentofacial esthetics (determined by three parameters, i.e., tooth form, long axes of maxillary anterior teeth, and connection line between embrasure) and the four mental temperaments through the concept of visagism.

Materials and Methods

A total of 190 participants with properly aligned dental arches that included 66 undergraduate students aged between 20 and 25 years, 74 postgraduate students aged between 26 and 30 years, and 50 faculty members aged between 32 and 38 years from a dental college were randomly selected. Their identity was kept confidential. Participants with incisal wear, tooth fractures and gingival hyperplasia of the maxillary anterior teeth, and need for orthodontic treatment were excluded from the study.

A modified self-reporting questionnaire,[16] consisting of 37 questions, whose validity was checked by performing a pilot study and was used to identify the temperament of the participants. The participants answered the questions as yes/no or doubtful. Each participant was seated upright in a comfortable position, cheek retractors were applied, and the photographs of frontal view of teeth in centric occlusion were captured using a DSLR camera (Canon EOS 1200D).

Coding

The collected questionnaires and photographs were assigned with a common serial number, specific for each participant. For example, the questionnaire and the photograph of the first participant were named as \( Q_1 \) and \( P_1 \), respectively. Similar codes were assigned for all the participants such that the serial numbers ended up at \( Q_{190} \) and \( P_{190} \).

Recoding

The sequences of the serial numbers from \( Q_1 \) to \( Q_{190} \) to \( P_{190} \) were disarranged randomly and renamed as \( A_1 \) to \( A_{190} \) and \( B_1 \) to \( B_{190} \) respectively. For example, in the random sequence, \( Q_1 \) might have corresponded to \( A_{40} \) to \( A_{80} \) to \( A_{170} \), and so on. Similarly, \( P_1 \) might have corresponded to \( B_{15} \) to \( B_{65} \) to \( B_{150} \) and so on. This procedure of recoding was done by an assistant so as to keep the principal investigator blinded for the study and to avoid any bias that could develop during evaluation.

Questionnaire evaluation

Each question in the questionnaire indicated a specific temperament.[16] The questions with an affirmative response were evaluated for their respective temperament, and the most frequent one, among the four, was decided as the temperament of the participant. Each temperament can be described with the following characteristics:

1. Choleric: Determined, explosive, intense, passionate
2. Sanguine: Extroverted, communicative, enthusiastic, dynamic
3. Melancholic: Organized, perfectionist, enthusiastic, dynamic
4. Phlegmatic: Pacific, mystic, spiritualized, discreet

Photographic evaluation

The tooth forms, the long axes of maxillary anterior teeth, and the connection lines of embrasures on the collected photographs were drawn using the Adobe Photoshop version 7.0 software, Adobe Systems, San Jose, California, United States, following which the evaluation was carried out and the participants were categorized into the respective temperaments based on the following criteria:

Choleric/strong

These individuals are characterized by strong leadership qualities and fearlessness. The maxillary anterior teeth are positioned with their long axes perpendicular to the horizontal plane with dominant rectangular central incisors. The connection line of the embrasures is horizontal between the central and lateral incisors [Figure 1].

Sanguine/dynamic

They are active, communicative, and extroverted. The long axes of the maxillary anterior teeth are inclined slightly distally. The central incisors are usually triangular or trapezoidal. The connection lines of the embrasures and the incisal plane are ascendants from the medial line [Figure 2].
Melancholic/sensitive
This personality is characterized by gentleness and abstract thinking. The long axes of the maxillary anterior teeth are distally inclined. The central incisors are usually oval in shape. The connection lines of the embrasures descend from the medial line, creating an inverted incisal plane [Figure 3].

Phlegmatic/peaceful
These individuals are gentle, discreet, and diplomatic. The maxillary anterior teeth have their long axes perpendicular to the horizontal plane. The central incisors are square and small. The connection line of the embrasures is straight [Figure 4].

Decoding
After the evaluation of the questionnaires and photographs by the principal investigator, the recoding sequence was broken, and the jumbled numbers of the questionnaires and photographs were arranged according to their original serial numbers that were assigned specific for a participant.

Results
The decoded sequences of the questionnaires and photographs were tabulated. The type of temperament obtained from the questionnaire for each participant was compared with that obtained from photographic evaluation. The number and percentage for either positive or negative matching between the two evaluations of temperament were calculated for the entire sample, and for individual groups of undergraduate students, postgraduate students, faculty, males, and females [Table 1]. The obtained data were statistically analyzed by applying Kappa statistics for kappa measure of agreement [Table 2].

Discussion
The rise in dental awareness among the general population has led to an increased demand for esthetic restorations.[17] Esthetic dental treatment involves artistic and subjective components designed to create the illusion of beauty.[1] A patient’s self-esteem and quality of life can be improved by accomplishing a successful esthetic dental treatment through the creation of a beautiful smile.[18] The size, shape, and arrangement of the maxillary anterior teeth form a major contribution to esthetic anterior dentition, the upper central incisors being the key determinants for evaluation.[14]

The clinician not only faces the exacting task of interpreting the personality traits, emotions, and desires of the patient but also a constant endeavor is expected in incorporating these factors into the parameters of smile design. It is possible for the patients to express the desirable emotions and personality traits, through their smile, by applying the concept of visagism.[11] The clinician can design a smile that blends with the patient’s physical appearance, personality, and desires. The aim...
Table 1: Questionnaire and photographic evaluation

|                      | Positive matching, n (%) | Negative matching, n (%) |
|----------------------|--------------------------|--------------------------|
| Total number of subjects (n=190) | 52 (27)                  | 138 (73)                 |
| Males (n=73)         | 18 (24.6)                | 55 (75.3)                |
| Females (n=117)      | 19 (16.2)                | 98 (83.7)                |
| Undergraduate students (n=66) | 18 (27.3)            | 48 (72.7)                |
| Postgraduate students (n=74) | 22 (29.8)            | 52 (70.2)                |
| Faculty (n=50)       | 12 (24)                  | 38 (76)                  |

Table 2: Questionnaire and photographic evaluation kappa measure of agreement-group wise

| Questionnaire versus photographic tabulation | κ       |
|---------------------------------------------|---------|
| Overall sample (n=190)                      | 0.023   |
| For postgraduate students (n=74)            | 0.012   |
| For undergraduate students (n=66)           | 0.064   |
| For faculty (n=50)                          | 0.024   |
| For males (n=73)                            | 0.043   |
| For females (n=117)                         | 0.003   |

Kappa value-measure of agreement - 0-0.20: None; 0.21-0.39: Minimal; 0.40-0.59: Weak; 0.60-0.79: Moderate; 0.80-0.90: Strong; Above 0.90: Almost perfect

of visagism is to create a smile design that expresses the patient’s personality and lifestyle, ensuring harmony between the restorations and the patient’s physical appearance, values, and attitudes.[11] An attempt was made in this study to find a correlation between the temperaments obtained through a questionnaire answered by the participants and that obtained after photographic evaluation. The results show that there is no agreement (kappa value: 0.023) between the temperament that was obtained by questionnaire and that through photographs. Out of 190 participants, positive matching was found in 52 participants (27.36%) and negative matching in 138 participants (72.63%), suggesting that there is no correlation between the temperaments obtained from questionnaire and photographic evaluation [Table 1].

Similar results were observed in both the genders; kappa value for males and females, respectively, was 0.043 and 0.003 [Table 2], as well as in different age groups, kappa values for faculty, PG, and UG students, respectively, were obtained as 0.024, 0.012, and 0.064 [Table 2].

These results were in contrast to the study done by Sharma et al. in which only 50 participants were chosen, whose socioeconomic background was unknown.[14] The participants included in that study were aged between 18 and 30 years without any information regarding their frequency distribution and their gender.[14] Due to small sample size and a wider range of age group, the uniformity of the sample with respect to different age groups may be questionable. The educational background of the participants was not revealed in their study and hence their level of understanding and capability to answer the questionnaire remains unknown.

To overcome these limitations, in the present study, 190 individuals from the dental profession (140 were pursuing education and 50 faculty members) were chosen as participants. A pilot study was conducted on forty participants before the main study to know the validity of the questionnaire.[16] The questions, which were difficult to understand and to answer, were eliminated from the questionnaire.

The modified questionnaire consisted of 37 questions that helped the participants in understanding the questions. The level of understanding of the questionnaire and the answering capability by the participants in the present study is superior, owing to their common educational background that is in contrast to that of the participants in the study conducted by Sharma et al. This could have contributed to the contrasting results achieved in the present study from that of Sharma et al.[14]

The principal investigator in the present study was presented with recoded questionnaires and photographs. The process of coding, recoding, and decoding holds significance as it helped in avoiding any bias that could develop while evaluating the collected data.

The concept of combining few principles of smile design such as the tooth form, the long axes of maxillary anterior teeth, the connection line of embrasures, and the mental temperaments as proposed by Paulocci et al. is novel, but yet to be established thoroughly. Hence, future research in terms of modifying the novel concept of visagism for clinical use, over larger groups of populations would be beneficial so that it can be incorporated as one of the solid principles of smile design, thereby the temperament of the patient can be combined with dentofacial esthetics to achieve a harmonized smile design.

The participants were asked to mark the statements in the self-reporting questionnaire that describe their own behavior. Considering the human nature, where a person may not be comfortable to be criticized, a bias could have developed in the study, while the participants answered the questionnaire. This could be considered as a limitation of the study, which cannot be overcome.

Conclusion

Considering the limitations of this study, it can be concluded that the concept of combining the principles of mental temperaments and smile design through visagism in its present format, is too primitive in its current state, and hence may not be a practical approach in clinical practice to create a personalized smile for each patient.
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Conflicts of interest
There are no conflicts of interest.

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