

Smile Attractiveness

Self-perception and Influence on Personality

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ABSTRACT

Objectives: To investigate self-perception of smile attractiveness and to determine the role of smile line and other aspects correlated with smile attractiveness and their influence on personality traits.

Subjects and Methods: Participants judged their smile attractiveness with a patient-specific questionnaire. The questionnaire contained a spontaneous smiling photograph of the participant. Objective smile-line height was measured using a digital videographic method for smile analysis. Personality was assessed with the Dutch Personality Index.

Results: Cronbach's α for the smile judgment questionnaire was .77. The results showed that size of teeth, visibility of teeth, and upper lip position were critical factors in self-perception of smile attractiveness (social dimension). Color of teeth and gingival display were critical factors in satisfaction with smile appearance (individual dimension). Participants, smiling with teeth entirely displayed and some gingival display (two to four millimeters), perceived their smile line as most esthetic. Smiles with disproportional gingival display were judged negatively and correlated with the personality characteristics of neuroticism and self-esteem. Visibility and position of teeth correlated with dominance.

Conclusion: The results of this research underpin the psychosocial importance and the dental significance of an attractive smile.

KEY WORDS: Esthetics; Facial expression; Smiling; Psychology; Personality

INTRODUCTION

Facial attractiveness plays a key role in social interaction. It influences mating success, kinship opportunities, personality evaluations, performance, and employment prospects.¹⁻³ Furthermore, attractiveness is

suggested to influence personality development and social interaction. Empirical evidence for this relationship is given by a meta-analysis of facial-attractiveness studies.⁴ These showed that attractive children and adults are judged and treated more positively than unattractive children and adults, even by those who know them. Attractive children and adults also exhibited more positive behaviors and traits. Facial attractiveness correlated with extraversion and self-confidence/self-esteem. In most domains, attractiveness was found to be equally important for men and women. Other studies showed correlations between self-reported attractiveness and personality traits such as dominance, emotional stability, and self-esteem⁵ or with inhibition, health anxiety, and self-esteem.⁶

Facial attractiveness and smile attractiveness appear strongly connected to each other. The fact is that in social interaction, one's attention is mainly directed toward the mouth and eyes of the speaker's face.⁷ As the mouth is the center of communication in the face, the smile plays an important role in facial expression and appearance. This has been demonstrated in studies with photographs, where higher intellectual and so-

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cial abilities were attributed to individuals with esthetic smiles. They were also judged to be more attractive than the same individuals on photographs with modified lower-level esthetic smiles.^{8,9}

An esthetically pleasing smile is not only dependent on components such as tooth position, size, shape, and color, but also on the amount of gingival display and the framing of the lips. All of these components are supposed to form a harmonic and symmetric entity. The lips are the controlling factor in which portions of the teeth, gingiva, and oral cavity will be seen in an individual's smile.¹⁰ Yet the higher the upper lip is elevated when smiling, the more visible the teeth and gingiva are, and the greater their role is in the esthetic value of the smile. In studies using photographs of smiling individuals unknown to the observer, aspects concerning smile attractiveness were extensively assessed, but in self-assessment studies such aspects were assessed to a lesser degree.^{8,9,11-14} Indeed, studies in which participants judge the attractiveness of their own smiles in a mirror or on a photograph are rare.¹⁵ Moreover, because most portrait photographs are made with posed smiles, people seldom see how their smiles look when acting spontaneously.

Assuming that smile esthetics are closely related to body esthetics and psychological state, Dong et al¹⁶ investigated correlations between personality factors and smile esthetics in 60 Koreans. Personality traits were assessed by means of a Sixteen Personality Factor Questionnaire and esthetics of social smiles were assessed by a panel. The study showed significant correlations of smile attractiveness with extraversion and anxiety. Interestingly, only personality traits of the female participants correlated significantly. No other studies were found, confirming this relation in (nondisfigured) adult participants.

Female beauty has taken a central place in art and culture for centuries. In Western society however, the role of male attractiveness, next to female attractiveness, has been emphasized more and more in the past decades. Therefore, the main hypothesis of this study is that smile attractiveness can be a factor in body satisfaction and can influence personality traits also in men.

To investigate the influence of smile attractiveness on the individual, several aspects of smile esthetics were surveyed in this study: effects of tooth and gingival display on self-judgment of smile esthetics, aspects of the smile that are meaningful in self-perception and satisfaction with the smile, and influence of smile attractiveness on personality traits. Because studies have shown relations between facial attractiveness and traits concerning neuroticism, self-esteem, and extraversion, these traits were included in the hypothesis.

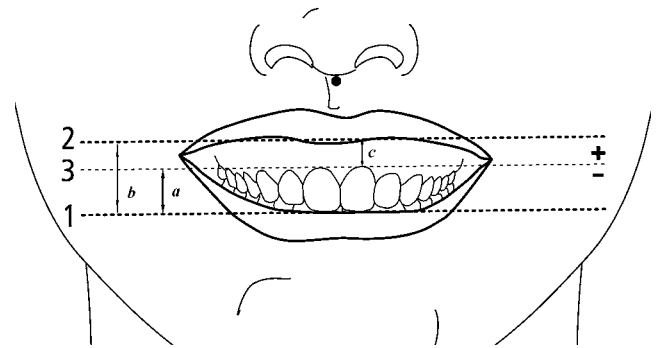


Figure 1. Measurement of the smile line; Line 1: marking of the most incisal point of the central incisor; Line 2: marking the lip edge on the central incisor; Line 3: cervical margin of the central incisor. Above this line the smile line is positive; below the smile line is negative. a: tooth length; b: lip line height; c: smile line height; $c = b - a$.

MATERIALS AND METHODS

Participants

Of 1069 military men on an air force base, 122 were randomly selected for the study. The sample size was determined by means of a power analysis. Based on a pilot study an expected effect size of $r = .25$ was used in the power calculation. To find such an effect with a probability of .80 and with a two-tailed significance level of .05, a sample of 121 people was needed.

Participants were randomly selected from three age cohorts (20–25 years, 35–40 years, 50–55 years). Selection criteria were full maxillary and mandibular dental arches up to and including the first molar, Caucasian, no excessive facial disharmonies, and no visible periodontal disease or caries. The research proposal was approved by the Ethical Committee of the Academic Center of Dentistry Amsterdam. Informed consent was obtained from the participants according to the guidelines of the Academic Center of Dentistry Amsterdam.

Smile Recording and Measurement

A digital videographic measurement method was used to record a spontaneous smile of joy and to measure the smile line height for each tooth in the maxilla.¹⁷ Following Peck and Peck,¹⁸ the smile-line height was expressed relative to the gingival margin and thus is a measure for tooth and gingival visibility (Figure 1). Smile-line height was calculated as the difference between lip-line height and tooth length. When the lip was above the gingival margin, positive values were given. When the teeth were partly covered, negative values were given.

For each participant two smile line heights were used, the minimum and maximum smile-line height in



Figure 2. Spontaneous photograph of the participant smiling made using the digital videographic method.

the maxilla. Using a within-person mean score to express the smile line would result in an incorrect view, as the heights of the smile line between the teeth of a person can differ considerably.

Assessment of Smile Esthetics

For assessing smile attractiveness, a participant-specific questionnaire was developed. On the left page a full smile photograph of the participant was printed. This record of a spontaneous smile was made with a digital videographic measurement method (Figure 2). The spontaneous smiling photograph enabled the participant to judge his smile more in a way as it would be judged by others. On the right page, participants judged perception components: (general) attractiveness of the smile and (general) satisfaction with the smile. Furthermore they judged the contribution of three major components on the esthetic appearance of their smiles:

- General dental components: Size and color of teeth
- Orthodontic components: Position and visibility of teeth
- Smile line components: Upper lip position and visibility of “gums”

A five-point response scale was used, ranging from 1 (very unfavorable) to 5 (very favorable).

Assessment of Personality Traits

The Dutch Personality Index was used for participants' personality assessment.¹⁹ It is one of the most frequently used personality assessment question-

naires in the Netherlands and has been used successfully before in dental-psychological studies. According to the hypothesis that attractiveness can be related to traits concerning neuroticism, self-esteem, and extraversion, the Dutch Personality Index was chosen for this study because it focuses primarily on emotional stability and extraversion.

The Dutch Personality Index measures on seven scales: neuroticism (suffering from vague anxieties, bodily symptoms, depression, and feelings of inferiority), social inadequacy (the tendency to avoid social contacts and feeling uncomfortable in dealing with social contacts), rigidity (holding on to settled habits and principles), aggrievedness (criticizing and suspecting others), self-centeredness (a strong feeling of satisfaction with ones self combined with disinterest in others and their problems), dominance (self-confidence, taking the initiative, and managing others), and self-esteem (a positive attitude toward self, life, and work; adjusted and active).

Data Analysis

Both low smile lines with marginal tooth display as well as high smile lines with excessive gingival display were considered less desirable.^{16,20} Thus, the relationship between the objective smile-line height and judgment of the smile esthetics was determined using a nonlinear quadratic regression analysis; the relation between the general dental, orthodontic, and smile-line components on the one hand and perception components on the other hand was supposed to be linear.

Following the conventions set by Cohen, correlations of 0.10, 0.30, and 0.50 were considered weak, moderate, and strong, respectively.²¹

RESULTS

Smile Line Height and Perception

Cronbach's α of the smile judgment questionnaire was .77, and all items showed substantial contribution to the reliability of the scale.

The general dental components ($r = .25$, $P = .04$) and smile-line components ($r = .29$, $P = .01$) showed substantial relations with the objective smile line. Figure 3 shows that cases where the smile line was positioned such that the teeth were entirely displayed and some gingiva (2 to 4 mm) could be seen were regarded as the most esthetic by the participants. Deviation from this ideal led to a less favorable judgment.

Assessment of Smile Esthetics and Satisfaction

Table 1 shows the predictive ability of esthetic judgments for general smile attractiveness and satisfac-

Table 1. Regression coefficients of esthetic judgments with attractiveness and satisfaction as dependent variables^a

	Attractiveness	Satisfaction
General dental components		
Size of teeth	.29*	
Color of teeth		.36*
Orthodontic components		
Position of teeth		
Visibility of teeth	.23*	
Smile-line components		
Upper lip position	.21*	
Visibility of gums		.25*
Perception components		
Attractiveness of the smile	NI ^b	
<i>R</i>	.54	.52

^a Standardized coefficients for comparing attributes of the components; forward selection of predictors.

^b NI indicates not included.

* $P < .05$.

tion. The fit of both regression models was high. Looking at the predictability of attractiveness, size of teeth, visibility of teeth, and upper lip position were included in the model using forward selection. Because upper lip position and visibility of gums were conceptually and empirically close ($r = .42$), only one of the two showed a significant effect. Yet both were significant, if analyzed separately. The same holds true for position of teeth and visibility of teeth ($r = .39$).

Looking at the predictability of satisfaction, color of teeth and, to a lesser extent, visibility of gums, were especially important for the participants.

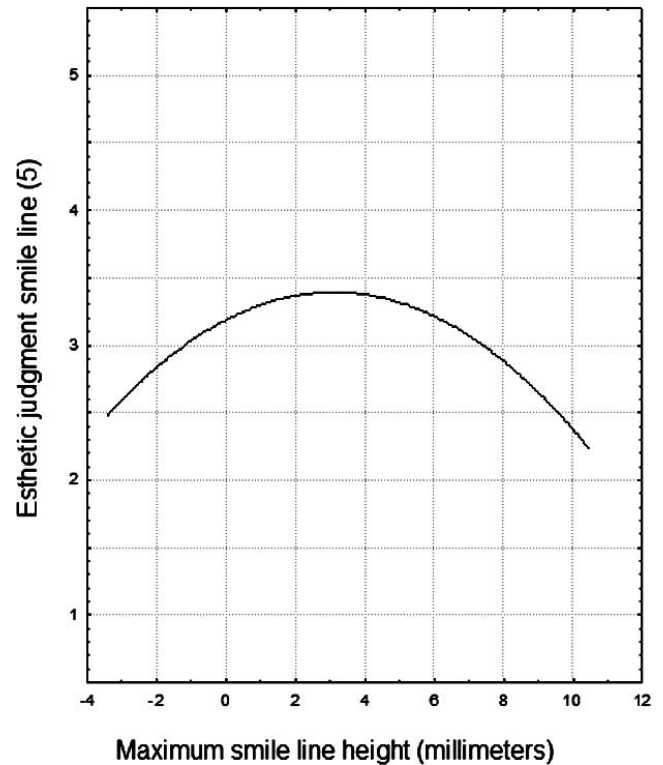


Figure 3. Nonlinear regression curve of the objective smile-line height and the self-perception of the smile line components. 1 = very unattractive; 5 = very attractive.

Smile Esthetics and Personality

Table 2 shows the correlation between self-perception of smile esthetics and personality traits. Negative perception of visibility of gums correlated significantly

Table 2. Correlations between self-perceived smile esthetics and personality scales (*r*), and scores of the personality scales

Variables	Social						
	Neuroticism	Inadequacy	Self-centeredness	Dominance	Self-esteem	Rigidity ^a	Aggrievedness ^a
Size of teeth	-.00	.05	.08	.17	.00	-.01	.08
Color of teeth	.03	.01	.08	.08	.07	-.01	.01
Position of teeth	-.01	-.12	-.13	.20*	.10	.06	-.01
Visibility of teeth	-.09	-.12	.08	.24*	.12	-.15	.01
Upper lip position	-.07	-.17	-.08	.08	.17	-.00	-.06
Visibility of gums	-.27**	-.16	-.04	.09	.20*	-.03	-.09
Attractiveness of smile	-.05	-.00	.11	.12	.01	-.05	-.09
Satisfaction with smile	.09	.13	.06	-.11	-.17	.01	.02
Scores Dutch Personality Index ^b							
Minimum	1	1	1	1	1	1	1
Maximum	8	8	9	9	9	9	9
Mean	3.8	3.1	4.8	5.8	6.5	4.7	5.2
Standard deviation	1.7	1.8	1.9	1.7	1.8	1.5	1.9

^a Italics indicates not included in hypothesis.

^b Dutch Personality Index scores are stanines: 1 = extremely low, 9 = extremely high. Norm scores in reference population: mean = 5, standard deviation = 2.

* $P < .05$; ** $P < .01$.

with higher scores on the neuroticism scale. Visibility of gums also correlated significantly with self-esteem. Visibility of teeth and position of teeth correlated significantly with dominance.

DISCUSSION

The design of this study was relatively new in the orthodontic-psychological field. As in literature, a clear discrepancy between self-perception of facial attractiveness and judgment of others was found. Further study of self-perception of facial and oral attractiveness was clearly needed to gain more insight into the oral self-image and esthetic satisfaction.^{5,6}

To this purpose an individual smile-judgment questionnaire was developed. When assessing smile attractiveness, the smile must be evaluated in the whole face because it is an expressive feature. For example, many movie stars have an attractive smile that is not technically perfect when seen from a dental perspective; however, when the smile fits in the face, the imperfections are not always regarded as disturbing.²² By recording spontaneous smiles of joy, participants were able to assess their smiles, and approach the way their spontaneous smiles will be perceived by the social environment. Analysis of this questionnaire showed high reliability (Cronbach's $\alpha > .70$).²³

Earlier studies found attractiveness to be equally important for men and women in most domains.⁴⁻⁶ In the present study, the sample was restricted to military men, which has both advantages and disadvantages. Selection of the sample according to the criteria was accurate, because adequate dental documentations were present. Admittance to the air force implies selection according to psychological and physical criteria, which implies consistency of the sample. This is confirmed by the Dutch Personality Index scores, which showed a pattern of a psychologically sound population (Table 2). Furthermore, different professional groups within the air force were represented. This resulted in a wide range of educational and social levels. Facial attractiveness is not a primary concern for members of such a sample, as attractiveness is not a professional requirement or advantage as it would be in service professions requiring "face-to-face" contacts with clients. Thus, the choice for such a sample may have limited the strength of the relationships. On the other hand, given that such a sample was used, the results address elementary phenomena in social interaction.

The lips are the controlling factor in the smile. The higher the smile line, the more visible the teeth and gingiva are, and the more they will determine the appearance of the smile. Higher smile lines that fully display the teeth are associated with youth. Lower smile

lines are associated more with old age, as the lips are supposed to sag when a person grows older.²⁴

In the present study, participants with smile lines situated in the 2 to 4 mm range (full teeth and some gingival display) had the most favorable perception of the smile-line height. This is in accordance with Kokich et al,¹³ where laypeople considered smile-line heights in strangers with a general gingival display exceeding 4 mm as unattractive. In the study of Geron and Atalia,¹⁴ laypeople already considered 1 mm gingival display as unattractive. However, comparability with their study is somewhat compromised because it defined gingival display at the upper central incisors only. Higher smile lines with substantial gingival display are regarded in the literature as a serious esthetic problem, especially in males, where lower smile lines are the norm; whereas higher smile lines are considered to be the norm for females.^{14,18,24} Therapies vary from gingival surgery to orthodontics in milder cases.²⁵ More severe cases require orthodontics in combination with surgical osteotomies.¹⁸

Participants' favorable self-perception of smile attractiveness as having a full display of teeth and some gingival display is supported by the results shown in Table 1. Size of teeth, visibility of teeth, and upper lip position are most important predictive variables for smile attractiveness. Appreciation of these variables by the male participants corresponds with female preferences for the expressive feature of a bright smile in men.²⁶ A bright smile in which well-proportioned teeth are clearly displayed is associated with favored male qualities as dominance, maturity, masculinity, strength, and social competence.

Tooth color and visibility of gums correlated with satisfaction of the smile (Table 1). The fact that tooth color is one of the most important factors in satisfaction with oral appearance is in accordance with the self-perception study of Neumann et al.²⁷

Concerning self-perception of smile attractiveness and satisfaction, we presume a difference in self-perception of parts and the whole. Following the rules of the Gestalt psychology, the whole is more than the sum of its parts.²⁸ Especially in the case of the mouth, self-perception will be influenced by psychological circumstances as the mouth plays a significant role in the psycho-physiologic development of the individual and the emotional perception in adults.

Therefore, from a psychological point of view, we can distinguish two dimensions in self-perception of the smile. The first dimension is perception of attractiveness of the smile. This perception is especially defined by the opinions of others and cultural norms. The social dimension (field of social psychology) is relative to the history of culture. As cultures are changing, perception of attractiveness is changing too. Nowadays a

bright smile has become an important aspect of facial attractiveness in Western culture. Indeed, in this study, attractiveness of the smile correlated with size of teeth, visibility of teeth, and upper lip position. The second dimension in self-perception of the smile is satisfaction with its appearance. This perception originates from the internal view, the inner experience of the individual itself: the individual dimension (field of personality psychology). Tooth color and visibility of gums, correlating with satisfaction in this study, can be seen as basic components in self-perception of the smile. White teeth and marginal gingival display correspond with the authentic meaning of the smile expression as a friendly and nonaggressive signal to others.

Attractiveness theories predict that a person's attractiveness can influence judgments and treatments by others. As a result of this, attractiveness can influence a person's behavior and traits.⁴ Being part of facial attractiveness, the influence of smile attractiveness on personality was studied here. As hypothesized, significant relations between self-perception of smile attractiveness and the personality traits of neuroticism, self-esteem, and dominance have been found. Visibility of gums correlated with both neuroticism ($-.27$) and self-esteem ($.20$). Visibility of teeth and position of teeth correlated with dominance ($.24$ and $.20$, respectively). Heights of these correlations correspond with studies investigating self-perception of facial attractiveness where (significant) correlations ranged between $r = .18$ (dominance) and $r = .27$ (self-esteem).^{5,6}

On the one hand, these correlations are limited. In this study, basic personality traits were chosen in the hypothesis. Based on the existing literature, attention was given to extraversion and neuroticism. However, a large impact of facial attractiveness on these personality traits could not be expected as a result of the rather stable character and the relative high genetic determination of these traits. On the other hand, the correlating traits in this study are considered important personality traits in men because they are associated with a masculine personality: low neuroticism, high self-esteem, and dominance.

The results of this research underpin the psychosocial importance and the dental significance of an attractive smile. We suggest further study on the esthetic aspects of the oral region within the whole scope of facial esthetics and in the context of acceptance with one's own body.

CONCLUSIONS

- Size of teeth, visibility of teeth, and upper lip position are critical factors in self-perception of smile attractiveness (social dimension). Color of teeth and gin-

gival display are critical factors in satisfaction with smile appearance (individual dimension).

- Smiles with disproportional gingival display are judged negatively and correlate with personality characteristics.

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REFERENCES

1. Dion K, Berscheid E, Walster E. What is beautiful is good. *J Pers Soc Psychol.* 1972;24:285–290.
2. Bull R, Rumsey N. *The Social Psychology of Facial Appearance.* New York, NY: Springer Verlag; 1988.
3. Flanary C. The psychology of appearance and psychological impact of surgical alteration of the face. In: Bell WH, ed. *Modern Practice in Orthognathic and Reconstructive Surgery.* Philadelphia, Pa: Saunders; 1992: 3–21.
4. Langlois J, Kalakanis L, Rubenstein A, Larson A, Hallam M, Smoot M. Maxims or myths of beauty? A meta-analytic and theoretical review. *Psychol Bull.* 2000;126:390–423.
5. Feingold A. Good-looking people are not what we think. *Psychol Bull.* 1992;111:304–341.
6. Greitemeyer T, Brodbeck F. Wer schön ist, "wird" auch gut. *Z Sozialpsychol.* 2000;31:73–86.
7. Thompson L, Malmberg J, Goodell N, Boring R. The distribution of attention across a talker's face. *Discourse Process.* 2004;38:145–168.
8. Eli I, Bar-Tal Y, Kostovetzki I. At first glance: social meanings of dental appearance. *J Public Health Dent.* 2001;61: 150–154.
9. Newton JT, Prabhu N, Robinson PG. The impact of dental appearance on the appraisal of personal characteristics. *Int J Prosthodont.* 2003;16:429–434.
10. Moskowitz M, Nayyar A. Determinants of dental esthetics: a rationale for smile analysis and treatment. *Compend Contin Educ Dent.* 1995;16:1164–1166.
11. Kenealy P, Gleeson P, Frude N, Shaw W. The importance of the individual in the "causal" relationship between attractiveness and self-esteem. *J Community Appl Soc.* 1991;1: 45–56.
12. Dann C 4th, Phillips C, Broder HL, Tulloch JF. Self-concept, class II malocclusion, and early treatment. *Angle Orthod.* 1995;65:411–416.
13. Kokich V, Kiyak H, Shapiro P. Comparing the perception of dentists and lay people to altered dental esthetics. *J Esthet Dent.* 1999;11:311–324.
14. Geron S, Atalia W. Influence of sex on the perception of oral and smile esthetics with different gingival display and incisal plane inclination. *Angle Orthod.* 2005;75:778–784.
15. Wolfart S, Quaas AC, Freitag S, Kropp P, Gerber WD, Kern M. Subjective and objective perception of upper incisors. *J Oral Rehabil.* 2006;33:489–495.
16. Dong JK, Jin TH, Cho HW, Oh SC. The esthetics of the smile: a review of some recent studies. *Int J Prosthodont.* 1999;12:9–19.

17. Geld Van der P, Oosterveld P, Van Waas M, Kuijpers-Jagtman AM. Digital videographic measurement of tooth display and lip position in smiling and speech: reliability and clinical application. *Am J Orthod Dentofacial Orthop*. In press.
18. Peck S, Peck L. Selected aspects of the art and science of facial esthetics. *Semin Orthod*. 1995;1:105–126.
19. Luteijn F, Starren J, van Dijk H. *Manual to the Dutch Personality Index (NPV)*. Lisse, The Netherlands: Swets en Zeitlinger; 2001.
20. Sarver DM. The importance of incisor positioning in the esthetic smile: the smile arc. *Am J Orthod Dentofacial Orthop*. 2001;120:98–111.
21. Cohen J. *Statistical Power Analysis for the Behavioural Sciences*. 2nd ed. Hillsdale, NJ: Lawrence Erlbaum; 1988.
22. Shaw W, Rees G, Dawe M, Charles C. The influence of dentofacial attractiveness on the social attractiveness of young adults. *Am J Orthod*. 1985;87:21–26.
23. Nunnally JC. *Psychometric Theory*. New York, NY: McGraw Hill; 1967.
24. Dickens ST, Sarver DM, Profitt WR. Changes in frontal soft tissue dimensions of the lower face by age and gender. *World J Orthod*. 2002;3:313–320.
25. Kokich V. Esthetics: the orthodontic-periodontic restorative connection. *Semin Orthod*. 1996;2:21–30.
26. Cunningham M, Barbee A, Pike L. What do women want? Facialmetric assessment of multiple motives in the perception of male facial attractiveness. *J Pers Soc Psychol*. 1990; 59:61–72.
27. Neumann LM, Christensen C, Cavanaugh C. Dental esthetic satisfaction in adults. *J Am Dent Assoc*. 1989;118: 565–570.
28. Wertheimer M. Gestalt theory. In: Ellis WD, ed. *A Source Book of Gestalt Psychology*. New York, NY: The Humanities Press; 1938:1-11.