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Relationship between Facial Attractiveness and Occlusal Treatment Outcomes: A Retrospective Study

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RELATIONSHIP BETWEEN FACIAL ATTRACTIVENESS AND OCCLUSAL
TREATMENT OUTCOMES: A RETROSPECTIVE STUDY

A thesis submitted in partial fulfillment of the requirements for the degree of Master of
Science in Dentistry at Virginia Commonwealth University.

by

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Abstract

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The goal of this study was to determine if a relationship exists between pretreatment facial attractiveness and posttreatment occlusal outcome in orthodontic patients. A randomized sample of forty-seven patients (26 males, 21 females) was selected for inclusion in this study. Orthodontic evaluators rated pretreatment patient photographs (frontal smile, frontal, profile) using a 100 mm visual analog scale (VAS). Occlusal outcomes were evaluated using percentage reduction in weighted Peer Assessment Rating (PAR) index scores and the American Board of Orthodontics objective grading system (ABO-OGS). Spearman correlation coefficients were calculated to assess the relationship between pretreatment VAS attractiveness ratings and posttreatment occlusal scores. There was a fair correlation between facial attractiveness and reduction in weighted PAR index

scores for all patients ($r=.41$, $p<.01$) and for male patients ($r=.48$, $p<.05$). The results showed a good correlation between facial attractiveness and the ABO-OGS for females ($r=.55$, $p<.05$).

Introduction

An individual's facial attractiveness has significant bearing on their social, professional, and personal life. Graber¹ noted that although clinical orthodontics and social psychology seem to be merely tangentially related, they actually possess numerous areas of overlap between them. Research by Shaw et al² focused on the psychological well-being of patients initiating orthodontic treatment by analyzing factors such as teasing, self-esteem, facial attractiveness and patient motivation for treatment. Previous studies showed that beginning orthodontic treatment alone dramatically improved the self-esteem of patients.³ O'Brien conducted a multi-center randomized controlled trial to examine early treatment for the correction of Class II malocclusions and observed an improved self-concept and overall psychosocial well being of the patients.^{4,5} It is apparent that the link between orthodontics and social psychology has been well established.

The research in social psychology is replete with findings emphasizing the benefits of beauty and attractiveness. Studies show that more attractive individuals are perceived as more intelligent⁶ and rated as more likely to enjoy richer social lives.⁷ Dion and Bercheid showed that people assume that attractive individuals are better parents, are more likely to get higher paying and more prestigious jobs, and have happier marriages.⁸ Other research concluded that teachers are less harsh with attractive students when disciplining them⁹ and criminologists have shown that more attractive criminals get lighter sentences.¹⁰ Additionally, attractive adolescents were perceived as smarter, more extraverted and socially skilled than less attractive individuals.^{11,12} Zebowitz showed that teachers project

a sense of intellectual superiority to their more attractive students, who have subsequently shown increases in IQ scores.¹³

People often make inferences regarding an individual's character instantaneously based on attractiveness. Facial attractiveness is assessed rapidly and from a brief stimulus, and these brief exposures bias other cognitive processes and form a lasting opinion of the individual. The brain allegedly processes these perception biases selectively to maintain the initial association between an individual's character and their appearance.^{14,15,16} These theories can explain why first impressions are lasting.

The research in the area of social psychology concerning attractiveness bias can be applied in a clinical orthodontic setting. Studies indicate that orthodontists focus on improving attractiveness as the primary goal of orthodontic treatment.¹⁷ It is possible that the initial perception of a patient's facial attractiveness may influence the quality of treatment that a patient receives. The purpose of this study was to determine if a relationship exists between pretreatment facial attractiveness and posttreatment occlusal outcome in orthodontic patients. To date, no clinical studies have been performed to assess the link between perceived facial attractiveness and occlusal outcome measures. A study of this nature can be beneficial in determining if clinician biases regarding facial attractiveness impact treatment success.

Materials and Methods

Records from treated patients at the Virginia Commonwealth University School of Dentistry Department of Orthodontics were used for this study. The patients were treated by graduate orthodontic residents under the supervision of full-time and part-time orthodontic faculty members. Institutional Review Board approval was granted to conduct this retrospective study. From a list of 757 patients who completed treatment over a 24 month period, 107 records (43 males, 64 females) qualified for the study based on the following inclusion criteria: 1) patients who completed non-surgical comprehensive orthodontic treatment with conventional fixed appliances, 2) patients who did not present with a syndrome affecting their dentoalveolar and/or facial appearance, 3) patients with a pretreatment ANB value no more than one standard deviation from the normative values, 4) patients without anterior open bites and 5) patients with high quality pretreatment and posttreatment dental casts, photographs and radiographs. A random number generator was used to select a population of 47 patients (26 males, 21 females) from the sample of 107 for this study.

Treatment success and effectiveness was evaluated using two separate occlusal indices: Peer Assessment Rating (PAR) index and the American Board of Orthodontics objective grading system (ABO-OGS). The PAR index is a valid and reliable tool used to quantify malocclusion severity and to measure improvement due to orthodontic treatment.^{18,19} The measures of the PAR index include overbite, overjet, centerline, maxillary and mandibular anterior alignment, and right and left buccal occlusion. Higher

PAR scores indicate a greater severity of malocclusion. The ABO-OGS is a validated tool to evaluate posttreatment records according to eight measurement categories: alignment, marginal ridges, buccolingual inclination, occlusal contacts, occlusal relations, overjet, interproximal contacts, and root angulation.²⁰ Points are deducted based upon deviations from ideal within each of these categories and totaled to give the final OGS score for a completed case. Therefore lower scores indicate better occlusal results as defined by this measure. This scoring system is much more stringent and precise than the PAR index in assessing the outcome of treatment and can be useful in detecting detailed differences between cases.^{21,22} Pretreatment and posttreatment plaster dental models were evaluated and scored using the PAR index by a calibrated examiner (C.E.F.). All PAR scores were rated as described by DeGuzman et al¹⁹ to reflect the American opinion of malocclusion severity. The posttreatment models and panoramic radiographs were scored according to the ABO-OGS by the same calibrated examiner. Intraexaminer reliability was assessed by repeating the scoring of both measures on a set of 10 models at one week after the initial examination.

Pretreatment attractiveness was rated by ten orthodontic evaluators who were given a packet of photographs containing 3 pretreatment photographs (frontal smiling, frontal, profile) of each patient per page. Pretreatment photographs of male and female patients were used based on the assumption that orthodontists form their initial opinion of patient attractiveness even before treatment begins. A 100 mm visual analog scale was printed at the bottom of each page and anchored on the left with “very unattractive” and on the right with “very attractive.” All of the evaluators were asked to not turn back to previous pages

of the packet to view completed ratings and they were given no time limit for completion of the ratings. Four photographs (two male, two female) were repeated in each packet to assess intraexaminer reliability. Based on a method utilized by Dion and Bercheid,⁸ only the ratings from evaluators with interexaminer and intraexaminer reliability coefficients greater than .50 were used for the study. For statistical purposes, the average VAS attractiveness score was used to assess the overall facial attractiveness of the study subjects.

All statistical analyses were performed with SAS software (SAS, Cary, NC). Spearman correlation tests were used to assess intraexaminer and interexaminer reliability for VAS attractiveness scores, as well as intraexaminer reliability for PAR index scoring and ABO-OGS measures. Spearman correlation coefficients were calculated independently to describe the relationship between the mean VAS attractiveness scores and the percentage improvement in weighted PAR index scores as well as the ABO-OGS scores. A Wilcoxon signed-rank test was used to determine differences in percentage reduction of weighted PAR scores and ABO-OGS scores between the ten most attractive patients and ten least attractive patients. This analysis was repeated using the ten most attractive patients and ten least attractive patients within gender groups. A significance level of 0.05 was set for all analyses.

Results

The demographic characteristics, attractiveness rating values, and occlusal measures of the patient sample are presented in Table 1 and Table 2. The VAS attractiveness mean scores were derived from the ratings of the five orthodontic raters with Spearman correlation coefficients greater than .50 for the entire patient sample.

Table 1: Demographic Characteristics of Patients

Variable	Overall (N=47)	Males (n=26)	Female (n=21)
Mean Age at Start of Treatment (years)	15.9 (4.2)	15.6 (4.0)	16.2 (4.4)
Ethnicity n (%)			
Caucasian	36 (76.6%)	17 (65.4%)	19 (90.5%)
African-American	6 (12.8%)	5 (19.2%)	1 (4.8%)
Asian	3 (6.4%)	3 (11.5%)	0 (0.0%)
Hispanic	2 (4.3%)	1 (3.9%)	1 (4.8%)
Mean Treatment Duration (years)	1.5 (0.67)	1.60 (0.74)	1.36 (0.57)

Table 2: Summary of Occlusal Outcomes and Attractiveness Measures

Group	Weighted PAR Score			ABO-OGS	VAS
	Initial	Final	Percent Reduction		
All	20.3 (5.8)	4.2 (2.8)	77.9 (15.7)	36.7 (11.3)	46.9 (26.9)
Males	19.1 (4.5)	4.0 (2.1)	76.7 (18.2)	38.3 (7.6)	41.6 (23.9)
Females	21.5 (6.9)	4.4 (3.4)	79.1 (13.8)	35.1 (14.3)	52.4 (29.9)
10 Most Attractive	20.7 (7.2)	2.6 (2.1)	86.5 (9.2)*	35.2 (11.7)	72.6 (7.3)
10 Least Attractive	19.9 (4.3)	5.8 (2.5)	69.3 (16.5)*	38.2 (11.4)	21.4 (4.7)
Males					
10 Most Attractive	20.1 (5.3)	3.2 (2.0)	84.9 (8.2)	43.8 (13.0)	60.7 (8.6)
10 Least Attractive	19.7 (6.0)	4.6 (1.7)	73.5 (16.8)	40.5 (10.4)	26.6 (5.1)
Females					
10 Most Attractive	24.8 (10.3)	3.2 (2.2)	85.4 (9.8)	31.4 (13.6)*	67.6 (11.2)
10 Least Attractive	20.7 (6.4)	4.7 (2.7)	76.6 (11.1)	44.9 (12.4)*	33.1 (13.9)

*p<.05

The Spearman correlation coefficients assessing intraexaminer reliability for the Peer Assessment Rating (PAR) index scores and the ABO-OGS scores were both .99 ($p < .01$), indicating excellent reliability in the consistency of the occlusal measures.

The correlation between pretreatment facial attractiveness and posttreatment percentage reduction in weighted PAR scores for all patients showed a fair,²³ but not strong, statistically significant correlation ($r = .41$, $p = .004$; Fig 1). However, the correlation between the attractiveness ratings and the ABO-OGS scores did not show a significant correlation ($r = -.27$, $p = .30$; Fig 2). There were no significant differences between the ten most attractive and ten least attractive subjects for initial weighted PAR scores ($p = .96$; Fig 3, Table 2). Additionally, the subset analysis results of the subjects with the lowest and highest attractiveness scores across genders referenced in Table 2 showed a significant difference between these two groups for percentage reduction in weighted PAR score ($p = .01$), but no significant difference was found between the groups using the ABO-OGS score ($p = .97$).

The data were analyzed to determine if there were any differences in occlusal outcomes within gender groups based on pretreatment facial attractiveness scores. The pretreatment VAS attractiveness scores for the females indicated a non-significant correlation with posttreatment occlusal outcome using the percentage reduction in weighted PAR scores ($r = .41$, $p = .06$; Fig 1) and a good²³ correlation using the ABO-OGS scores ($r = -.55$, $p = .01$; Fig 2). Additionally, the results of the subset analysis using the most attractive and least attractive segments of the patient populations by gender shown in Table 2 indicated a significant difference in ABO-OGS scores for females ($p = .01$; Fig 4). The

average ABO-OGS score for the most attractive female group were nearly fifty percent lower than the value for the least attractive female group. The pretreatment VAS attractiveness scores for the males were significantly correlated with the posttreatment occlusal outcome using the percentage reduction in weighted PAR scores ($r=.48$, $p=.01$; Fig 1). There was also not a significant correlation between pretreatment VAS attractiveness scores and the ABO-OGS scores for the males ($r=.32$, $p=.12$; Fig 2). There were no significant differences between the most and least attractive male patients using the percentage reduction in weighted par scores ($p=.05$; Fig 3, Table 2) and average ABO-OGS scores ($p=.50$; Fig 4, Table 2).

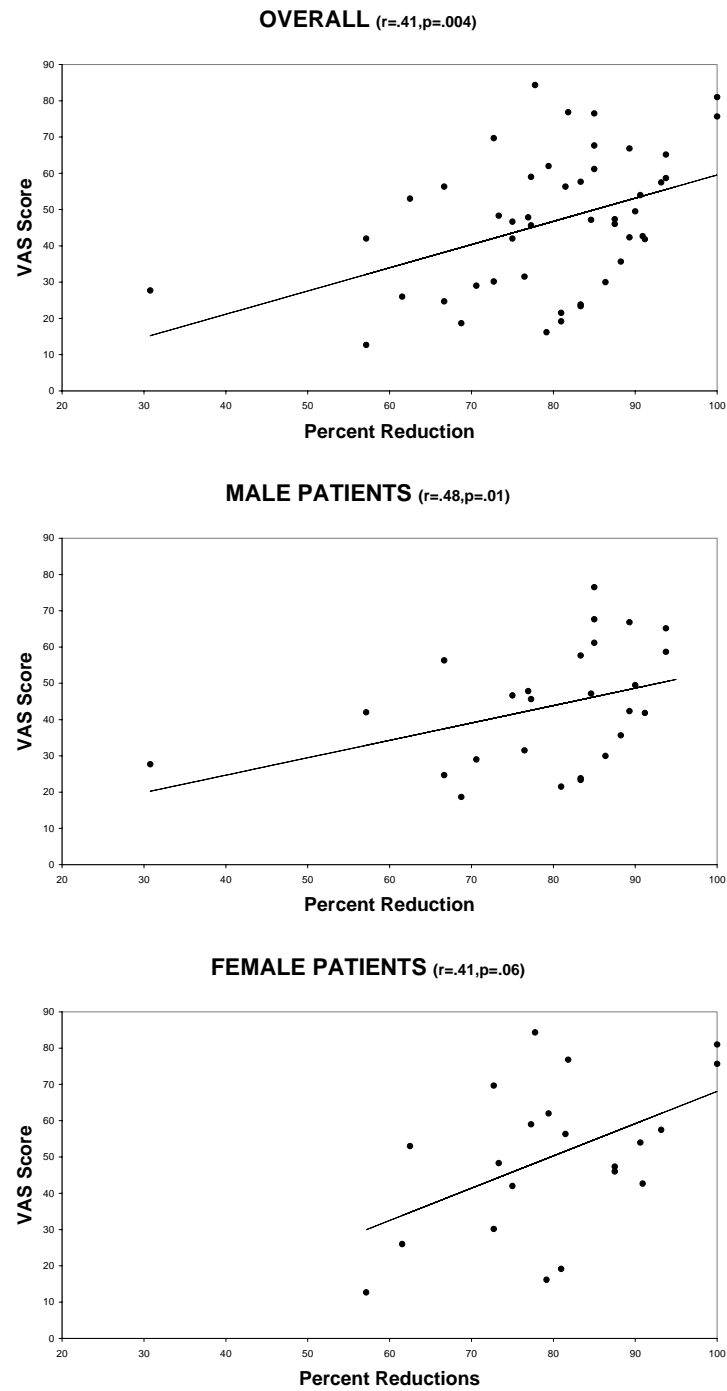


Figure 1: Scatterplots showing percent reduction in weighted PAR scores versus pretreatment VAS attractiveness rating

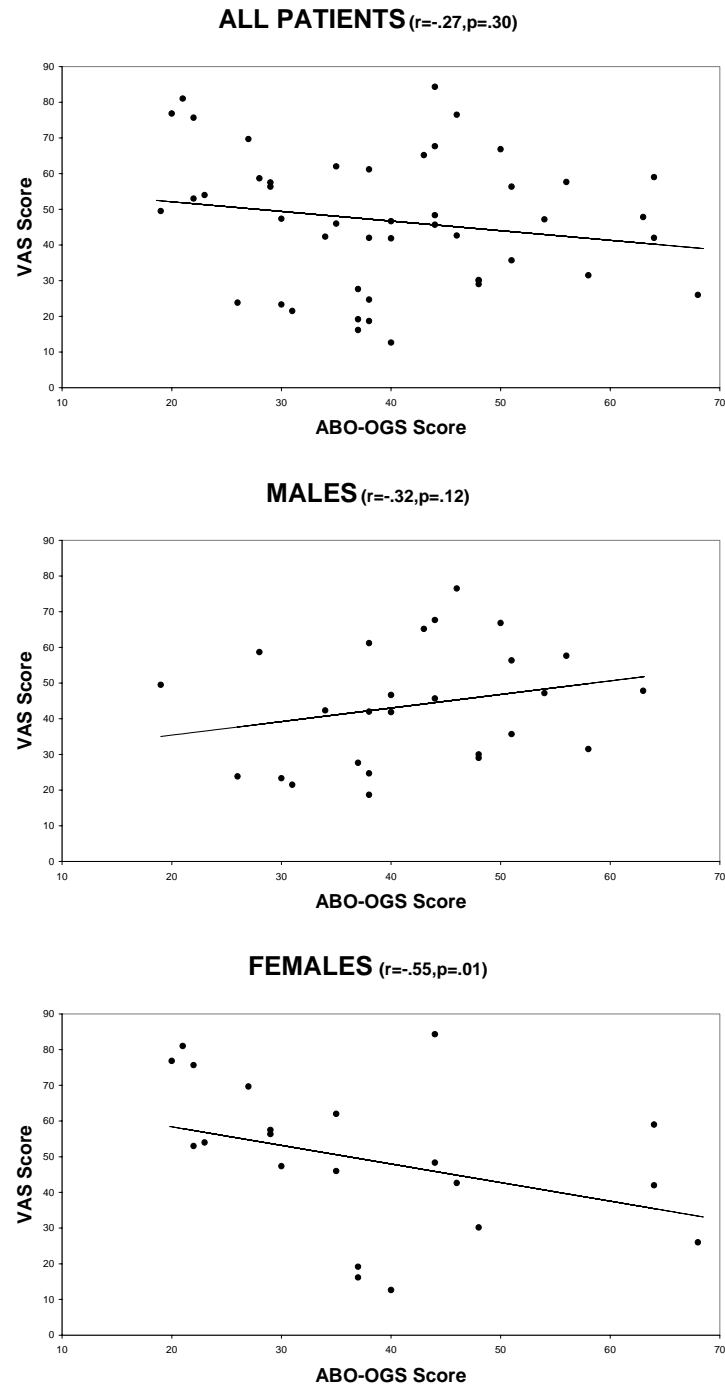


Figure 2: Scatterplots showing ABO-OGS scores versus pretreatment VAS attractiveness ratings

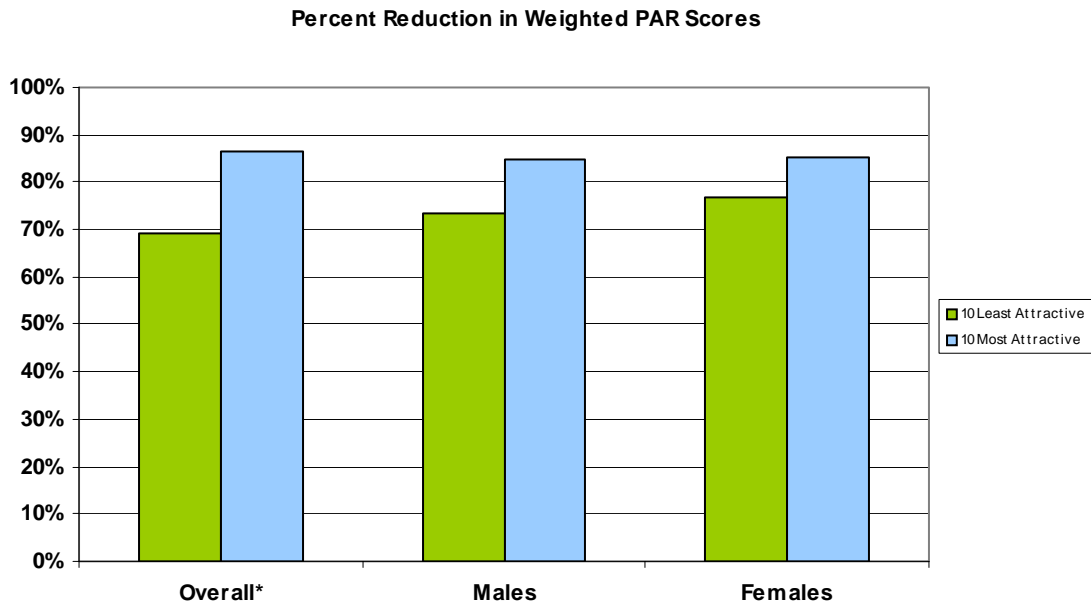


Figure 3: Percentage reduction in weighted PAR scores for the 10 most attractive and 10 least attractive patients (*p<.05)

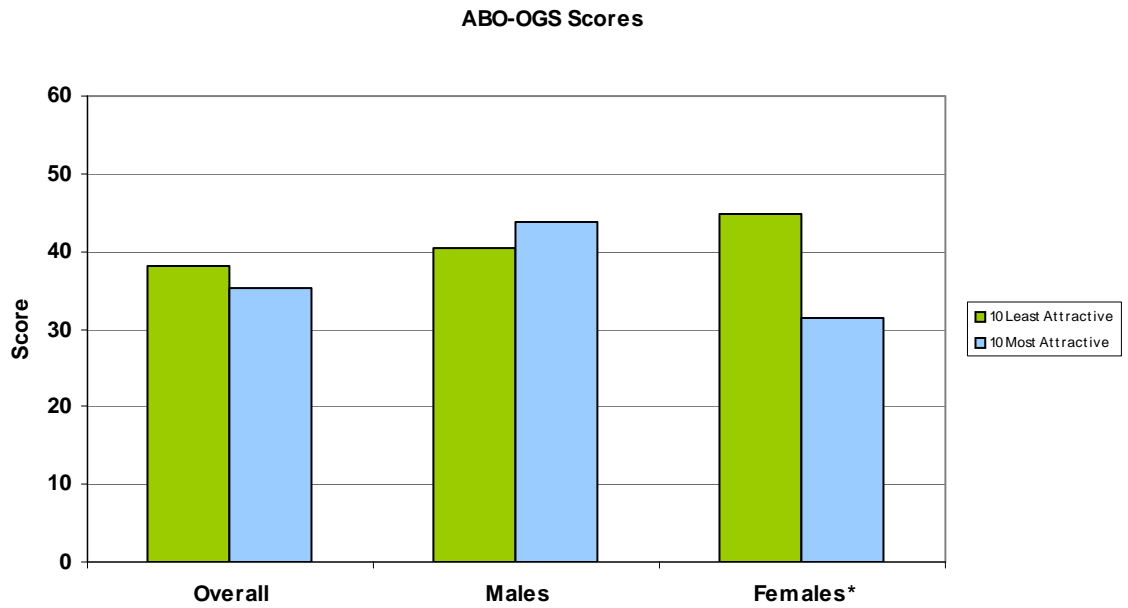


Figure 4: ABO-OGS scores for the 10 most attractive and 10 least attractive patients (*p<.05)

Discussion

This study assessed the relationship between pretreatment facial attractiveness of orthodontic patients and posttreatment occlusal outcomes based on two separate measurement tools. No studies have been published linking patient attractiveness with treatment quality in either the medical or dental literature. However, many social psychology studies have been performed associating individual attractiveness with positive attributes and social benefits.

Based on the findings of this study, the hypothesis that more attractive individuals have better occlusal outcomes resulting from orthodontic treatment is true based on the positive correlation between facial attractiveness and percentage reduction in weighted PAR scores. Additionally, the findings for the female subset of the population showed a strong correlation between facial attractiveness and the more stringent ABO-OGS measure. In a meta-analysis of the social psychology attractiveness literature, it was noted that human culture values female attractiveness more than male attractiveness.¹² It is perhaps the greater value placed on female attractiveness that influenced the outcome of this study.

Although a positive correlation between attractiveness and treatment outcome was apparent, it does not necessarily confirm a bias in treatment quality delivered based on a patient's attractiveness. As noted earlier, patients who are more attractive may value esthetically driven treatments, such as orthodontics, and be more compliant during treatment. Studies have shown that compliance during orthodontic treatment is a primary factor in determining treatment success.²⁴ It is interesting that among the most predictive factors for patient compliance are also highly correlated attributes of attractive individuals:

self-esteem and self-confidence.^{7,25} The studies of self-efficacy show that individuals have the ability to focus on achieving goals based upon the way others perceive them.^{7,24,26-28} If an individual perceives they possess an attribute valued by others in society such as attractiveness, then they feel more empowered and self-confident. Although orthodontists may be biased and truly provide better treatment for more attractive patients, it may be because more attractive patients value and demand detail to a higher degree than average. This is consistent with research in social psychology enumerating the positive personal attributes possessed by more attractive individuals.¹²

The variability in VAS attractiveness ratings by orthodontists was comparable to that reported in previous studies.²⁹ The VAS scale is a simple, sensitive and effective tool to evaluate facial attractiveness in a group of patients and has advantages over other tools (eg. Likert scales) by avoiding biases in the selection of preferred values.^{30,31} The below average VAS ratings for the sample (mean of 46.9/100) are consistent with prior studies showing that orthodontic specialists are more critical of facial attractiveness than lay persons.³² The rationale to include only the scores from raters with high correlation coefficients was used to strengthen the score by reducing the variability of ratings for particular patients and has been applied in previous studies.⁸ The rationale to include three pretreatment photographs in the evaluation packet (frontal smiling, frontal, and profile) was based on recommendations from a previous study, citing the need for multiple views to fully assess facial attractiveness.³³ The inclusion criteria were carefully set to exclude individuals with obvious anteroposterior skeletal discrepancies. This measure theoretically reduced the inherent bias associated with an orthodontic specialist's study and

criticism of the profile view of the face.³⁴ Additionally, it seemed appropriate to use pretreatment photographs for the evaluation of facial attractiveness based on prior studies showing that immediate inferences are made regarding an individual's character. Studies have shown that attractiveness, likeability, trustworthiness, and competence are assessed in as little as 100 ms.³⁵ Hence, viewing pretreatment photographs may be analogous to an initial encounter between a patient and a clinician, including all of the inferences made regarding their character.

Although there was a statistically significant relationship between pretreatment facial attractiveness and posttreatment occlusal outcomes for the overall patient population, the high correlation between pretreatment facial attractiveness and occlusal outcomes for the female subset of this population is of particular interest. This may not imply that orthodontists are biased in their treatment of patients, but could be due to factors such as motivational differences between males and females and higher esthetic standards possessed by females. Further research may include the further examination of a possible relationship between patient cooperation, facial attractiveness and occlusal treatment outcome.

Conclusions

The conclusions of this retrospective study were:

- There is a fair correlation between pretreatment facial attractiveness and the percentage reduction in posttreatment PAR index scores for all patients.
- There is a moderately strong correlation for female patients between pretreatment facial attractiveness and occlusal treatment outcome measures (ABO-OGS scores).

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