Original Article

Sex differences in esthetic treatment needs in American Black and White adolescent orthodontic patients

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ABSTRACT

Objective: To test whether the severity of malocclusions in adolescents who actually entered orthodontic treatment is different between the sexes, as this might explain the preponderance of girls in orthodontic practices.

Materials and Methods: Severity was gauged with the 10-grade esthetic component of the Index of Orthodontic Treatment Need (IOTN) scored on the pretreatment intraoral photographs (n = 562) in a university-based specialty program. The samples of American White (n = 401) and American Black (n = 161) adolescents were free of craniofacial defects. Nonparametric statistics were used for analysis.

Results: There is a significant sex difference in the IOTN in White teenagers due to milder, more esthetic cases among the girls. No sex difference occurs in the sample of Blacks, with both sexes having IOTN scores on a par with White males. The severity of malocclusion is independent of the age at start of treatment (within range of 12 to 19 years).

Conclusions: Greater subjective self-perceptions of occlusal issues seem to account for the preponderance of White girls in the patient pool, though why the sex difference is not evident in American Blacks is complex. We speculate that sex differences are larger in private practices, since there are fewer selection criteria for entering treatment. (*Angle Orthod.* 2011;81:743–749.)

KEY WORDS: Treatment need; Esthetics; Sex difference; Self-image

INTRODUCTION

Factors motivating adolescents to seek orthodontic care are complex, but esthetics—especially alignment of the visible anterior teeth—often is a predominant issue.[1–7] Psychosocial issues, driven by the adolescent's self-perception of his or her occlusion, creates an interesting disparity. On the one hand, objective epidemiological studies find few sex differences in the incidence or severity of malocclusions.[8–12] In contrast, orthodontic patients consist of roughly twice as many girls as boys. The present study is an effort to resolve this apparent discrepancy.

An obvious inference is that girls (and their financially responsible parents) are appreciably more sensitized to occlusal issues compared to boys.[4,13,14] The purpose of the present study was to test for a sex difference in the severity of pretreatment malocclusions of adolescents who were treated orthodontically. Several studies of unselected children report that adolescent girls tend to be more critical of their occlusion than boys,[5,15–17] and, interestingly, this sex difference extends to the percentage of parents who are more critical and more concerned about their daughter's malocclusion than that of their son.[13] The present study looks instead at adolescents who actually entered treatment, which is a subset of those who would benefit from treatment.[4] Expectation was that the median measure of severity would be less in girls than boys, suggesting that the sex difference is based on subjective psychosocial factors rather than a biological basis for the severity of malocclusions. Given our access to the cases, we also explored whether the results are comparable in American Blacks and Whites who shared the same orthodontic facilities. Nationally, there appears to be little Black-

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White difference in the need for treatment, but a much smaller proportion of Blacks receives treatment.[10,11]

MATERIALS AND METHODS

This was a retrospective study of 562 adolescent orthodontic patients treated in a university-based graduate orthodontic program. The adolescents studied were either American Whites (n = 401) or American Blacks (n = 161) based on self-identification. Cases were between 12 and 19 years of age at the start of treatment, so the permanent canines were erupted, but with a young enough upper limit that treatment was almost invariably covered financially by the parents. Institutional review board approval and a waiver of consent were obtained for this retrospective HIPAA-compliant study.

Patients with mutilated dentitions were omitted (which was quite rare in this age interval), as were cases with discernible developmental syndromes[18,19] such as facial clefts, including the congenital absence of permanent teeth. The intent was to restrict the sample to cases presenting primarily for esthetic reasons. All cases subsequently were treated with comprehensive full-bonded appliances.

The Standardized Continuum of Aesthetic Need (SCAN) component of the Index of Orthodontic Treatment Need (IOTN) developed by Brook and Shaw[20] was used to score each person's malocclusion. The IOTN consists of two independently scored components. The dental health component focuses on the functional capacity of the dentition, and the esthetic component, the SCAN, is a 10-grade ordinal scheme used to visually score the severity of a malocclusion, specifically focusing on esthetic considerations of the anterior teeth.[2] SCAN grades are arrayed from 10 (most attractive tooth arrangements) to 1 (least attractive). Broadly, grades 7–10 indicate little need for orthodontic treatment, grades 4–6 suggest a moderate need, and grades 1–3 reflect definite treatment needs.[3,13] Prior studies have documented the validity and reliability of the SCAN as a practical tool for measuring a patient's need for orthodontic treatment,[3,21] and significant correlation between self-evaluation and evaluation by a dental professional using the SCAN has been established.[13,20]

All scores were made by one observer following several trials to develop internal consistency. Cases were scored from frontal intraoral photographs of sequential cases archived in an orthodontic case-display system (Dolphin Imaging 10; Dolphin Imaging, Chatsworth, Calif) of adolescents who had entered treatment since 2000. The digital color photographs had been taken of the frontal view of the dentition exposed with cheek retractors as a normal part of diagnostic orthodontic records. These images correspond closely with the nature of the 10-photograph scale of the SCAN, and photographs can be scrutinized longer and more carefully than during actual patient examinations. Repeatability of 30 cases scored several weeks apart had a Spearman's rank correlation of .94 ($P < .0001$), and a kappa statistic of 0.71 (SE = 0.096). Scores not identical between sessions were all within 1 grade difference.

Potential sex and race differences were tested using the nonparametric Wilcoxon-Mann-Whitney test for independent samples (where the test statistic is labeled *z*).[22] The Kruskal-Wallis test was used to test for differences among multiple samples (corrected for tied ranks). Tests for association were based on Spearman's rank-order correlation (*rho*). Statistics were calculated using JMP software (SAS Institute, Cary, NC). Tests were two-tail evaluated at the conventional alpha level of .05.

RESULTS

SCAN Distributions

The SCAN distribution of these orthodontic cases is positively skewed (Figure 1), with a longer tail toward the smaller (less esthetic) grades. Predictably, there are few cases of the most esthetic tooth arrangements (grade 10), but there are also few cases of grades 1 or 2, because we omitted cases with clefts or other craniofacial anomalies that are most likely to fit into this extreme category. The modal grades are 6 and 7, which correspond to the upper levels of moderate malocclusions (Table 1).

Black-White Differences

There are significant Black-White ethnic differences in the SCAN distributions, but the difference depends on the children's gender. By Wilcoxon test, there was no ethnic difference among boys (Figure 2); indeed, the two distributions are very similar statistically ($z = 0.49$; $P = .6221$). In contrast, girls differ appreciably ($z = 2.18$; $P = .0289$), primarily due to the relative excess of Black girls who were treated with severe malocclusions. In other words, the typical SCAN score was significantly higher (more esthetic) in the White girls being treated.

Sex Differences

The SCAN scores in Whites were shifted toward lower (less esthetic) scores in the boys compared to girls (Figure 3a), and the difference is highly significant by the Wilcoxon test ($z = -2.5$; $P = .01$). That is, the typical White boy seeking treatment has a less esthetic malocclusion than the typical girl, and, equivalently,

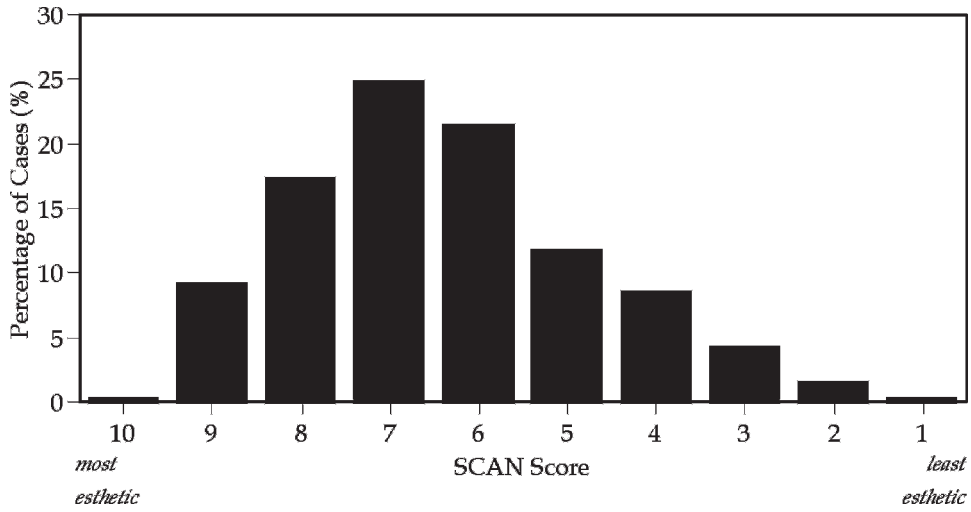

Figure 1. Distribution of SCAN scores for the entire sample of adolescents in treatment, with 10 being the most esthetic and 1 the least esthetic. The distribution is approximately normal, but with the left (most esthetic) portion being truncated since these cases would benefit little from treatment.

girls tend to enter treatment with milder esthetic issues than boys.

The situation is different for Blacks, where there is no suggestion of a sex difference ($z = 0.15$; $P = .8804$). The considerable similarity in SCAN distributions between sexes is shown in Figure 3b. An inference here is that the level of esthetic concern—as enacted by actually entering treatment—is the same in the Black boys and girls.

Group Comparisons

Box plots of the four groups (Figure 4) help put the several relationships in context. Median SCAN scores are about the same—around grade 6—for all groups except White girls, where the scores are shifted toward the higher (more esthetic) end. A Kruskal-Wallis test discloses a highly significant difference ($H = 11.3$; $P = .0101$), primarily due to the milder occlusal issues in the White girls.

Chronological Age

Within this age range of 12 to 19 years, the median age at the start of treatment was 14.0 and 13.8 years for White girls and boys, respectively, but somewhat older (14.6 and 14.3 years, respectively) for Blacks. None of these mean ages differs significantly. SCAN scores are statistically independent of the age at start of treatment (which is effectively the age at which these adolescents sought treatment). This is true for the four race-sex combinations analyzed separately; for the total sample Spearman's *rho* is merely +.04 ($P = .6353$). This lack of an association suggests that the severity of the esthetic problem does not have much effect on how early the adolescent seeks treatment, at least within this age interval.

DISCUSSION

Epidemiological studies of occlusal factors in the early permanent dentition consistently find few sex

Table 1. Distributions of SCAN Scores, by Race and Sex[a]

	White Males		White Females		Black Females		Black Males		Pooled Subtotals	
SCAN Grade	n	%	n	%	n	%	n	%	n	%
10	1	0.61	0	0.00	1	1.32	0	0.00	2	0.36
9	9	5.52	30	12.61	8	10.53	5	5.88	52	9.25
8	37	22.70	45	18.91	7	9.21	9	10.59	98	17.44
7	30	18.41	68	28.57	17	22.37	25	29.41	140	24.91
6	32	19.63	46	19.33	20	26.32	23	27.06	121	21.53
5	26	15.95	20	8.40	12	15.79	8	9.41	66	11.74
4	15	9.20	18	7.56	7	9.21	8	9.41	48	8.54
3	8	4.91	11	4.62	1	1.32	4	4.71	24	4.27
2	4	2.45	0	0.00	3	3.95	2	2.35	9	1.60
1	1	0.61	0	0.00	0	0.00	1	1.18	2	0.36
Sample sizes	163		238		76		85		562	

[a] Scan scores range ordinally from 10 (most esthetic) to 1 (least esthetic).

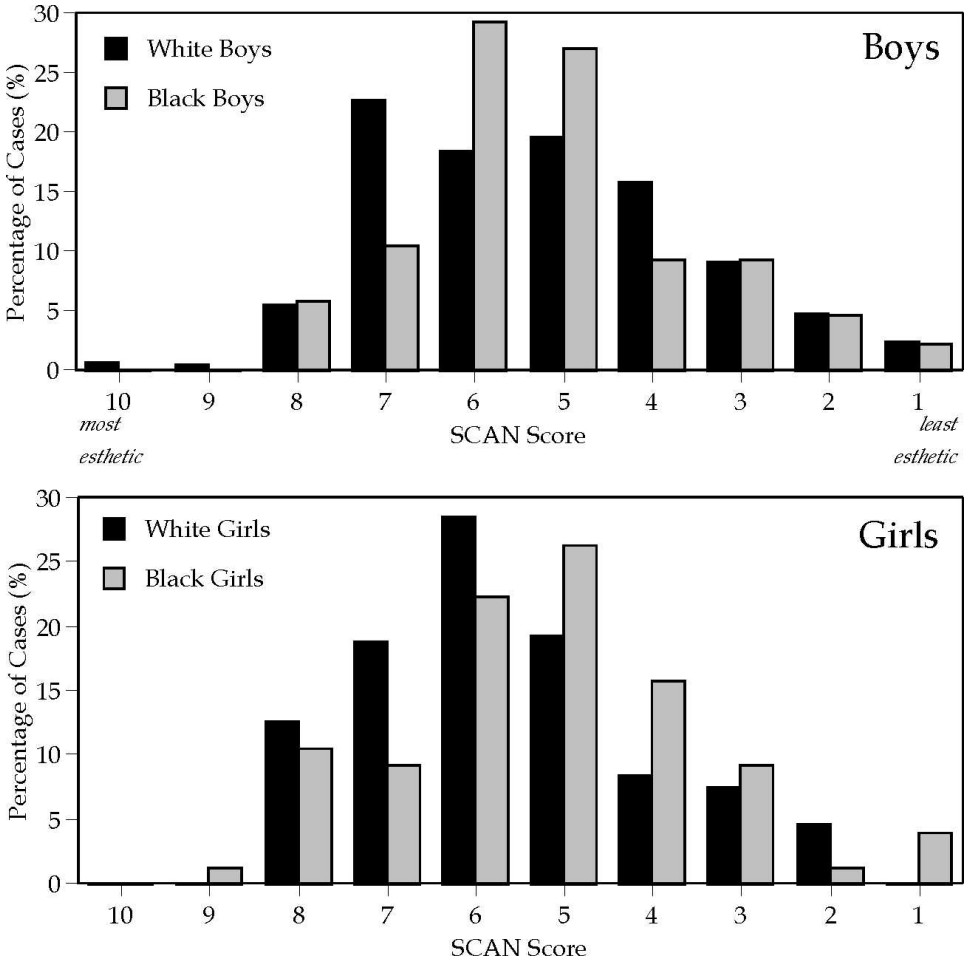

Figure 2. Distributions of SCAN scores, by sex, between American Blacks and Whites. Top, the distributions suggest higher (more esthetic) scores for White boys, but the difference is not significant statistically. Bottom, the distribution for girls is shifted significantly to the lower (less esthetic) scores in Blacks.

differences in the occurrence or severity of malocclusions, either in the United States or elsewhere.[8–12] Likewise, genetic studies of cephalometric[23–25] and occlusal variables[26–28] do not disclose sex differences in the ontogeny of the occlusion that would lead to either of the sexes being at greater risk of malocclusion.

In contrast, most orthodontic practices have a predominance of girls over boys, often on the order of a 3-to-2 ratio. In lieu of a biological basis for this sex difference, studies commonly ascribe the excess of females to subjective psychosocial differences that persuade girls to seek treatment (and/or dissuade boys from treatment). Girls tend to be less satisfied with their occlusions and place greater importance on the need for and value of orthodontic treatment.[15,16,29] One supposes that adolescents with greater self-perceived occlusal issues would be more likely to actually seek orthodontic treatment,[4,30,31] but self-perception is necessarily filtered through actuation that is colored by parents' perception, financial options, peer pressure, and other considerations.[32–34] The present study evaluated adolescents who actually had entered treatment, which is some complex subset of the population at large. Moreover, we studied adolescents in an urban, university-based teaching setting, where fees are pegged at about one-half of the costs of area private practitioners. It remains to be seen how the present results compare to those of most orthodontic patients, who are treated in private practice. We suppose that the sex differences are appreciably greater in private practice. In the university setting, there is selection for good teaching cases, which means more complex malocclusions. Intuitively, this approximate selection criterion should reduce the observed sex difference since females with lesser esthetic issues would be culled out. No such truncation is expected in private practice, where virtually any occlusion can be improved to some degree.

If the sex difference here is highly significant in Whites, why not also in Blacks? SCAN scores for boys and girls are equivalent in Blacks, and both are higher

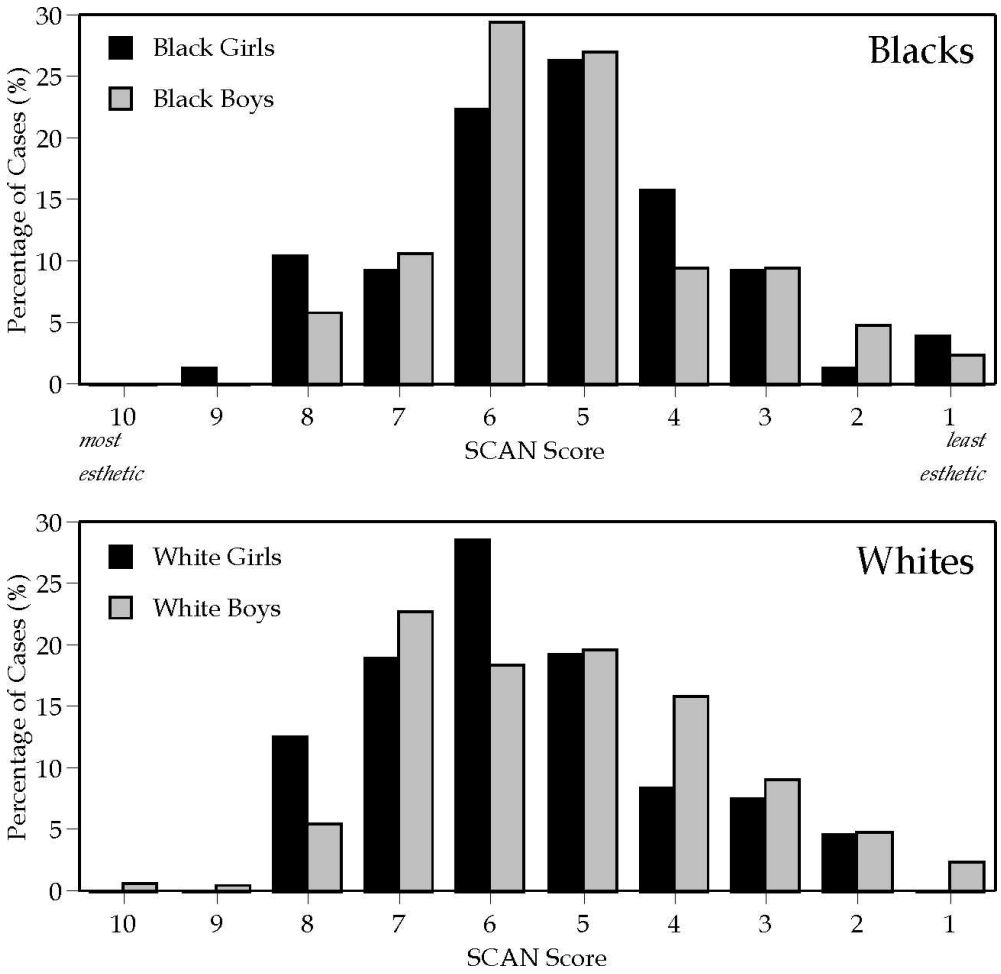

Figure 3. SCAN distributions between sexes in American Black adolescents (top) and American White adolescents (bottom). There is no statistically discernible sex difference in these Blacks, but there is a significant sex difference in Whites due to the distribution for girls being shifted to the left (more esthetic).

(less esthetic) than in Whites (Figure 4). Epidemiologically, American Blacks and Whites differ little in terms of malocclusion, but Blacks actually are treated far less commonly.[11] The first national, representative survey of the occlusal status of youths in the United States was conducted in 1966–1970 and was of adolescents born in the early 1950s.[9] Few differences were found between these two segments of the population. NHANES III, the comparable survey conducted two decades later (1988–1991), found similar results[10]—American Blacks and Whites differ little in treatment need, especially after accounting for the substantially higher percentage of Whites who have been treated. The striking difference—and what could readily account for the race differences in the present study—is simply the lower utilization of orthodontic services by Blacks compared to Whites.[11,35] Research is needed to clarify the Black-White differences in uptake of orthodontic services. That is, people's perceived needs of orthodontic treatment are appreciably higher than objective assessments by dentists,[36] perhaps because of inflated self-concerns and hard-to-attain ideals set by the popular media.[37] This excess of perceived vs objective need may explain some of the difference in treatment uptake between American Blacks and Whites (and why other minorities are not underrepresented[38]) even though financial restrictions[39–41] and less trust of health-care professionals[42–44] also seem to have probable effects.[45]

CONCLUSIONS

Although epidemiological studies of adolescents disclose few sex differences in the incidence or severity of malocclusions, orthodontic practices are commonly composed predominately of girls.

- This study shows that this is because girls with milder occlusal issues seek treatment.
- No sex difference is evident in the sample of American Blacks, where the esthetic problems of both sexes are on a par with those seen in White boys.

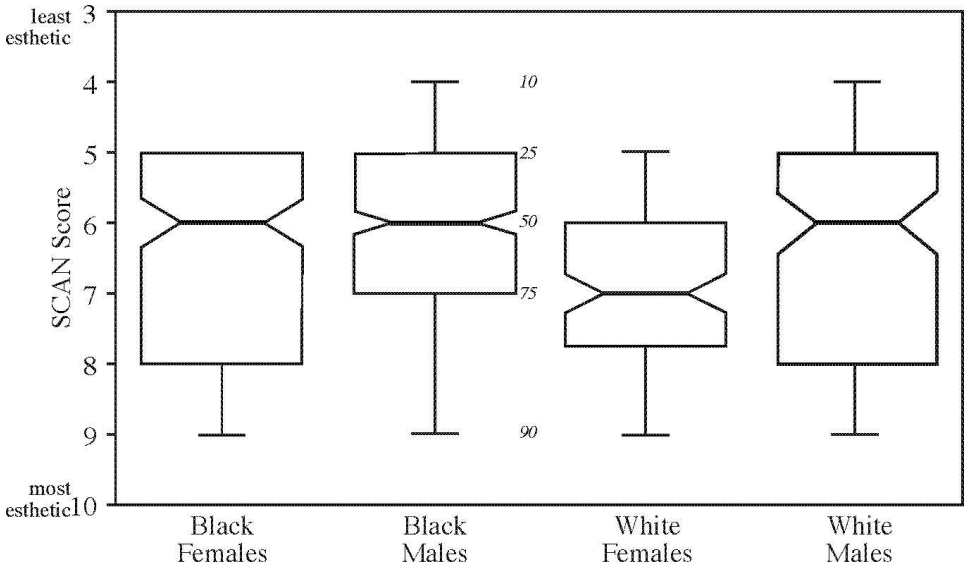

Figure 4. Box plots of SCAN scores, by race and sex. The horizontal line at the waisted region of each plot is the median of that sample. It is apparent—and confirmed statistically—that Blacks have significantly lower (less esthetic) SCAN scores. Also, note the similarity in scores between boys and girls in the sample of Blacks, whereas girls have significantly higher (more esthetic) scores than boys in the sample of Whites. The numbers noted along the middle box plot are the centiles of each distribution.

- Age at seeking treatment is independent of the severity of malocclusion in these teenagers.
- This study was performed in a university teaching context. Sex differences probably are greater in private practice, where no selection criteria as to severity are used for treatment.

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