

Occlusal Relations in Children Born and Reared in an Optimally Fluoridated Community.

II. Clinical Findings

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This paper presents clinical findings of a study designed to describe the occlusion of children born and reared in an optimally fluoridated community, and to determine if there are differences in the prevalence of certain occlusal relations of Caucasian and Negro children who had consumed optimally fluoridated water since birth. Subjects were school children, ages nine through fourteen, in grades 5, 6 and 7. The first paper in this series, which appeared in the last issue of this journal, described in detail the clinical methods that were used to measure occlusal relations. Subsequent papers in the series will present the children's perception of various occlusal conditions and the relation between clinical findings and their perception of occlusal conditions.

The following occlusal variables were scored and recorded for each child: dental age, molar relation, buccal and lingual crossbite, overjet, overbite, maxillary midline diastema, midline deviation, frenum attachment, tooth displacement and anterior spacing. A total of 759 children were examined. Table 1 shows their distribution according to chronological age, race and sex. Because few children of ages nine, thirteen and fourteen were examined, their findings have been eliminated and the remainder of the paper concentrates on the occlusal relations of 718 children ten to twelve years old. Negro children comprised 397 of the total and white

children numbered 321.

Although the children in this study do not represent a random sample, chi squares were calculated from the findings according to race and sex as a guide to determining whether obtained frequency distributions for the measured variables differed from expected distributions. Except for crossbites and displaced posterior teeth, all the calculations according to race showed greater than expected deviations and thus, findings of each of the measurements will be presented by race. Findings according to sex will be presented for only those occlusal measurements where obtained frequency distributions showed marked departures from expected values.

FINDINGS

Dental Age

Table 2 shows the percentage distribution of the children by race and sex according to dental age as described by Summers.¹ The Negro children were of a more advanced dental age than were the white children and, within each race, females were more advanced than males. These relationships held separately for each chronological age. Gen-

Table 1. Distribution of all examined children by chronological age, race and sex - Occlusal relations study, Chattanooga, 1967.

Chrono- logical age	Number of children	White			Negro		
		Both sexes	Male	Female	Both sexes	Male	Female
All ages	759	349	180	169	410	186	224
9	3	0	0	0	3	1	2
10	213	89	39	50	124	59	65
11	245	112	57	55	133	57	76
12	260	120	66	54	140	64	76
13	36	26	17	9	10	5	5
14	2	2	1	1	0	0	0

From the Division of Dental Health, National Institutes of Health, San Francisco, California.

Table 2. Percentage distribution of children, ages 10-12, by race and sex according to dental age - Occlusal relations study, Chattanooga, 1967.

Dental age	White		Negro	
	Male	Female	Male	Female
4	11.7	4.4**	4.4	1.4
5	57.4	55.3	53.3	46.1
6	30.9	40.3	42.2	52.5
Total*	100.0	100.0	100.0	100.0

* Components may not add to totals because of rounding

** Includes one white female, dental age 3

N = 162 white males
159 white females
180 Negro males
217 Negro females

erally, Negro males tended to be at the same stage of dental development as were white females.

The data in the remainder of this paper are shown for all dental ages combined because the findings by specific dental age showed consistent patterns of distribution for each occlusal relation.

Molar Relation

Table 3 presents the percentage distribution of children by race accord-

ing to their molar relation. The method of Summers¹ was used principally for the classification. For convenience, equivalent molar relations according to Angle² are also shown.

A greater percentage of Negro children had bilaterally normal molar relations than did white children. Considerably more white children had either unilateral or bilateral distocclusions than Negroes; nearly 34 percent of the white children had unilateral or bilateral distocclusions compared with only 11 percent of the Negroes. The percentages of all children with mesiocclusion were small. No large differences existed according to race in the percentages of children with mesiocclusion. Within each racial group first molar relations were very similar for each sex.

Buccal and Lingual Crossbite

No appreciable differences were found between the white and Negro subjects or between the sexes with regard to crossbite and, therefore, no

Table 3. Percentage distribution of children, ages 10-12, by race according to molar relation - Occlusal relations study, Chattanooga, 1967.

Molar relation		White (n=321)	Negro (n=397)
Angle equivalent	Summers' method		
Class I	Normal (7,7)	53.6	76.8
Class II	Distocclusion		
	Unilateral (7,5 7,6 5,7 6,7)	16.5	7.6
	Bilateral (5,5 6,6 6,5 5,6)	17.1	3.8
	Total	33.6	11.4
Class III	Mesiocclusion		
	Unilateral (7,8 7,9 8,7 9,7)	2.8	4.8
	Bilateral (8,8 9,9 8,9 9,8)	1.9	1.5
	Total	4.7	6.3
	Other (Missing first molars or bilaterally mixed mesio- and distocclusions)	8.1	5.5
	Total	100.0	100.0

Table 4. Percentage distribution of children, ages 10-12, by race according to overjet and overbite - Occlusal relations study, Chattanooga, 1967.

Measurement in millimeters	Overjet		Overbite	
	White	Negro	White	Negro
Negative	1.2	0.5	1.2	4.8
0	0.0	1.5	0.3	4.8
1-2	9.0	17.6	12.1	29.2
3-4	52.0	49.1	37.7	45.3
5-6	24.3	23.2	45.2	14.4
7 or more	13.4	8.1	3.4	1.5
Total	100.0	100.0	100.0	100.0

tabular data on crossbite are presented in this report. About 2 percent of the children had one or more posterior teeth in buccal crossbite and roughly 15 percent of the children had one or more maxillary teeth in lingual crossbite.

Overjet and Overbite

Table 4 shows the percentage distribution of the children by race according to their overjet and overbite measurements. Negro children tended to have lower overjet scores than did whites; nearly 18 percent of the Negroes had scores of 1 or 2 millimeters of overjet whereas only 9 percent of the white children had comparable scores. In the upper range of overjet measurements, 13 percent of the white children had scores of 7 millimeters or greater whereas 8 percent of the Negro children had scores this large.

Table 4 shows a pronounced tendency for white children to have greater overbite scores than Negroes. Nearly 5 percent of the Negro children had a negative overbite (open bite) contrasted to just over 1 percent of the white children. Proportionally, more Negroes than whites also had end-to-end bites (scores of zero). The percentage of Negro children with scores of 1 or 2 millimeters of overbite was nearly two and one-half times greater than that of white children. In contrast, white children predominated in large scores of overbite; 49 percent had scores

Table 5. Percentage distribution of children, ages 10-12, by race according to maxillary midline diastema and midline deviation - Occlusal relations study, Chattanooga, 1967.

Measurement in millimeters	Maxillary midline diastema		Midline deviation	
	White	Negro	White	Negro
0	72.0	62.5	42.1	54.2
1	18.7	17.9	27.4	29.0
2	6.5	15.4	22.7	12.3
3 or more	1.9	3.8	7.5	3.8
X*	0.9	0.5	0.3	0.8
Total	100.0	100.0	100.0	100.0

* Not recordable

of 5 millimeters or greater as opposed to only 16 percent of Negro children.

Maxillary Midline Diastema

The data in Table 5 on maxillary midline diastema show that Negro children had maxillary midline diastemas relatively more often than did white children; 19 percent of Negroes and 8 percent of whites had diastemas of 2 millimeters or greater. About 10 percent more of the white children than Negroes had no maxillary midline diastema.

Midline Deviation

Data on midline deviation are also shown in Table 5. White children had more and greater interarch midline deviations than Negroes. Forty-two percent of the white subjects had no midline deviation whereas more than half, 54 percent, of the Negroes had none. Relatively twice as many white children as Negroes had deviations of 2 millimeters or greater.

Frenum Attachment

Table 6 shows that the distance from

Table 6. Percentage distribution of children, ages 10-12, by race and sex according to distance from gingival crest to frenum attachment - Occlusal relations study, Chattanooga, 1967.

Crest to frenum attachment in millimeters	White		Negro	
	Male	Female	Male	Female
0	0.6	1.3	0.6	1.4
1-2	6.8	10.1	2.2	2.8
3-4	27.2	45.9	16.1	19.4
5-6	51.9	40.9	49.4	50.2
7 or more	13.6	1.9	31.7	26.3
Total	100.0	100.0	100.0	100.0

Table 7. Percentage distribution of children, ages 10-12, by race according to tooth displacement - Occlusal relations study, Chattanooga, 1967.

Anterior displacements		
Number of teeth	White	Negro
0	34.6	47.9
1	22.4	22.2
2	20.2	17.6
3 or more	22.7	12.4
Total	100.0	100.0

Posterior displacements		
Number of teeth	White	Negro
0	70.1	77.3
1	19.3	13.9
2	6.2	6.0
3 or more	4.4	2.8
Total	100.0	100.0

the point of attachment of the upper, labial frenum on the alveolar ridge to the tip of the gingival papilla between the central incisors was greater in Negro children than in whites. For about 29 percent of the Negro children, this distance was 7 millimeters or greater, whereas only 7 percent of the whites had measurements this large. There was also a tendency for white boys to have greater "frenum attachment measurements" than white girls; this trend according to sex was not as apparent among Negroes.

Tooth Displacement

Table 7 shows findings on number of tooth displacements according to race. Proportionally, Negro children had fewer displaced anterior teeth than did white children; nearly one half of the former were free of anterior tooth displacements compared with only about one third of the latter. Almost 43 percent of white children had two or more anterior teeth displaced; the corresponding figure for Negroes was 30 percent.

The majority of students of both

Table 8. Percentage distribution of children, ages 10-12, by race according to number of upper and lower anterior spaces* - Occlusal relations study, Chattanooga, 1967.

Upper anterior spaces		
Number of spaces	White	Negro
0	76.6	59.9
1	13.1	14.4
2	8.4	14.6
3 or more	1.8	11.0
Total	100.0	100.0

Lower anterior spaces		
Number of spaces	White	Negro
0	97.5	88.4
1	1.2	6.8
2	1.2	3.0
3 or more	0.0	1.8
Total	100.0	100.0

* 2 mm or greater

racers were free of posterior tooth displacements. There was a slight tendency, however, for white children to have more posterior teeth displaced than Negroes.

Anterior Spacing

Table 8 shows the distribution of children by race according to number of maxillary and mandibular anterior spaces of 2 millimeters or greater. Negroes tended to have more spacing between their upper anterior teeth than did whites. Nearly 77 percent of the white children had no upper anterior spaces compared with 60 percent of the Negro children. Only 10 percent of the white children had two or more upper anterior spaces whereas 26 percent of the Negroes had as many. It is apparent that children of both races were less likely to have lower anterior spacing than upper anterior spacing. There was a tendency, however, for Negroes to have more lower anterior spaces than did whites. Only 2 percent of the white children had any spacing

of 2 millimeters between their lower anterior teeth while 12 percent of the Negroes had such spacing.

DISCUSSION

The findings of this study show that there are differences in the occlusal relations of ten to twelve year-old white and Negro children who grow up in a fluoridated community. Negro children had a more advanced dental age than whites. More Negroes than whites had normal molar relationships; more whites than Negroes had Class II molar relations. White children tended to have greater overbites and overjets than Negroes. Whites had more displaced teeth and midline deviations than did Negroes, whereas Negroes had more midline diastemas, general anterior spacing and a greater distance between the point of attachment of the upper labial frenum to the gingival crest than whites. In short, Negro children had a better interarch relation between their first permanent molars and more available space in each arch for their permanent teeth than did whites.

Altemus³ reported the prevalence of malocclusion among 3,289 Negro children, ages 12-16 years, living in fluoridated Washington, D.C. Although he reported that 83 percent of the children had Class I molar relations, he also reported that 83 percent of the children had malocclusion and that only 4 percent had "ideal" occlusion. He found no differences according to sex.

Emrich, Brodie and Blayney⁴ reported data on occlusal relations for 13,475 white and 1,476 Negro children, 12-14 years old, examined as part of the Evanston-Oak Park, Illinois evaluation of fluoridation. They found that white children had Class II malocclusion (Angle²) about twice as frequently as Negro children, 15 and 7 percent, respectively. Within each race, there were no appreciable differences in the preva-

lence of malocclusion according to sex.

Bowbeer and Day⁵ examined white and Negro children, 12 to 16 years old, living in Ypsilanti, Michigan, a community that began to fluoridate in 1964, and found a lower prevalence of malocclusion and less need for orthodontic treatment in Negroes than in whites. They reported that 83 percent of the Negro children had Class I molar relations compared with 63 percent of the whites. Thirty-four percent of the white children (the same percentage as found in Chattanooga) were classified as having Class II molar relations, whereas only 10 percent of the Negro children (11 percent in Chattanooga) were so classified. Seven and 3 percent of the examined Negro and white children, respectively, in Ypsilanti had Class III molar relations.

Grewe and his co-workers⁶ studied the prevalence of malocclusion in 651 Chippewa Indian children, ages 6-18, and found for all ages combined that 11.8 percent of the girls and 7.3 percent of the boys had Class II malocclusion. For the 10 to 12 year olds, however, differences by sex were smaller: 9.3 percent for girls and 7.1 percent for boys. The investigators also found that children with more than 50 percent Indian ancestry had a tendency toward Class III, anterior crossbite or both, and fewer Class II malocclusions. Children with less than 50 percent Indian ancestry had posterior crossbites, open bites, overjets that exceeded 5.0 millimeters and deep anterior overbites more frequently than their counterparts.

Szwejdja,⁷ using the HLD Index,⁸ measured occlusal relations of 823 white and 274 Negro, 10 and 11 year old children living either in a fluoridated or nonfluoridated area of North Carolina. He reported no differences between children in the fluoridated and non-fluoridated areas, but he found significant differences in each area between

whites and nonwhites for overbite, mandibular protrusion, open bite and labiolingual spreading (displacement). Whites had greater overbite and labiolingual deviation measurements and less mandibular protrusion and open-bite measurements than nonwhites. No differences were found between the white and nonwhite children in overjet measurements, which conflicts with the findings in Chattanooga.

Ast, Allaway and Draker⁹ found differences in the prevalence of malocclusion between children in a fluoridated and nonfluoridated community. They studied 302 lifelong resident children, 13 and 14 years old, in Newburgh (fluoridated) and Kingston (nonfluoridated), New York. Dental casts of the children were made and evaluated randomly from each city. From the casts it was determined that children in the fluoridated city had normal occlusion about three times more frequently than did children in the nonfluoridated community. They ascribed the observed differences to the diminution of dental caries and the resultant decrease in tooth mortality in the fluoridated city.

Erickson and Graziano¹⁰ also found that children living in a fluoridated community had malocclusion less frequently than did children in a nonfluoridated city. A 10 percent sample of white 7th graders, ages 12-13 years, from fluoridated High Point, North Carolina and nonfluoridated Greensboro, North Carolina comprised their study population. Fifty-six percent of the lifetime resident children of High Point had malocclusion as opposed to 72 percent of the children in Greensboro. The Angle method was used.

Summers¹ examined the dental casts of 394 white children, ages 5-14, who were participants of the Tecumseh (Michigan) Community Health Study. Twelve occlusal variables were scored on each set of casts, and nine of these

variables were developed into an Occlusion Index (OI). He found that among the older children (ages 10-14) 39 percent had either a unilateral or bilateral Class II molar relation; bilateral predominated over unilateral by about two and one-half to one.

To augment knowledge about the descriptive epidemiology of malocclusion and to study its appearance in the young, Mills¹¹ surveyed 1,455 white children, ages 8-18 years, in fluoridated Suitland, Maryland. He found that boys had severe anterior overbite more frequently than girls and that girls had more anterior open bite. The Dewey-Angle molar relationships for children 10-12 years revealed no marked difference between boys and girls.

Much has been said about the lack of comparability of data from studies of the prevalence of occlusal relations; little attention has been given to the similarities. In Table 9, the findings of a number of studies have been assembled for comparative purposes. Because Chattanooga is fluoridated, the findings for nonfluoridated communities have been largely excluded from Table 9. Results of studies for age groups not comparable with the 10-12 year old children in Chattanooga have also been omitted from the table. Class I molar relations include "ideal," "normal" and "acceptable" occlusions, and malocclusions with Class I molar relations. The data for Chattanooga in Table 9 do not add to 100 percent because 8.1 percent of the white children and 5.5 percent of the Negro children had missing first molars or mixed Class II and Class III occlusions.

Perhaps the most striking feature of Table 9 is that in all the studies Class I dominates, followed by Class II and Class III, respectively. In those studies in which the prevalence of occlusal relations was assessed in two ethnic groups,⁴⁻⁶ the Caucasian or predominantly white group always was found to

Table 9. Selected findings on molar relation from studies conducted on populations with similar characteristics.

Study	Locale	Race	Age	Exposure to fluoridated water	Percentage distribution of children according to molar relation - Angle classification		
					Class I 0 20 40 60 80	Class II 0 20 40	Class III 0 20
As ⁹	Newburgh, New York	Mostly White	13-14	Lifetime	78	21	1
Erickson ¹⁰	High Point, No. Carolina	White	12-13	Lifetime	71	28	1
Mills ¹¹	Suitland, Maryland	White	10-12	Lifetime	82	11	7
Summers ¹	Tecumseh, Michigan	White	10-14	Lifetime	60	39	1
Altman ³	Washington, D.C.	Negro	12-16	Part of time	83	12	5
Bowbeer & Day ⁵	Ypsilanti, Michigan	White	12-16	Since 1964	63	34	3
Bowbeer & Day ⁵	Ypsilanti, Michigan	Negro	12-16	Since 1964	83	10	7
Horowitz	Chattanooga, Tennessee	White	10-12	Lifetime	54	34	5
Horowitz	Chattanooga, Tennessee	Negro	10-12	Lifetime	77	11	6
Emrich ⁴	Oak Park, Illinois	Negro	12-14	Some children	89	7	3
Emrich ⁴	Evanston, Illinois	White	12-14	Some children	84	15	1
Grew ⁶	Red Lake Indian Reserv., Minn.	<50% Indian	6-18	1-2 yrs.	84	13	3
Grew ⁶	Red Lake Indian Reserv., Minn.	>50% Indian	6-18	1-2 yrs.	89	8	3

have a lower percentage of children with Class I molar relations and a higher prevalence of Class II malocclusion than nonCaucasian or predominantly nonwhite children.

In Chattanooga and in the studies by Bowbeer and Day⁵ and Emrich and his co-workers,⁴ there is a slight indication that nonwhite children may have a greater tendency than whites for Class III malocclusion. These observations are suggestive but hardly conclusive at present. More studies are needed to verify or refute this hypothesis.

The results of the study by Szwejda⁷ are not given in Table 9, because he did not use the Angle classification of molar relationship. However, his survey of children ages 10 and 11 in fluoridated Charlotte, North Caro-

lina showed a greater percentage of white children than Negroes with large overbites. The findings in Chattanooga corroborate this relationship, but conflict with Szwejda's findings of no difference between the races for overjet. In Chattanooga, more white children tended to have greater overjet measurements than Negroes.

Although there is considerable agreement among studies on percentages of children classified according to molar relationship, great differences have been reported on percentages of children judged to have malocclusion severe enough to require correction. The introduction to the first paper in this series contained a brief discussion of reported variations among studies.

Differences in age, sex and ethnic

background of children in the various studies may account for some of the variation, but probably much is due to the lack of an adequate definition of malocclusion and of uniform measuring techniques. Standards must be developed to overcome these inadequacies.

Data based on standardized, objective measurements of occlusal relations are needed for children of different ethnic backgrounds and of all age groups living both in fluoridated and nonfluoridated communities if we are to fully understand the problems of malocclusion. Such data are essential as background for planning public programs of orthodontic care.

SUMMARY

Occlusal measurements were made on white and Negro children born and reared in Chattanooga, Tennessee on fluoridated water. Data are reported for 397 Negro children and 321 whites, ages 10 to 12 years.

The Negro children were of a more advanced dental age than white children and, by race, females were more advanced than males. Relatively more Negroes than whites had normal molar relations, whereas more whites than Negroes had Class II molar relationships.

White children tended to have greater overbite and overjet measurements than Negroes.

Whites had more displaced teeth and midline deviations than Negroes whereas Negroes had more midline diastemas, general anterior spacing, and a greater distance from the point of attachment of the upper labial frenum on the alveolar ridge to the gingival crest between the central incisors than whites.

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