

Occlusal Relations in Children in an Optimally Fluoridated Community:

IV. Clinical and Social-Psychological Findings

HERSCHEL S. HOROWITZ, D.D.S., M.P.H.

LOIS K. COHEN, Ph.D.

JOE DOYLE, B.S.

A clinical and social-psychological study was conducted to determine occlusal relations and perceptions of occlusion of children born and reared in an optimally fluoridated community.¹⁻³ The present paper relates clinical findings on occlusal relations to social-psychological data on the children's perception of their own occlusal conditions and those of others.

In a previous paper² in this series which reported the clinical findings, it was shown that Negro children were of a more advanced dental age than whites and, for each race, females were more advanced than males. Relatively more Negroes than whites had a normal molar relation, whereas more whites than Negroes had a Class II molar relation. White children tended to have greater overbite and overjet measurements than Negroes. Whites had more displaced teeth and greater midline deviations than Negroes. Negroes had more midline diastemas, general anterior spacing and a greater distance from the lower point of attachment of the upper labial frenum on the alveolar ridge to the gingival crest between the central incisors 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 whites.

Another report on the same children,³ however, indicated that there was a

generally uniform hierarchy of preferences for given occlusal relations, regardless of race. On the basis of the respondents' ranking of a set of nine pictures, the preferential order from highest to lowest was: ideal occlusion; anterior open bite; mandibular protrusion; midline deviation; maxillary protrusion; excess spacing; bimaxillary protrusion; crowding; and last, repaired cleft lip. In addition, children who perceived themselves as having a particular occlusal condition tended to rank that condition on the preferential hierarchy either as high as or a little higher than those who did not perceive themselves with that condition. White children tended to view their occlusion as somewhat more "ideal" than did Negro children, who viewed themselves with relatively more open bite and mandibular protrusion than did whites.

To see whether a pattern of association existed between objective occlusal measurements and a subjective frame of reference, the clinical data on occlusal relations were compared with the perceptual choices of occlusion made by the children. For example, did those children with excess spacing choose excess spacing as their self-image, and did they prefer a drawing of a child with excess spacing more often than children without the condition? If children with excess spacing identify with, and prefer, the appearance of that condition, should they be treated orthodontically if no physiologic disability exists or is likely to occur without treatment? The

From the Division of Dental Health, National Institutes of Health, Public Health Service.

psychological literature suggests that there is a relationship between anatomical irregularities and ratings of self-esteem.^{4,5} If future research shows, however, that no pattern exists between clinical occlusal measurements or orthodontic evaluations of children and the childrens' perception of their own occlusion, then it is conceivable that the dentist and the patient are concerned about different dimensions of occlusal relations. This would suggest the need for some new thinking in regard to treatment priorities, which would align the concerns of dentists with the concerns of patients, particularly when there are no apparent risks to health involved.

METHODS AND RESULTS

The original sample consisted of 759 children, 9 to 14 years old in Chattanooga, Tennessee. In order to assure homogeneity by age, 9, 13 and 14 year olds were omitted. Only those subjects 10 to 12 years of age on whom both clinical and social-psychological data were collected are included in the present analysis; this group numbers 718.

The final clinical and social-psychological measurements each represented samples of occlusal conditions from a potentially greater spectrum of possible conditions. Unfortunately, the clinical and perceptual measurements used did not correspond completely. The perceptual measuring tool, the standardized drawings, was developed with respect to those conditions that could be perceived from a uniform posture of the face. So that a standardized stimulus could be given to the children who were to judge the drawings, it was important not to mix representations of occlusal relations that could be viewed only in profile with those that could be viewed only from a frontal posture. The data were analyzed in two ways. Firstly, clinical findings on four individual occlusal conditions were compared with findings on preference and self-image.

Secondly, several individual occlusal conditions were combined to form profiles of occlusion, the findings from which were compared with the social-psychological responses.

Individual Occlusal Conditions

The following four conditions were used directly to compare clinical and social-psychological findings: crowding, excess spacing, maxillary protrusion, and midline deviation. These clinical conditions had corresponding pictures that depicted them directly. The conditions were assessed clinically as follows: *crowding* was measured by the number of upper anterior displaced teeth; *excess spacing* was measured by the number of spaces that were two millimeters or greater between upper anterior teeth; *maxillary protrusion* was measured by an assessment of overjet in millimeters; and *midline deviation* was measured by the number of millimeters which the upper midline was to the left or right of the lower midline with the subject in "centric occlusion."

To aid in the interpretation of the social-psychological results, the pictures were categorized according to the rankings and choices given by the subjects, as reported in a previous paper in this series.³ These results are summarized as follows:

Category	Drawing	Median Rank on Preference
"Ideal"	Ideal occlusion	2.0
I	Anterior open bite	2.2
	Mandibular protrusion	2.9
	Midline deviation	3.7
	Maxillary protrusion	6.1
II	Excess spacing	6.4
	Bimaxillary protrusion	6.6
	Crowding	7.0
	Repaired cleft lip	8.6

A separate category was used for ideal occlusion which had received the greatest proportion of the high preferential ranking and choices of self-image. Mandibular protrusion, anterior open bite

Perceptual Characteristic	Clinical measurement of crowding		
	Number of upper anterior displaced teeth		
	0	1	2 or more
Number of children*	411	183	124
Percentage	57.2%	25.5%	17.3%
Preference			
All children	100.0%	100.0%	100.0%
Crowding	0.7	0.0	2.4
Ideal	41.4	36.1	40.3
Category I	54.3	54.6	51.6
Category II (other)	3.6	9.3	5.6
Self-Image			
All children	100.0%	100.0%	100.0%
Crowding	2.4	4.4	12.9
Ideal	31.1	27.3	33.1
Category I	50.1	51.4	37.9
Category II (other)	16.3	16.9	16.1

* N = 718

TABLE I

and midline deviation were chosen next most frequently and are grouped together in this paper as Category I conditions. The least preferred and chosen pictures were those of excess spacing, crowding, maxillary protrusion, bi-maxillary protrusion and repaired cleft lip. The latter are designated Category II conditions.

Crowding: Table I relates clinical measurements of crowding or anterior displaced teeth to perceptual responses. There was little or no indication that children with crowded upper anterior teeth preferred the drawing which depicted crowding more than did those without crowding. Moreover, having crowded teeth did not greatly affect the preferential selections of other categories of occlusal depictions.

As upper anterior crowding increased, however, a larger percentage of children chose crowding as their self-image; 2

per cent of those without any upper anterior displaced teeth identified themselves with the picture showing this condition, whereas 4 per cent of those with one upper anterior displaced tooth and 13 per cent of those with two or more such teeth chose the picture of crowding as their self-image. Proportionately, just as many of the children with two or more crowded teeth saw themselves as looking like the picture of ideal occlusion as did children without crowding. Fewer saw themselves as having a Category I picture of occlusion. Overall, the findings in Table I indicate that there appeared to be some relation between choosing crowding as a self-image and the actual existence of that condition. On the other hand there appeared to be no relation between rankings on preference and the existence of crowded teeth.

Excess Spacing: Table II relates the

Perceptual Characteristic	Clinical measurement of excess spacing		
	Number of upper anterior spaces of 2 mm. or more		
	0	1	2 or more
Number of children*	484	99	135
Percentage	67.4%	13.8%	18.8%
Preference			
All children	100.0%	100.0%	100.0%
Excess spacing	2.7	5.1	5.2
Ideal	39.0	45.5	38.5
Category I	55.4	49.5	51.9
Category II (other)	2.9	0.0	4.4
Self-Image			
All children	100.0%	100.0%	100.0%
Excess spacing	6.2	9.1	11.1
Ideal	32.0	32.3	23.7
Category I	51.0	43.4	42.2
Category II (other)	10.7	15.2	23.0

* N = 718

TABLE II

findings on clinical measurements of upper anterior spacing to perceptual findings. Of the children who had one or more spaces of two millimeters or greater, larger percentages chose excess spacing as looking best than did those children without excess spacing. Moreover, whereas only 6 per cent of children with no excess spacing chose that condition as their self-image, 9 per cent of the children with one upper anterior space and 11 per cent of those with two or more spaces chose that condition as their self-image.

As the number of anterior spaces increased, a greater percentage of children chose one of the least desired pictures in Category II (other than excess spacing) as their self-image. These percentages ranged from 11 per cent among those with no upper anterior spaces to 15 per cent among those with one and 23 per cent among those with

two spaces.

Eighty-three per cent of the children without any upper anterior excess spacing chose either the ideal or a Category I picture as their self-image. The corresponding percentage dropped to 76 per cent for those with one excessive space, and further to 66 per cent for those with two or more spaces. The relation between excess spacing as an identified self-image and the existence of that condition was more pronounced than the relation between preference and the existence of the condition.

Maxillary Protrusion: Table III presents perceptual findings according to clinical measurements of overjet. Very few children preferred the drawing of the child with maxillary protrusion regardless of the extent of their own measurements of overjet. Paradoxically, as the amount of overjet increased there

Perceptual Characteristic	Clinical measurement of maxillary protrusion		
	Overjet in mm.'s		
	Negative, 0-3	4,5	6 or more
Number of children*	296	288	133
Percentage	41.3%	40.2%	18.5%
Preference			
All children	100.0%	100.0%	100.0%
Maxillary protrusion	1.0	0.3	0.0
Ideal	36.8	41.3	42.9
Category I	58.8	51.7	48.1
Category II (other)	3.4	6.6	9.0
Self-Image			
All children	100.0%	100.0%	100.0%
Maxillary protrusion	4.1	6.2	7.5
Ideal	29.7	32.3	28.6
Category I	53.7	44.1	45.9
Category II (other)	12.5	17.4	18.0

* N = 717; excludes one child whose overjet was unrecordable

TABLE III

was a tendency for a greater percentage of children to prefer the drawing of ideal occlusion. Also with increasing overjet, there was a tendency to prefer one of the drawings in Category II other than maxillary protrusion.

Although not many children selected maxillary protrusion as their self-image, there was a tendency for greater percentages of children to choose either maxillary protrusion or one of the other drawings in Category II as their self-image as measurements for overjet increased.

Midline Deviation: Table IV shows data on perceptual responses according to clinical measurements of midline deviation. For this analysis the children were divided into those with zero or one millimeter of midline deviation and those with two or more millimeters of deviation. For children with greater amounts of midline deviation, relatively

more preferred the pictorial representation of that condition than did those with no or minimal deviation, 13 and 6 per cent, respectively. However, the children with larger measurements of midline deviation did not perceive them-

Perceptual Characteristic	Clinical measurement of midline deviation	
	Millimeters	
	0,1	2 or more
Number of children*	553	161
Percentage	77.5%	22.5%
Preference		
All children	100.0%	100.0%
Midline deviation	6.1	13.0
Ideal	39.8	38.5
Category I (other)	47.0	44.7
Category II	7.1	3.7
Self-Image		
All children	100.0%	100.0%
Midline deviation	9.9	9.3
Ideal	29.1	35.4
Category I (other)	41.0	30.4
Category II	19.9	24.8

*N = 714; excludes four children whose midline deviation was unrecordable

TABLE IV

selves as looking like the drawing of that condition more than did those without or with minimal deviation. Of those children who had larger scores of midline deviation, proportionately more chose ideal, fewer chose other Category I and more chose Category II pictures as their self-image than did those children with smaller scores. Overall, the findings on midline deviation are mixed; although children with larger midline deviation scores did not recognize the condition in themselves, they apparently preferred the looks of that condition more than did those without midline deviation.

Occlusal Profiles

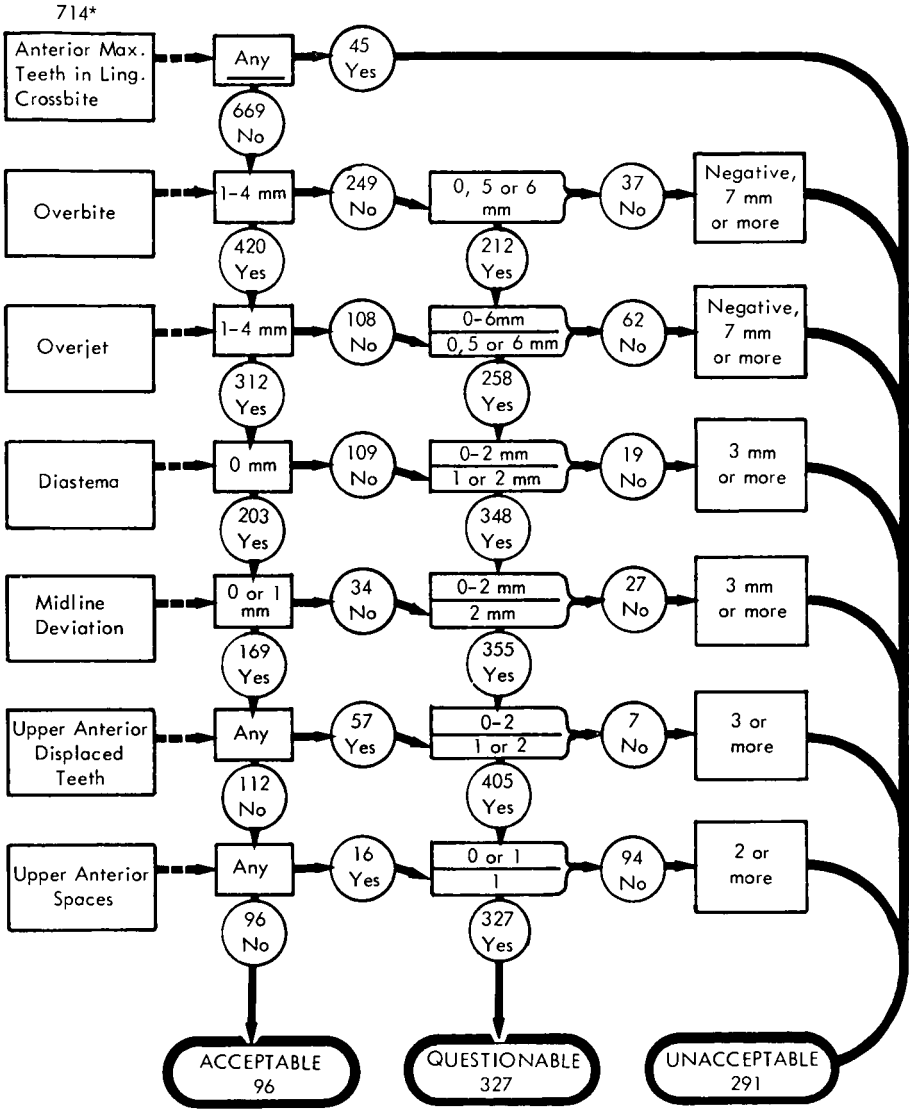
For the purpose of determining if the social-psychological factors used were associated with over-all occlusal profiles, the children were classified into three categories of occlusal status: "acceptable," "questionable" and "unacceptable." These categories were intended to differentiate the subjects grossly according to the severity of their over-all clinical conditions; because of limitations in the comprehensiveness of the collected data, the classification was not intended to imply an actual clinical need for orthodontic care.

As indicated in Figure 1, a child was classified as having "acceptable" occlusion only if he met the specified criteria for each of seven clinical measurements. The category of "questionable" occlusion contains those children who deviated from "acceptable" in *any* of one or more of the seven occlusal relations measured but where the deviation was not extreme. The "unacceptable" category of occlusion comprises those children who deviated excessively from acceptable measurements in any one or more of the seven occlusal variables measured. The sequence of considering occlusal variables in Figure 1 is arbitrary; any sequence would have produced the same results on classification.

As shown at the bottom of Figure 1, according to this analysis 96 children, or about 13 per cent, were classified as having "acceptable" occlusion, whereas 291 or 41 per cent were classified as having "unacceptable" occlusion and 327 or 46 per cent, "questionable" occlusion. There were some differences in the results of the classification according to race and sex. Among those classified as having "acceptable" profiles, the findings ranged from 9 per cent of white males to 17 per cent of Negro females. Thirty-six per cent of the Negro children were classified as having "unacceptable" occlusion contrasted with 46 per cent of the white children.

In Table V, results on occlusal profiles are compared with responses on preference and self-image. The findings on preference are not clear-cut. The column of totals shows that children with "acceptable" occlusion did not prefer the picture of ideal occlusion with greater relative frequency than did children in the other occlusal profiles. In fact, proportionately fewer of the children with "acceptable" occlusion selected the drawing of ideal occlusion as their preference than did those with "questionable" or "unacceptable" occlusion. Proportionately more children with "acceptable" occlusion preferred drawings of conditions in Category I than did children with "questionable" or "unacceptable" occlusion. A greater percentage of children with "unacceptable" occlusion, 9 per cent, preferred pictures of the most severe malocclusions (Category II) than did other children (4 per cent).

Similarly, the total rows on self-image show that there is no relation between occlusal condition and selection of "ideal" as self-image. Furthermore, more children with "acceptable" occlusion selected conditions in Category I as their self-image than did children with "questionable" or "unacceptable" occlusion. The strongest relation was



*Four children were excluded because one or more characteristics were unrecordable.

Fig. 1 Flow chart of clinical criteria used to classify children into three categories of occlusal profiles: "acceptable," "questionable" and "unacceptable."

Preference	Total	Self-Image		
		Ideal	I	II
"Acceptable" occlusal profile, N = 96				
Total	100%	30%	59%	10%
Ideal	33	14	17	3
I	62	17	41	5
II	4	-	2	2
"Questionable" occlusal profile, N = 327				
Total	100%	33%	50%	17%
Ideal	42	19	16	7
I	54	13	32	9
II	4	1	2	1
"Unacceptable" occlusal profile, N = 291				
Total	100%	28%	43%	29%
Ideal	40	15	16	9
I	51	11	25	14
II	9	2	2	5

*Components may not add to totals or sub-totals due to rounding


 Choices on preference and self-image match

TABLE V

between selection of drawings in Category II as self-image and actual occlusal status; only 10 per cent of the children with "acceptable" occlusion selected a Category II picture as their self-image, whereas 17 per cent of those with a "questionable" occlusion and 29 per cent of those with an "unacceptable" occlusion made a similar selection. Again, as with the specific occlusal relations, the association between over-all occlusal status with self-image was stronger than it was with preferential rankings.

The internal cells of Table V show

some patterns of relation when preference and self-image responses are matched. The cells in which selections on preference and self-image match form a diagonal for each occlusal profile. These children indicated that they preferred a drawing in the same category as the one they chose as a self-image. For children with "acceptable" occlusal profiles, 56 per cent showed matching preferential and self-image scores. The corresponding percentage for those with "questionable" occlusal profiles was 52 per cent, and for those with "unacceptable" profiles, it was 46.

Thus, as occlusal profile worsened, there was less agreement on preference and self-image.

The cells above the diagonal for each occlusal profile represent children who preferred a depiction of occlusion higher on the preferential hierarchy than their selected self-image. As occlusal profile regressed from "acceptable," the percentage of children who preferred a picture higher on the preferential hierarchy than their self-image increased from 25 to 31 to 39 per cent. There was thus a greater tendency to prefer a picture higher on the preferential hierarchy in relation to self-image as occlusal profile worsened.

The percentages in the cells below the diagonal, representing children who preferred drawings lower on the hierarchy than their self-image, showed only a slightly decreasing trend as occlusal profile became worse: 19, 17 and 15 per cent.

Overall, most children, regardless of occlusal profile, chose preferences in agreement with their self-image. If there was no agreement, children tended to prefer pictures on the hierarchy above their self-image rather than below it. As occlusal profile worsened, there was an increasing trend among children whose choices of preference and self-image were not aligned to select a higher-ranked likeness rather than a lower one.

The relations between self-image and preference according to occlusal profile differed considerably according to sex. Figure 2 shows the relation between selections of preference and self-image choices by category according to sex and occlusal profile. Males were less apt to select matching preference and self-image choices than females as occlusal profile worsened. There was a far greater tendency among males than females to select a preference higher on the hierarchical scale as occlusal profile went from "acceptable" to "unaccept-

able." Also, a definite downward trend was present among males in selecting a preference choice lower than self-image choice as occlusal profile worsened, whereas no trend was apparent among females. Thus, males account for nearly all of the over-all relationships between preference and self-image choices shown for all children in Table V.

When these data were examined by race within each sex, it was found that the trends for Negro and white girls were equally irregular. However, Negro males exhibited more pronounced trends than did white males. For instance, the percentage of Negro males who preferred pictures on the hierarchy above their self-image ranged from 20 per cent for those with "acceptable" occlusal profiles to 52 per cent for those with "unacceptable" profiles. White males in the same classifications ranged from 20 to 42 per cent. Negro males whose preference and self-image matched on the hierarchy ranged from 60 per cent for those with "acceptable" occlusal profiles to 32 per cent for those with "unacceptable" profiles. Comparable percentages for white males were 53 and 45 per cent.

DISCUSSION

This report contains some evidence that a child's actual occlusal condition may be associated with his self-image and, to a lesser extent, with his preference for that condition. For three of the four specific occlusal relations measured in this study, crowding, excess spacing and maxillary protrusion and for the over-all occlusal profile, data on clinical occlusal relations and self-perception of those relations seem to be related directly. Only for excess spacing and midline deviation does there seem to be a relation between clinical occlusion and preference.

The weakness of the over-all relationship may be a by-product of the measuring instruments themselves, both clini-

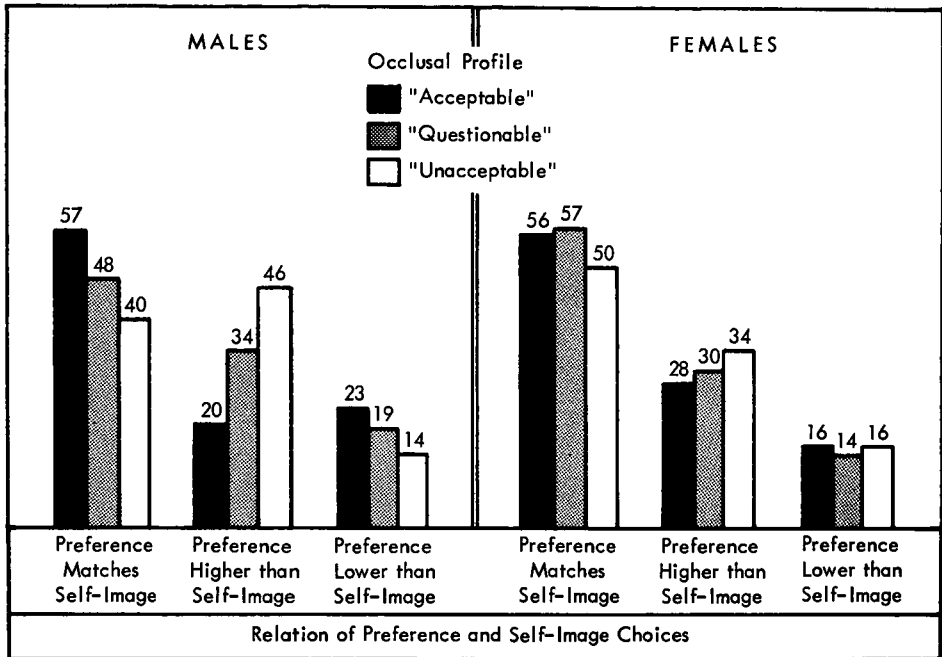


Fig. 2 Percentage distribution of children by sex according to occlusal profile and relation of preference to self-image choices.

cal and social-psychological, or it may possibly be explained because there is only a tenuous connection between actual occlusal conditions as measured by dentists and an individual's perception of those conditions.

It was originally hypothesized that girls would be more sensitive to differences in occlusal appearances than would boys. This hypothesis was not confirmed. Boys, particularly Negro boys, were most differentiating.

There are several limitations associated with these data. The population for this study was obtained from an ongoing investigation of a caries-preventive procedure.⁶ That population was selected essentially on the basis of two criteria that are pertinent to the present report: (1) children were born and reared on a fluoridated communal water supply; and (2) approximately equal numbers of white and Negro children of lower socio-economic status were used as subjects. Lifetime exposure to fluori-

dation may have an effect on the prevalence of malocclusion in a community^{7,8} and, related to the second criterion, malocclusion or perception of occlusal relations may not be an important concern to many children of lower socio-economic status^{9,10} or their parents. Results may have been different, particularly the perceptual findings, had a cross section of all social classes been included in the study.

The occlusal measurements used in the present study were adapted from an index designed primarily for epidemiologic purposes.¹¹ The focus of the present report, however, was for administrative purposes; its main intent hopefully would be to answer questions for the program administrator regarding which children to treat in a public program, in other words, as an aid in determining treatment priorities.

The clinical measurements and social-psychological findings of four individual occlusal conditions depicted on the

drawings—repaired cleft palate, bimaxillary protrusion, mandibular protrusion and open bite—were not compared in these analyses. Repaired cleft lip was omitted because no clinical cases of this condition were identified in the sample. Bimaxillary protrusion and mandibular protrusion were not used because no precise clinical measurements were made of these conditions. Open bite was omitted because perceptual results cited in a previous paper in this series³ indicated that the drawing of this condition bore a close resemblance to certain postures of normal or ideal occlusion.

Open to question is our attempt to combine specific measurements into arbitrary classifications of “acceptable,” “questionable” and “unacceptable” occlusions. Although the criteria for “acceptable” occlusion were rather strict, it is possible that some children met these criteria and still did not have an ideal or normal occlusion; they may have had some problem not reflected in the seven measurements made, particularly posterior deviations not assessed by the measurements of anterior relations. Furthermore, the methods used for arriving at children who were classified as having any of the three categories of occlusal profiles consisted only of compiling several discrete measurements. The assumption is a large one that all those who fell within the prescribed limits on all parameters for “acceptable” occlusion, for example, did in fact have a pleasing appearance.

Although posterior occlusal disharmonies may affect perception, the investigators assumed that there would be greater dissatisfaction and stigma associated with anterior conditions having greater visibility. Certainly there is some social-psychological literature that would support this assumption.¹²⁻¹⁵ Consequently, only anterior occlusal measurements were used.

Assumptions had to be made about

whether it was more suitable to use visual stimuli rather than verbal interview stimuli for pre-teenagers. The use of visual stimuli may have presented problems to the children in their distinguishing between depictions of various occlusal relations. If there was confusion, it was believed that it would more likely have occurred among pictures within a perceptual category rather than among categories. This hypothesis explains the grouping of pictures for analytical purposes into “ideal,” Category I and Category II classifications.

There was a three-minute limit per child in which to obtain a measure of the child's awareness of occlusion. Probing into the intensity of awareness and the sources of awareness, e.g., parents, friends, dentist, was not possible in this study. The data in this study, then, are superficial indicators of the social-psychological dimension. In addition, the pictures only sampled from the potential range of occlusal relations possibly affecting the child's attitudes; they represented only individual occlusal characteristics and not, as in reality, combinations of occlusal traits.

The population used may have been too young to experience perceptual awareness. From the standpoint of clinical orthodontic intervention, 10 to 12 year-old children would seem to be appropriate. However, teenage children may experience some conflict over their physical appearance,¹⁶ and thus may provide better subjects for research on social awareness of occlusion. If it is believed that the younger children should be used because treatment usually begins at that age, then awareness on the part of the mothers probably should be considered.^{9,17,18}

Because of the methodological limitations of these data, the findings should be treated cautiously; they can only be suggestive of what might be hypothesized in the design of a more refined re-

Perceptual status	Clinical status	
	Acceptable occlusion	Unacceptable occlusion
Acceptable occlusion	A	C
Unacceptable occlusion	B	D

Fig. 3 Simplified schema of combinations of clinical and perceptual statuses of children under consideration for orthodontic treatment in community programs.

search effort conducted solely for the purposes of testing such hypotheses.

Theoretically, if more precise measurements could be obtained for both clinical and social-psychological indicators and if such measurements were shown to be related, it is conceivable to hypothesize at a minimum four combinations of results. These are shown in Figure 3.

The following discussion mainly refers to alternatives for administrators of community dental programs. In the case of Cell A, the child's clinical condition is "acceptable" and his self-image, as an example of one type of perception, is acceptable to himself. Therefore, no problem exists for the administrator—no care is needed. However, in the case of Cell B in which the child's clinical condition is "acceptable" but in which he thinks something is wrong with his appearance, counseling is probably the prescribed remedy. For those in Cell C in which clinical criteria indicate the need for treatment but in which the patient is unconcerned about this need, the program administrator should consider counseling of the patient before treatment is initiated. If there is no physiologic disability, but merely an esthetic one defined only by the dentist, perhaps treatment should not be initiated. Those in Cell D have an "unacceptable" clinical condition and perceive their condition as such. In this case, there is no public health problem in priorities, for this type of child most probably should be treated first.

The cells in Figure 3 only designate "conceptual constructs" which serve to help one think out a problem. They do not represent the full range of reality but only polarize the extremes of reality to help clarify options for problem solving.

The model shown in Figure 3 probably should be expanded to include a greater number of variables that may have pertinence to decisions on treatment priority—for example, parental attitudes toward occlusion, the need for achievement, likelihood of successful, sustained results of clinical treatment, cost of treatment and patient satisfaction with treatment results. As variables are added, the model becomes multidimensional and more complex. Naturally, not all the variables can be considered immediately in programming decisions, nor can the impact of some of them even be determined at this point in time. The expanded model, however, may generate hypotheses for research with pertinence to community orthodontic programs. The results of this research can be fed back into the program to facilitate programming decisions.

Eventually, it may be feasible to have an index of occlusion for public health purposes which contains the appropriate type and proportion of clinical and social-psychological information. The index may also include cultural data as a refinement which might help international efforts to measure the severity of malocclusions more objectively. As Carlos¹⁹ stressed in his evaluation of the currently used indices of malocclusion, ". . . fresh approaches to the problem of measuring the heterogenous complex called malocclusion seems preferable to continued debate on the relative merits of existing techniques." We concur heartily.

*Dental Health Center
14th Avenue and Lake Street
San Francisco, California 94118*

REFERENCES

1. Horowitz, H. S., Thorburn, B. R., and Summers, C. J. Occlusal relations in children born and reared in an optimally fluoridated community: I. Clinical methods. *Angle Orthodont.*, 40:59, 1970.
2. Horowitz, H. S., and Doyle, J. Occlusal relations in children born and reared in an optimally fluoridated community: II. Clinical findings. *Angle Orthodont.*, 40:104, 1970.
3. Cohen, L. K., and Horowitz, H. S. Occlusal relations in children born and reared in an optimally fluoridated community: III. Social-psychological findings. *Angle Orthodont.*, 40:159, 1970.
4. Huntley, C. W. Judgments of self based upon records of expressive behavior. *J. Abnormal and Social Psychol.*, 35:398, 1940.
5. Stricker, G. Psychological issues pertaining to malocclusion. *Am. J. Orthodont.*, 58:276, 1970.
6. Horowitz, H. S., and Heifetz, S. B. Evaluation of topical applications of stannous fluoride to teeth of children born and reared in a fluoridated community: Final report. *J. Dent. Child.*, 36:65, 1969.
7. Ast, D. B., Alloway, N., and Draker, H. L. Prevalence of malocclusion, related to dental caries and lost first permanent molars, in a fluoridated city and a fluoride-deficient city. *Am. J. Orthodont.*, 48:106, 1962.
8. Erickson, D. M., and Graziano, F. W. Prevalence of malocclusion in seventh grade children in two North Carolina cities. *J.A.D.A.*, 73:124, 1966.
9. Baldwin, Jr., D. C., Barnes, M. L., Baldwin, M. A., and Papajohn, J. T. Social and cultural variables in the decision for orthodontic treatment. Paper read before 45th annual meeting of the International Association for Dental Research, Washington, D.C., 1967.
10. Hilzenrath, S. S. Social and psychological factors related to malocclusion and the seeking of orthodontic treatment. Orthodontics thesis, *Harvard School of Dental Medicine*, Boston, 1970.
11. Summers, C. J. A system for identifying and scoring occlusal disorders. The occlusal index. Doctoral thesis, *University of Michigan School of Public Health*, Ann Arbor, 1966.
12. Richardson, S. A., Goodman, N., Hastorf, A. H., and Dornbusch, S. M. Cultural uniformity in reaction to physical disabilities. *Am. Social. Rev.*, 26:241, 1961.
13. Goodman, N., Richardson, S. A., Dornbusch, S. M., and Hastorf, A. H. Variant reaction to physical disabilities. *Am. Social. Rev.*, 28:429, 1963.
14. Matthews, V., and Westie, C. A preferred method for obtaining rankings: Reactions to physical handicaps. *Am. Social. Rev.*, 31:851, 1966.
15. Secord, P. F. Facial features and inference process in interpersonal perception. P. 300. (In Laguri, R., and Petruccio, L., eds). *Person Perception and Interpersonal Behavior*. Stanford Univ. Press, California.
16. Powell, M. Age and sex differences: Degree of conflict within certain areas of psychological adjustment. *Psych. Monograph No. 387*, Vol. 69, No. 2, 1955.
17. Baldwin, Jr., D. C., and Barnes, M. L. Psychosocial factors motivating orthodontic treatment. Paper read before 43rd annual meeting of the International Association for Dental Research, Toronto, 1965.
18. ———. Patterns of motivation in families seeking orthodontic treatment. Paper read before the 44th annual meeting of the International Association for Dental Research, Miami, 1966.
19. Carlos, J. P. Evaluation of indices of malocclusion. Paper read before ADA/FDI International Conference on Epidemiologic Assessment of Dentofacial Anomalies, New York, 1969.