Self-concept, Class II malocclusion, and early treatment

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The highly visible nature of Class II malocclusion may lead to psychosocial problems such as teasing,[1] negative stereotyping, and low self-concept.[2] One rationale for early treatment is that correction of the visible aspects of malocclusion at an early stage in a child's maturation will prevent the development of poor self-concept. Self-concept is believed to be a relatively stable set of attitudes that reflects a description and evaluation of one's own behavior and attributes.[3] Self-concept defines an individual's organization of self-attitudes,[4] including perceptions and beliefs with respect to body structure and appearance, referred to as body image.[5] The way individuals perceive their body is thought to play a significant part in determining their sense of security and self-concept.[6]

It is now generally recognized that there is a strong relationship between physical appearance,[7] particularly facial appearance, and social attractiveness.[8] Although it would seem logical to assume that improving an individual's appearance would have a positive effect on body image and hence on self-concept, the role that dentofacial appearance plays in developing self-concept remains controversial.[9-12] Even though improvement in appearance is the primary rea-

Abstract

Increased overjet has been associated with teasing, negative stereotyping, and low self-concept. Early treatment for children with Class II malocclusion is often recommended under the assumption that an improved dental appearance may benefit a child by increasing his or her social acceptance and hence self-concept. The self-concept of 208 patients, age 7 to 15 years and with increased overjet, was measured before treatment using the Piers-Harris self-concept scale; a subset of 87 of these children were measured again after 15 months of early growth modification. The mean self-concept score for these children was above the population norm, and there was no association between the child's score and the magnitude of his or her overjet or age. Although some significant associations were found between Class II malocclusion features and self-concept scores, the explained variation in self-concept scores was low (R^2 from 5% to 8%). There was no change in the mean self-concept score of these children during early treatment, nor was there any association between reduction of Class II malocclusion features and improved self-concept. These findings suggest that children with Class II malocclusion do not generally present for treatment with low self-concept and, on average, self-concept does not improve during the brief period of early orthodontic treatment.

Key words

Othodontics • Early treatment • Self-concept • Class II malocclusion

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Table 1
The Piers-Harris children's self-concept scale

Measure	No. of items	Explanation of Measure
Total Score	80	Assessment of global self-concept
(i) Behavior	16	The extent to which a child admits or denies problematic behavior
(ii) Intellectual school status	17	Self-assessment of abilities with respect to intellectual and academic task, including general satisfaction with school and future expectations
(iii) Physical appearance attributes	13	Attitudes concerning physical characteristics as well as attributes such as leadership and the ability to express ideas
(iv) Anxiety	14	General emotional disturbance and dysphoric mood
(v) Popularity	12	Evaluation of popularity with classmates, being chosen for games, and ability to make friends
(vi) Happiness satisfaction	10	A general feeling of being a happy person and easy to get along with, and feeling generally satisfied with life

* Piers-Harris Revised Manual 1984
i-vi represent the six components that comprise total self-concept.

son for seeking orthodontic treatment,[13] there is little evidence to support an association between the absence of malocclusion and measurably higher self-concept.[11]

This research was undertaken to address the following questions: Do children with Class II malocclusion have low self-concept? Are there specific dental and facial features that are related to self-concept? Does early treatment for Class II malocclusion improve self-concept?

Materials and methods

Two groups of children with Class II malocclusion being treated at the University of North Carolina participated in this study. The first group comprised 104 of 192 children enrolled in a randomized clinical trial (RCT) of the benefits of early orthodontic treatment. The second group was made up of 105 children being treated concurrently in the graduate orthodontic clinic (GOC). Since measures of self-concept were introduced only after the randomized trial began, not all of the children in the trial completed the self-concept questionnaire. Children in the graduate clinic were included if they had increased overjet (≥4.5mm measured from the lateral cephalogram) and were younger than the age of 15 years at their initial records. Children from both groups (RCT and GOC) were Caucasian and without congenital defects or dental syndromes.

Self-concept was measured using the Piers-Harris children's self-concept scale, an 80-item forced choice self-report designed to quantitatively assess how children feel about themselves.[3] The Piers-Harris provides a total score that assesses a child's global self-concept and six cluster scores that measure various components of self-concept (Table 1). Given the age range of the children, the Piers-Harris was selected as the most appropriate tool for measuring self-concept because the questionnaire provides for both global and cluster scores, and because empirical evidence supports its reliability and validity.[9] The questionnaire was given to all children using the standardized test format and instructions, and, in order to avoid external influence, without parents or guardians present. Although the Piers-Harris is intended for children 8 to 18 years of age and is designed at a third-grade reading level, if a child had difficulty reading any part, this was read to him or her. No time limit was set to complete the questionnaire. Inconsistencies and response biases were assessed using the methods described in the Piers-Harris manual.[3]

Prior to the first phase of the trial, the children in the RCT group were randomly assigned to one of three groups: early treatment with headgear (N=34), early treatment with a functional appliance (N=33), or observation only until the permanent dentition was established (N=37). The children were evaluated at the time the initial records were taken and after 15 months (the end of phase 1). The children in the graduate clinic (N=105) were treated according to the recommendations of the attending clinician and were evaluated using the same measures as the RCT patients, but only at their initial records. Lateral cephalometric radiographs and plaster models were taken for both groups at each visit the Piers-Harris was completed.

Preliminary analysis of the Piers-Harris questionnaires identified highly inconsistent responses for three of the initial and four of the end-of-phase-1 evaluations, and data from these children (two from RCT and one from GOC) were excluded from further analysis. The chil-

dren in the randomized trial (N=104, 43% female) were slightly younger (mean age 9.3 yrs.), and had on average more severe malocclusions than those in the graduate clinic group (N=104, 51% female, mean age 11.4 yrs.) (Table 2). The pretreatment equivalence of the two groups and the changes occurring during the initial phase of treatment for those children in the RCT were evaluated using t-tests. (The alpha level was set at $P \leq 0.01$ for these tests).

Only age, gender, overjet, irregularity index, SNA, and SNB were included as predictor variables in the regression model in order to eliminate the multicolinearity that existed within the data set. The regression analysis for the total self-concept score and each component cluster used a strategy of multiple-step forward selection with backward overlook. The intent of this approach was to adjust for predictor variables that are related to the outcome but are unbalanced between the two patient groups. Variables were eliminated using backward selection if the P value to remain in the model was greater than 0.05. The correlation between change in overjet resulting from early treatment and change in self-concept score for the patients in the randomized trial was evaluated using Spearman correlations.

Results

Initial self-concept

Self-concept scores for the two groups are presented in Table 3, together with the normative values given in the Piers-Harris manual. With one exception, the mean total score and mean cluster scores for the two patient groups are consistently higher than those used as population norms. The only measure that was significant between the two groups was the average cluster score measuring a child's belief about his or her popularity. Because all the differences were small and, in general, not statistically significant, data from the two patient groups were combined in the subsequent analyses.

Features related to self-concept

There was no systematic relationship between the global self-concept score and either the patient's age or the severity of the overjet (Spearman's correlations 0.07 and -0.07 respectively). The multiple regression analysis used to determine whether there were additional patient characteristics that would predict self-concept showed that, while some variables were identified as significant, their predictive power was low ($R^2 \leq 8\%$) (Table 4).

Table 2
Comparison of the initial characteristics of the two patient groups; randomized clinical trial patients (RCT n=104), and graduate orthodontic clinic patients (GOC n=104).

	RCT		GOC		
	Mean	SD	Mean	SD	P
Age yrs	9.3	1.1	11.4	1.6	.0001*
Irreg index mm	1.0	0.7	1.3	0.8	.007*
Overjet mm	8.3	2.0	7.1	2.1	.0001*
SNA deg	82.5	3.7	82.6	3.8	.75
SNB deg	76.4	3.5	77.5	3.5	.03
AB skel mm	-10.3	3.2	-9.2	3.3	.01
AB soft mm	-13.3	3.5	-11.9	3.7	.004*
Pg to N perp. mm	-12.3	6.4	-11.1	7.4	.21

Between group comparison using unpaired t-tests.
* = level of significance set at P<.01

Table 3
Comparison of initial self-concept scores measured in two patient groups.

	RCT		GOC			POP	
	Mean	SD	Mean	SD	P	Norm	SD
Total score	61.4	11.9	63.1	11.9	0.3	56.0	11.8
Cluster scores							
Behavior	14.0	2.4	13.9	2.9	0.7	11.4	3.2
Intellect	13.7	3.2	14.2	2.8	0.3	11.6	3.6
Physical appear	8.9	3.0	9.6	3.1	0.1	8.3	3.1
Anxiety	10.6	3.1	10.9	3.1	0.4	9.5	3.1
Popularity	7.7	3.0	9.0	2.7	0.0*	8.2	2.7
Happiness	8.5	2.1	8.6	1.8	0.7	8.0	2.0

Between-group (RCT-GOC) comparison using unpaired t-test
* =level of significance set at P<.01.
Population values derived from 1,183 children grades 4-12 from a Pennsylvania public school system in early 1960.

Effect of early treatment on self-concept

The morphologic changes occurring during the first phase of the randomized clinical trial are presented in Table 5. Data are reported only for the subset of patients completing both initial and end-of-phase-1 Piers-Harris questionnaires (N=87). The two appliance groups, headgear and functional appliance, are combined into a single early treatment group (N=56). While the treatment groups did show a general reduction in

Table 4
Significant explanatory measures from regression analysis using pooled data from both malocclusion groups (n=208)

	Explanatory measures	R^2
Total Score	SNA°, SNB	5%
Cluster scores		
Behavior	SNA°, GEND	5%
Intellect	SNA°, SNB	5%
Physical appear		
Anxiety		
Popularity	SNA°, ALIGN, GROUP	8%
Happiness		

A multi-step multiple regression forward selection with backward overlook strategy was used to identify significant predictors. In the first step, main effect models using forward selection were performed for the entire sample and then separately for males and females, RCT and GOC patients, and patients less than 10 or greater than 10 years old. In the second step, significant main effects for the entire sample were included in a second model as predictors, but interaction terms suggested by the subgroup analysis were available for inclusion if the variation explained was significant. A continuous measure was considered to interact with the subgroup variable if it entered as a significant main effect in one of the subgroup analyses but not in the entire sample analysis. In the third step, available predictors were the significant terms from the first and second steps along with an indicator for the group (RCT or GOC). Variables were eliminated using backward selection if the P value to remain in the model was greater than 0.05.

severity of Class II malocclusion features, the control group patients (N=31), who had no active treatment during this time, showed little change in any values.

The changes in Piers-Harris scores during phase 1 of the clinical trial are given in Table 6. In general, during the 15 months over which the children where evaluated, the magnitude of the mean changes was extremely small for both treated and control groups, with only one cluster in the observation-only group showing a statistically significant change. Given the conservative levels chosen for testing the significance of the multiple comparisons being made, there was no difference in the mean changes experienced by the treatment groups as compared with the observation-only group. The correlations between change in overjet and change in global self-concept scores were not statistically different from zero (r values ranged from -0.1 to 0.20).

Discussion

The literature relating the importance of physical appearance, particularly facial appearance, to social experience is compelling. The "beauty is good" paradigm[14] has been consistently supported, and it is recognized that physically attractive people receive many social and psychological advantages.[15] It has also been demonstrated that dentofacial appearance plays an important part in establishing the overall attractiveness of individuals.[2,16,17] As such, it would seem logical to expect that early reduction in malocclusion severity would lead to improved appearance, body image, and social acceptance. However, what is not clear is the extent to which malocclusion contributes to a child's self-concept, and whether early treatment directed at correcting or reducing the features of malocclusion prevents the development of low self-concept or results in improved self-concept.

From our data we cannot conclude that, on average, the self-concept of children with Class II malocclusion is low. The two clinic groups both have average total and cluster scores that are above the population norms. However, these norms should be interpreted with some caution because they were derived during the 1960s from a non-clinic population of school children who may well have had other important socio-demographic differences. Nevertheless, the Piers-Harris remains the most widely used measure of self-concept for children in this age group. Unfortunately, neither more contemporary norms nor a comparison sample of children with Class II malocclusion who were not seeking treatment or children with normal occlusion were available to us. It is possible that our sample, where all patients were anticipating improvement in their malocclusion, may differ from children who are not seeking care.

An earlier exploratory analysis[18] of this data had suggested that there might be some association between increased overjet and low self-concept. However, with the sample size and age range increased, these preliminary findings were not sustained. No association between total self-concept scores and the patients' age or amount of overjet was found. Although the predictor variables accounted for relatively little of the variance in self-concept, it may be of interest to note that SNA was significant for 4 of the 7 regressions. However, the coefficients of determination from the regression analysis are extremely low.

One major tenet of the Piers-Harris Scale is that self-concept is stable by age 8 to 9 years.[3] This

Table 5
Morphologic changes during phase 1 of clinical trial. Headgear and functional appliance groups were combined to form a single treatment group, while the observation-only group served as a control.

	Treatment N=56		Control N=31	
	Mean	SD	Mean	SD
Irreg index mm	0.0	0.6	0.0	0.6
Overjet mm	-2.1*	2.0	0.1	1.1
SNA deg	-0.3	1.6	0.2	1.5
SNB deg	0.8*	1.1	0.4	1.1
AB skel mm	-1.1*	1.2	0.2	1.7
AB soft mm	-1.5*	2.1	0.1	1.7
Pg to N perp mm	0.9*	2.0	0.8	2.0

Paired t-test for changes within each group
* = level of significance set at P<.01

Table 6
Comparison of change in self-concept scores during phase 1 of the clinical trial. Patients in the headgear and functional appliance groups were combined to form a single early treatment group. Patients in the observation-only group served as a control.

	RCT tx group (N=56) ◊		RCT control group (N=31) ◊		P values for tx vs control ♦
	Mean	SD	Mean	SD	P
Total score	1.6	9.2	4.5	9.8	0.19
Cluster scores					
Behavior	-0.1	2.4	0.6	2.4	0.22
Intellect	0.2	2.3	1.0	2.5	0.16
Physical appear	0.2	2.8	1.5	3.0	0.05
Anxiety	0.7	2.6	0.5	2.2	0.71
Popularity	0.4	2.6	*1.5	2.6	0.03
Happiness	0.4	2.0	0.2	1.8	0.97

◊ = within group comparisons using paired t-tests
* = level of significance p < 0.01
♦ = between-group comparisons using unpaired t-tests

has been challenged by those who contend that self-concept is a more dynamic construct influenced by situational factors and social interactions.[19] Although the samples spanned from age 7 to 15 years, the distribution of age and malocclusion severity was uneven in the two groups. The children in the randomized trial were, on average, not only 2 years younger but had more severe malocclusions than children in the graduate clinic. The apparent lack of difference in self-concept between the two groups may be explained in part by the fact that adolescent and pre-adolescent children face different psychosocial tasks.[6] Younger children, who in this study generally represent the more severe malocclusions, are primarily concerned with peer acceptance (popularity), while adolescent children, who in this study generally represent the less severe malocclusions, are primarily concerned with being attractive (physical appearance).

An important focus of this research was to determine whether early orthodontic treatment for Class II malocclusion should be considered to provide a psychosocial benefit or whether failure to treat might have a detrimental effect. During phase 1 of the clinical trial, even though growth modification without any attempt to correct anterior tooth position was the goal, the RCT treatment groups did experience a significant reduction in severity of Class II features, (dental relationship, skeletal discrepancy, and soft-tissue difference) as compared with the observation-only group. The change in severity of malocclusion was not, however, accompanied by any change in self-concept, nor was any difference in the change in self-concept experienced by the treatment or observation-only groups. This lack of change would tend to support the idea that self-concept is not only reasonably stable over this short period, but also independent of malocclusion or orthodontic treatment. It is possible that a longer time frame and the completion of all phases of orthodontic treatment may be necessary before significant effects relating to the timing of treatment appear.

It is probable that there are many factors contributing to a child's self-concept. For the majority, Class II malocclusion and orthodontic treatment seem to account for only a small part of the variation in self-concept. Early treatment may provide an important benefit for some children who are experiencing teasing and negative stereotyping. Given the body of literature that points to attractive children receiving more positive feedback in this culture, early orthodontic intervention to improve dentofacial attractiveness may well improve a child's social interactions. However, if this occurs, it would appear that the psychological impact is more on the reaction of others to the child rather than in the child's own self-concept. Even if early treatment reduces the teasing a child with a large overjet has to endure, there is little evidence that lack of treatment leads to reduced self-concept in the pre-adolescent period. At an older age, being

treated differently because of protruding incisors may possibly affect one's adjustment to life. However, such effects did not show up in these pre-adolescent children, and we feel therefore that the importance of self-concept as a reason for early treatment may have been exaggerated.

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