ORIGINAL ARTICLE

Ratings of profile attractiveness after functional appliance treatment

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The aim of this study was to determine the change in profile attractiveness in children with Class II Division 1 malocclusion after 18 months' treatment with functional appliances. Changes in profile attractiveness were assessed by panels of art students, dental students, and parents of orthodontic patients. Each panel consisted of an equal number of male and female raters. The raters first decided whether the initial or 18-month profile silhouette was more attractive, and then scored the degree to which it was more attractive on an unmarked visual analog scale. There were no significant differences between either male and female raters or among panels in their assessments of the change in profile attractiveness in the whole sample. Neither were there significant differences between the change in profile attractiveness of the untreated subjects and the subjects treated with either Fränkel function regulators or Harvold activators. It is concluded that treatment with functional appliances does not lead to more attractive profiles than nontreatment. (Am J Orthod Dentofacial Orthop 2000;118:371-6)

One of the major objectives of orthodontic treatment is to improve facial attractiveness. To orthodontists this invariably means that the nose, lips, and chin form an attractive outline when the face or a standardized image of the face is viewed from one side. To determine if orthodontic treatment improves profile attractiveness, it is necessary to devise a method to assess changes in profile attractiveness and to identify changes in profile attractiveness that occur in untreated subjects. To meet the latter requirement, and to avoid many of the biases that lead to false results in nonrandomized trials, it is essential that subjects be randomly allocated to treatment and control groups at the outset.

As some facial features, such as skin complexion and hair color and style, and nonfacial features, such as gender, may bias assessments of profile attractiveness based on photographs, profile silhouettes have been used in previous studies.[1-3] The silhouettes are generally assessed by panels to prevent the extreme views of individuals from influencing the results. Some previous studies have reported that panels drawn from professional groups, such as orthodontists, have a heightened, and perhaps biased, view of the facial profile.[4-12]

The purpose of this study was to determine if improvements in profile attractiveness occur in children with Class II Division 1 malocclusion after treatment with functional appliances. Although claims that these appliances result in a dramatic improvement of the entire lower face and a more attractive profile appear to be justified, they are unsubstantiated.[13]

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SUBJECTS AND METHODS

Subjects

The subjects consisted of 42 11-year-old Dunedin, New Zealand, school children with Class II Division 1 malocclusion[14] who participated in a randomized control trial of 2 functional appliances. At the start of the study, the children were age-matched and sex-matched in triads and randomly assigned to 1 of 3 groups. Thirteen children (8 boys, 5 girls) were treated with Fränkel function regulators,[15,16] 12 children (7 boys, 5 girls) were treated with Harvold activators,[17] and 17 children (11 boys, 6 girls) were left untreated. Lateral cephalometric radiographs were taken of the subjects standing, head held by a Wehmer cephalostat, and teeth occluded in the intercuspal position with the lips unstrained, at the start of the study and 18 months later. Further details of the subjects and methods are given elsewhere.[18-20]

Assessment of the Silhouettes

Profile silhouettes were constructed by contact printing the initial and 18-month lateral cephalometric radiographs onto photographic paper, cutting along the soft tissue profile, and mounting the background fragment, reverse side uppermost, to standard-sized sheets of heavy black paper. For each subject, the initial silhouette was randomly designated either A or B, and the 18-month silhouette was given the alternate letter. The pairs of silhouettes were then randomly assigned a number from 1 to 42. Two orthodontists constructed 3 additional silhouettes, representing very unattractive,

Fig 1. Anchor stimuli: **A,** very unattractive; **B,** average attractiveness; **C,** very attractive.

Table I. Comparison of changes in profile attractiveness after treatment with functional appliances

	Control (n = 17)			*FFR (n = 13)*			*HA (n = 12)*			*ANOVA*
Panel	*Mean*	*SD*	*SE*	*Mean*	*SD*	*SE*	*Mean*	*SD*	*SE*	*P*
Art students										
Male	8.08	23.99	5.82	11.05	19.89	5.52	15.35	30.77	8.88	.745
Female	6.16	25.62	6.21	14.77	19.70	5.46	19.11	31.17	9.00	.391
Combined*	7.12	24.45	5.93	12.91	19.42	5.39	17.23	30.71	8.86	.558
Dental students										
Male	6.39	24.92	6.04	15.88	20.34	5.64	20.98	32.41	9.36	.317
Female	7.26	30.20	7.32	13.86	24.96	6.92	16.86	37.27	10.76	.693
Combined*	6.83	27.08	6.57	14.87	21.41	5.94	18.92	34.63	10.00	.497
Parents										
Male	7.30	27.56	6.69	14.21	30.28	8.40	19.62	35.48	10.24	.566
Female	9.38	34.08	8.27	11.15	30.69	8.51	24.11	43.39	12.53	.526
Combined*	8.34	30.03	7.28	12.68	29.68	8.23	21.67	39.13	11.30	.551
All panels										
Male	7.26	24.43	5.93	13.72	22.33	6.19	18.65	32.53	9.39	.515
Female	7.60	28.98	7.03	13.26	23.74	6.58	20.03	36.74	10.61	.551
Combined†	7.43	26.48	6.42	13.49	22.78	6.32	19.34	34.56	9.98	.531

*Males (n = 15) and females (n = 15) combined.
†All males (n = 45) and all females (n = 45) combined.

average, and very attractive profiles, using the silhouettes of facial parts of the subjects. These silhouettes were used as anchor stimuli (Fig 1).

Three rating panels, comprising 30 fifth-year dental students from the School of Dentistry, University of Otago, 30 art students from the Otago Polytechnic School of Art, and 30 parents of children undergoing orthodontic treatment in the Department of Orthodontics, School of Dentistry, University of Otago, assessed the silhouettes. Each panel contained an equal number of males and females, and parents of the subjects were excluded from the panels. The raters were given an explanation of the study and were allowed a few minutes to ask questions and view the anchor stimuli. They were then given 20 seconds to view each silhouette pair laid out in numeric and alphabetical order, and to record which profile was more attractive and the extent of the attractiveness of the preferred silhouette over its pair. An unmarked 100 mm analog scale, anchored at the ends by the descriptors 0% and 100% more attractive, was used to record the attractiveness of the preferred profile.

Data Management

The visual analog scales were measured, then remeasured 4 to 8 weeks later. If the initial silhouette was selected as the more attractive one, the scale measurement was given a negative value; if the 18-month silhouette was chosen as the more attractive one, the measurement was given a positive value. Intrapanel reliability was tested by randomly selecting 15 raters from each panel and comparing their scores of 10 randomly selected subjects with the scores obtained by the remainder of their panel for the same 10 subjects. In each panel the scores obtained by the male raters were

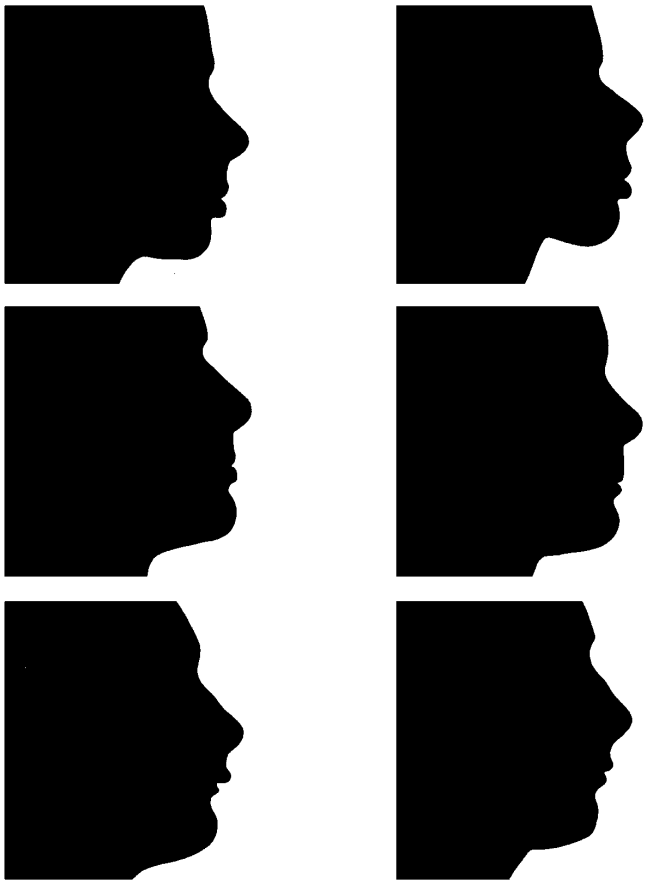

Fig 2. Silhouettes of boys in triad 12. *Top,* control group subject, preferred profile, initial profile; *middle,* Fränkel group subject, preferred profile, initial profile; *lower,* Harvold group subject, preferred profile, initial profile.

also compared with the scores obtained by the female raters. Pearson product-moment correlation coefficients were used to determine the intrapanel reliability, and the *t* test for unpaired data was used to test for significant differences between male and female raters. High coefficients between split panels indicate that the raters performed at an acceptable level of reliablity.[21] An analysis of variance was used to determine if statistically significant differences existed between the panels and between the scores given to each group by each panel.

RESULTS

Panel Comparisons

High correlation coefficients were found between the rater subgroups in each panel (art students .928; dental students .965; parents .914). There were no statistically significant differences between either male and female raters in each panel (art students $P = .793$; dental students $P = .815$; parents $P = .891$), or between panels ($P = .598$) in their assessments of the changes in profile attractiveness.

Group Comparisons

There were no statistically significant differences between the changes in profile attractiveness of subjects treated with either Fränkel function regulators or Harvold activators and untreated subjects in the control group (Table I). There were also no significant differences when the 2 appliance groups were combined and compared with the control group ($P = .310$). Silhouettes of 3 boys in triad 12 are shown in Fig 2.

A feature of the group comparisons is the variation displayed by the 3 panels. The art students were the most consistent of the 3 panels and parents were the least (Table I). All panels were most variable in assessing the profile changes in the Harvold activator group.

Control group. Six subjects in the control group were rated by the panels as having less attractive pro-

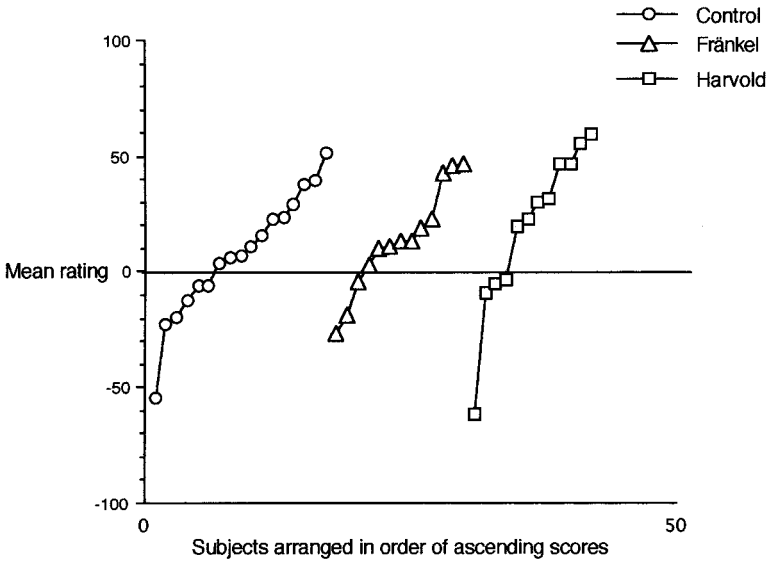

Fig 3. Change in profile attractiveness of all subjects (n = 42) as assessed by all raters (n = 90). Positive values indicate 18-month profile rated more attractive; negative values indicate initial profile rated more attractive.

files after 18 months; one subject by –55, 3 subjects were rated between –10 and –25, and 2 subjects were under –10 (Fig 3). Of those with a more attractive profile after 18 months, 3 subjects improved by less than +10, 4 subjects between +10 and +25, 3 subjects between +25 and +50, and 1 subject by +50.

Fränkel group. Three Fränkel subjects were rated by the panels to have less attractive profiles after 18 months' treatment (Fig 3). Six subjects had less than +20 change in profile attractiveness, and the remaining 4 subjects had between +20 and +50 change. All panels were less variable when rating this group compared with the Harvold and control groups. The panels agreed closely on only 2 subjects: 1 subject who was considered to have a marked improvement in profile attractiveness, and the other who showed little change.

Harvold group. The highest rated subject by the 3 panels, with a mean overall score of +59, was in the Harvold group. Of the 7 other subjects rated to have more attractive profiles after treatment, 1 improved by +20, 2 were rated between +20 and +30, 3 between +30 and +50, and 1 by +55 (Fig 3). Four subjects in the Harvold group had less attractive profiles after 18 months' treatment. One of these, with an overall mean of –61.4 was the lowest rated subject by any panel. The remaining 3 subjects were rated between 0 and –10.

In summary, 13 subjects were perceived by all raters to have less attractive profiles after 18 months. Six of these were control subjects, 3 were treated with Fränkel function regulators, and 4 were treated with Harvold activators. Of the 2 subjects with ratings greater than –50, one was in the control group and the other in the Harvold activator group. Four subjects (3 control, 1 Fränkel) had less than a +10 change in profile attractiveness, and only 3 subjects (1 control, 2 Harvold) had more than a +50 change in their profile attractiveness. Sixty-five percent of the control subjects had more attractive profiles after 18 months' observation, and 67% of the Harvold activator group and 77% of the Fränkel function regulator group had more attractive profiles after 18 months' treatment.

DISCUSSION

The present study provides evidence that treatment of Class II Division 1 malocclusions with functional appliances does not lead inevitably to more attractive profiles. Because profile attractiveness improved in approximately two thirds of the untreated group and in between two thirds and three quarters of the treated groups, it was not surprising that there were no significant differences between the groups. These findings suggest that it is unwise for a clinician to promise that functional appliance treatment will improve the attractiveness of a growing patient's profile.

Profile silhouettes were used in this study to keep distractors, such as skin complexion, hair color, texture, and style, and facial expression, from influencing the results.[1-3] In contrast to previous work that assessed attractiveness from single profile silhouettes, the panels in this study were asked to decide which of 2 pro-

files, taken 18 months apart, was more attractive, and to indicate on an unmarked visual analog scale the extent of that attractiveness. Use of a scale in this way enables ratings to be made with greater sensitivity than if semantic phrases are used, and it avoids any bias toward preferred values, a problem found with numeric or equal-appearing interval scales. It also enables more powerful parametric statistics to be used.[22-24] When visual analog scales are used it should not be assumed that identical scores by different raters, or by the same rater on different occasions, express the same intensity of feeling about a particular profile. Furthermore, it should not be assumed that a multiple of a rating is a multiple of the intensity of feeling about a particular profile. Each rater's preference is subjective and may vary widely from ratings of the same subject by other raters.[22]

The method of assessment required each rater to decide which of 2 profile silhouettes in each pair was more attractive and then to indicate the difference in attractiveness on an unmarked scale. Influencing these judgments is each rater's own body image and self-esteem. The more a person's profile deviates from the ideal, the greater their anxiety and dissatisfaction with it.[25,26] Thus, raters dissatisfied with their own profile will judge subjects' profiles similar to their own more harshly. Some other profiles may also have had more salience for certain raters than others. Body parts, including the dentofacial region, assume a greater or lesser importance for people based on their particular life experiences as well as self or other's perceptions.[27] In addition, because ratings of overall facial attractiveness are known to be more highly correlated with the physical attractiveness of some individual facial components than others, the raters' perception and liking of a profile may have been influenced by changes in these components.[28,29] For example, the forward growth of the nose between 7 and 12 years of age may offset favorable changes in the lips and chin.[30,31] For these reasons, large panels were used to prevent the extreme views of individuals from unduly influencing the panel means.

Whereas panels drawn from different ethnic and nondental occupational groups tend to agree closely on what constitutes acceptable lip posture, previous studies have reported that orthodontic and dental professionals have different perceptions of facial and dental appearance than lay people.[4-6,8-12] The dental students in the present study were within a few months of graduation and therefore were regarded as dental professionals. Despite this, no significant differences were found between the panels' assessments of profile attractiveness of the treated and untreated children. The panel composed of art students was the least variable in appraising profile attractiveness, contrary to the experience of Kerr and O'Donnell,[7] who reported that art students and parents were more variable than senior dental students and orthodontists. In agreement with others,[1,32,33] there were no significant differences between male and female raters, either in each panel or when all the male raters were compared with all the female raters.

The finding that there was no significant improvement in profile attractiveness of the subjects in the treatment groups agrees with Nielsen,[34] who reported that there was no profile improvement in 7 of 10 subjects treated with Fränkel function regulators, and disagrees with others,[35,36] who have reported favorable profile changes in selected subjects treated with Fränkel function regulators or Harvold activators. It could be argued that greater facial attractiveness of the subjects in the treated groups compared with subjects in the untreated group was not found because the changes were either too variable or too small to be detected consistently by the panels, or because they were due to differences in raters' perception and liking of one profile over its pair. The present study does, however, underline the importance of recognizing that profile attractiveness can improve without treatment.

SUMMARY AND CONCLUSIONS

The purpose of this prospective study was to examine the changes in profile attractiveness in children with Class II Division 1 malocclusion after 18 months' treatment with either a Fränkel function regulator or a Harvold activator. The changes in profile attractiveness were assessed by panels of art students, dental students, and parents of orthodontic patients. The panels had equal numbers of male and female raters.

There were no significant differences between either male and female raters or between panels in their assessments of the changes in profile attractiveness. There were also no significant differences between the changes in profile attractiveness of untreated subjects and subjects in the appliance groups. It is concluded that treatment with functional appliances does not lead to more attractive profiles than nontreatment.

We thank the art students of Otago Polytechnic, the final year dental students at the University of Otago, and the parents who gave unselfishly of their time to evaluate the silhouettes. We also thank Rob Garrett and Linda Tyler, Department of Art History, Otago Polytechnic, for their invaluable help in arranging the panel of art students.

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