THE INFLUENCE OF DENTOFACIAL SCHEMA COMPLEXITY ON ASSESSING FACIAL ATTRACTIVENESS AND BENEFIT OF ORTHODONTIC TREATMENT

by

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Abstract

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Five groups of people with presumably different relative levels of dentofacial schema complexity viewed frontal, smile and profile facial photographs of people seeking orthodontic treatment and evaluated three main variables: (1) degree of facial attractiveness, (2) whether orthodontic treatment would benefit the appearance and (3) which facial features did they base their responses on regarding the first two variables.

The rater groups consisted of the following (listed in order of presumably decreasing schema complexity): (1) orthodontists (O), (2) general practitioners (GP), (3) second year dental students (DS), (4) high school students who had orthodontic treatment (HSO) and (5) high school students with no orthodontic treatment experience (HS). Each rater evaluated 50 slides consisting of different views of 22

subjects with regard to the three variables and their responses were timed for each slide.

Mean ratings for attractiveness, benefit of orthodontic treatment on appearance and mean response time were determined for each group. Correlation coefficients were also calculated between the O group and the other four groups for mean attractiveness and benefit of treatment ratings. Actual and mean frequencies for the facial features were also determined for each group. One-way analyses of variance and Tukey's HSD multiple comparison tests were performed to evaluate differences between group means. For mean ratings of attractiveness and benefit of treatment, both within and between group analyses by facial view were done.

The results of this study suggested the following implications for assessing appearance and benefit of treatment in potential orthodontic patients:

1. The degree and type of dentofacial experience (i.e. facial schema complexity) influenced attractiveness ratings and to some extent the facial features on which these ratings were based.

2. Experience apparently did not play a role in determining the benefit of orthodontic treatment on appearance.

3. As experience increased, in general, so did attractiveness ratings. This is contrary to data of most previous research.

4. Self-experience (vs. practice or educational experience) with orthodontic treatment may have a negative influence on perceptions of facial attractiveness.

5. The time required to make esthetic judgments increased with experience, possibly due to the possession of a more complex dentofacial schema.

6. The mouth (lips) and chin may be more relevant features to dental professionals than to high school students in evaluating appearance.

7. Smile views may be more important than frontal or profile views to experienced groups in determining the benefit of orthodontic treatment on dental appearance per se, but apparently they are not more important in rating facial attractiveness. Orthodontists and those with presumably the least experience, however, may not be influenced as much by the different views in these ratings as the other groups.

DEDICATION

To my parents, whose love, guidance and many sacrifices made possible my education.

and

To my wife, Carol, for her unlimited love, patience, understanding and support, without which I could not have survived the completion of my education.

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INTRODUCTION

Improvement in appearance is probably the single most important reason why people seek orthodontic treatment for their children or themselves. Reinforced by the media, appearance is perceived as playing an influential role in social acceptance and shaping one's future in general. Much research in the health and social sciences has been devoted to assessing the psychosocial effects of physical attractiveness. Whether pleasing or displeasing, appearance makes an important difference in a person's life, from intimate interpersonal relations to more formal matters such as educational and career opportunities (Berscheid, 1980).

From the standpoint of interpersonal interaction, the face is the center of attention. Facial characteristics have been shown to influence perceptions by another person. Personality traits, social desirability, and other attributes are inferred from facial features and expressions during a social encounter (Aronson, 1972). Any deviations from socially defined norms for dentofacial features will likely have a negative effect on interpersonal attraction. For instance, the effects of various malocclusions on dentofacial appearance appear to be significantly related to esthetic judgments by others (Lucker and Graber, 1981). With this esthetic concern in mind, the orthodontist must evaluate a patient's dentofacial appearance, what can or cannot be done to change it and whether there is a need for treatment.

Some dental research of this nature has shown a considerable disagreement between the professional and public opinions regarding appearance and need for treatment (Shaw et al., 1975, Prahl-Anderson et al., 1979, and Bell et al., 1985). It is possible that this disagreement is not based on different sets of esthetic standards but on differences in range of acceptable appearance. Professional dental training and experience may play a role in explaining these differences. Previous research has not measured the effects of different levels of dentofacial esthetic experience on these views of esthetics and need for treatment.

Having considerable training and experience, orthodontists may have a high level of expertise in the area of dentofacial esthetics. As such they are accustomed to making esthetic judgments about others. Research on expertise in any given area has shown how it can affect judgments made about new information and about others. Markus (1977) has defined an "expert" as having a complex schema about a particular subject or domain. A schema represents knowledge gained from past experience that helps process and organize new information relevant to the subject (Fong and Markus, 1982). The expert, or schematic, is capable of making accurate discriminations in evaluations of others and is more sensitive to variations in this domain (Fong and Markus, 1982). Schema complexity may also increase with experience.

The aim of the present study was to investigate the influence of dentofacial experience (i.e. schema complexity) on judgments about

facial attractiveness and benefits of orthodontic treatment. Essentially five groups of people with relatively different "levels" of dentofacial experience evaluated facial photographs for attractiveness and benefit of orthodontic treatment.

LITERATURE REVIEW

The importance of physical appearance and its effects on interpersonal interaction is well-documented with numerous studies primarily from the 1960's and 1970's. Attractive individuals have been shown to possess a myriad of advantages over their less attractive counterparts, whether it be likability or popularity (Walster et al., 1966; Byrne, et al., 1968; Sigall and Aronson, 1969; Dion et al., 1972) or perceived greater intelligence and educational potential (Clifford and Walster, 1973, Adams, 1978). Dion (1972) and Sigall and Ostrone (1975) also found attractive individuals to be judged less harshly when committing transgressions. In addition, increased chances for employment or career opportunities have been attributed, in part, to attractiveness (Dipboye et al., 1975; Cash et al., 1977; Gustovich, 1980).

An essential ingredient in all these observations of interpersonal behavior is the influence of facial attractiveness. Individuals with attractive faces are perceived as having many of the same positive attributes described in the aforementioned studies based on physical attractiveness in general. This is not surprising, however, since facial photographs are the primary stimulus used in the majority of physical appearance studies (Berscheid, 1980). In fact, when compared to other body features, the face is correlated most highly with overall attractiveness (Hilzenrath and Giddon, 1963). They also found that the eyes and mouth ranked as the most important features.

The dentition, however, makes a very significant contribution to overall facial appearance and expression. Those individuals with so called "normal" dental appearance were perceived to be better looking, more socially attractive and more intelligent (Shaw, 1981, Tedesco et al., 1983, Shaw et al., 1985). Conversely, children with malocclusions and/or seeking orthodontic treatment were judged as less attractive (Albino, 1981, Lucker and Graber, 1981, Tedesco et al., 1983). Though a few studies, such as that by Shaw et al. (1985), have shown that general attractiveness of the face may be more salient than dental appearance per se, visible aspects of occlusions significantly affect perceptions and assessment of appearance. Except for one study in which both lay person and dental judges evaluated dentofacial appearance of children (Shaw, 1981), all of the above studies utilized either peers (similar aged adolescents) or other lay judges (college students) with no dental training. It is the dental professional, especially the orthodontist, however, who is accustomed to evaluating dentofacial appearance and making treatment decisions based on his/her judgement.

Interestingly, the public and professional opinions regarding appearance and need for treatment show considerable disagreement with both variables. Prahl-Anderson et al. (1979) found that parents differed significantly from dentists and orthodontists in their perceptions of abnormal vs. normal and need for treatment in evaluations of profiles and mouth photographs.

In another study there was a relative isolation of the orthodontist group from the general dental and non-professional groups in their assessment of need for treatment in children (Shaw et al., 1975). Bell et al. (1985) found lay persons more likely to rate an individual's profile as being normal compared with orthodontists and oral surgeons. The professional groups tended to be more critical of appearance; their range of acceptable appearance may be smaller.

These observed differences between the public and professionals are apparently based more on tolerance of deviations from certain socially defined norms for our society than on different sets of esthetic standards. Lucker (1980) showed that not only do individuals make objective evaluations of their own facial form, they also have set standards for facial appearance that correlated well with several accepted cephalometric measurements. Even though Peck and Peck (1970) showed that the public prefers a more protrusive dento-alveolar profile than the orthodontic standards, the majority of research of this nature provides evidence that the public and professionals prefer the same ideal. Professional dental training and experience probably play a role in explaining these differences in range of acceptable appearance. Further, the professional is likely to include more subtle aspects of appearance or functional characteristics in dentofacial evaluations.

Having considerable training and experience, orthodontists may have a high level of expertise in the area of dentofacial esthetics. As such they are accustomed to making esthetic judgments about

others. Research on expertise in any given area has shown how it can affect judgments made about new information and about others. Markus (1977) has defined an "expert" as having a complex schema about a particular subject or domain. A schema represents knowledge gained from past experience that helps process and organize new information relevant to the subject (Fong and Markus, 1982). The expert, or schematic, is capable of making accurate discriminations in evaluations of others and is more sensitive to variations in this domain (Fong and Markus, 1982). Schema complexity may also increase with experience.

The orthodontist probably possesses a complex facial esthetic schema and can therefore make fine discriminations of variations in appearance. A study done by Haxton and Giddon (1985) quantifying the tolerance of craniofacial deviations from "normal" physical appearance exemplifies this idea. The dental professional and orthodontic patient and parent groups were more sensitive to changes in interocular distance in viewing retouched photographs than the orthodontic-inexperienced group. In addition, the experienced groups took longer to respond while viewing the photographs on which the study was based. Reaction time may then be postulated as an operational definition of schema complexity.

STATEMENT OF THESIS

The purpose of the present investigation was to determine a possible association between dentofacial experience (i.e. dentofacial schema complexity) and judgments about appearance and benefit of orthodontic treatment. Five groups of people with presumably different relative levels of dentofacial experience viewed facial photographs of people seeking orthodontic treatment and evaluated three variables: (1) degree of facial attractiveness, (2) whether orthodontic treatment would benefit the appearance and (3) on what facial features did they base their attractiveness and benefit of treatment decisions. Two main hypotheses were tested. First, there is a positive correlation between dentofacial experience (i.e. dentofacial schema complexity) and similarity of photograph judgments for the three main variables: (1) attractiveness, (2) benefit of treatment and (3) facial features. Second, the response time (i.e. time to rate each photograph) increases with experience (schema complexity). The reason for including facial features in the evaluations was to attempt to identify which feature(s) was (were) most salient in the groups' decisions about attractiveness and possible benefit of orthodontic treatment.

MATERIALS AND METHODS

Sample

The photographs (slides) used in this study were selected from initial patient records taken during the summer of 1985 by the first year orthodontic residents at Case Western Reserve University's Orthodontic Department. There was a total of 74 patient records with approximately 200 color slides which included non-standardized frontal, smile and profile views for most of the patients. The age range was from 10-18 years. A consent form explaining the purpose of the study and how the photos were to be used was mailed to each parent (Appendix I). From those patients for which signed consent forms were obtained, 140 slides were selected.

Though these photos represented varying degrees of attractiveness and dentofacial balance, an initial sorting based on attractiveness was performed in order to select a predominance of intermediate faces (fewer extremely attractive and unattractive persons). This was done to differentiate between the rater groups by using photos with more subtle differences in appearance. Some photos were also excluded on the basis of poor quality, i.e. improper exposure, focus or shadows. In order to generate a non-biased sample, a panel of persons with two members representing each of the rater groups conducted the initial attractiveness rating of the 140 slides using a ten-point scale from very unattractive to very

attractive (Appendix II). The initial ratings were converted to numerical scores and plotted as a frequency distribution (Appendix III). The distribution revealed a majority of slides with intermediate ratings from which a random sample of 50 slides, representing a total of 22 subjects (patients), was selected for use in the main study. This method was adapted from a sorting procedure by Evans et al., 1968 and Tedesco et al., 1983.

Frontal, smile and profile views were utilized to avoid any possible bias in evaluations based on only a single view. Some serious artifacts in previous research may have been introduced when relying on only one view (Lucker, 1980). Also, research using frontal representations has been much rarer than that using profile views. The views used in this study were arranged in the slide carousel so that different views of the same subject were spread out in the series, rather than being presented together. This was done to minimize possible effects of previous experience of a particular subject. For approximately one third of the subjects, the frontal view was presented first, followed by the other two views. For the remaining two thirds, the order of views was varied. The rationale for including all three views was to determine to what degree information available in a particular view influenced the ratings compared to other views of the same subjects. A breakdown of the subjects by sex, age, and view appears in Table I.

TABLE I

SLIDE SUBJECT CHARACTERISTICS:
SEX, AGE AND DISTRIBUTION OF VIEWS

SLIDE	SUBJECT	SEX	AGE	VIEW	SLIDE	SUBJECT	SEX	AGE	VIEW
1	1	F	12-8	F	26	11	M	15	F
2	2	F	13	P	27	1	F	12-8	S
3	3	M	12-10	F	28	7	M	11	F
4	4	M	12	S	29	8	F	13	P
5	5	M	14	P	30	20	F	11-9	F
6	6	F	10-2	F	31	12	M	14-11	S
7	7	M	11	P	32	2	F	13	F
8	8	F	13	S	33	15	F	14	P
9	9	M	14-3	F	34	21	M	14	P
10	10	F	12	S	35	6	F	10-2	S
11	11	M	15	P	36	10	F	12	P
12	12	M	14-11	F	37	17	M	14-8	F
13	13	F	12	S	38	13	F	12	P
14	14	M	12	P	39	9	M	14-3	S
15	15	F	14	S	40	3	M	12-10	P
16	16	F	16-7	F	41	18	M	13	P
17	3	M	12-10	S	42	16	F	16-7	S
18	17	M	14-8	P	43	22	F	14-10	S
19	18	M	13	S	44	19	F	10	P
20	19	F	10	S	45	14	M	12	F
21	20	F	14	S	46	12	M	14-11	P
22	21	M	14	S	47	7	M	11	S
23	22	F	14-10	F	48	13	F	12	F
24	5	M	14	F	49	21	M	14	F
25	4	M	12	P	50	2	F	13	S

SUMMARY

SEX

#M	11
#F	11
Total	22

AGE (yrs)

Mean	12.8
Range	10-16.7

VIEW

	#M	#F	Total
F (Frontal)	9	7	16
S (Smile)	7	10	17
P (Profile)	10	7	17
Total	26	24	50

Rater Groups

The rater groups were selected to represent different relative levels of dentofacial experience or facial schema complexity. They consisted of the following:

1. Orthodontists from the CWRU teaching staff and from the greater Cleveland area (17)
2. General dentists from the CWRU teaching staff (20)
3. Dental students from the CWRU second year class (20)
4. High school students who have had orthodontic treatment; from a local high school, grades 7-12 (19)
5. High school students with no orthodontic treatment experience; from the same high school and grades as group 4 (17)

In terms of dentofacial esthetic experience or schema complexity, it was presumed that the groups are listed above in order of decreasing experience. The high school students were first screened for orthodontic treatment experience as well as some other variables using the questionnaire in Appendix V. No attempt was made to control for siblings or other family members who may also have had orthodontic treatment. A consent form (Appendix VI) was obtained for each high school student who participated in the study.

The distribution of raters by group appears in Table II. There were approximately the same number of raters in each group. The groups were identified by the following letters (for this table as well

TABLE II

DISTRIBUTION AND SEX OF RATERS BY GROUP

GROUP	HS	HSO	DS	GP	P	TOTAL
#M	9	9	14	17	15	64
#F	8	10	6	3	2	29
TOTAL	17	19	20	20	17	93
%	18	20	22	22	18	100

as in the remainder of the text): HS (High school students with no orthodontic treatment experience), HSO (High school students with orthodontic treatment experience), DS (Dental students), GP (General practitioners), and O (Orthodontists).

Only the HS and HSO groups contained about the same numbers of male and female raters. The HS and HSO groups had mean ages of 15.4 years (range 13-18 years) and 15.8 years (range 13-18 years), respectively. Their educational level was age-related. The educational level of the other three groups was based on either their year in school (DS group only) or their degree(s) (GP and O groups). No attempt was made to control for number of years or type of experience for the GP and O groups.

Data Collection

The settings for the data collection were either a seminar room in the dental school, (for the dental student, general practitioner and orthodontist rater groups), or an office in the high school. For the high school students and most of the dental students the room was arranged so that two raters at a time sat at a table with a partition between them so that they could not see each other. The slide projector was situated between them and in front of the partition. I functioned as examiner and sat to one side and towards the front of the room so that I could see both raters. Each rater had a rating form, pencil and a small box with a button and colored light (either

red or white) that lit when the button was depressed. The room was mostly darkened and the slides projected one at a time onto the screen by me.

For the rest of the dental students and all of the general practitioners and orthodontists, one rater at a time viewed the slides while I was present. No partition or lights were used. The rater controlled the projector so that he/she advanced the slides at his/her own pace.

Each rater answered four questions for each slide. The rating form used appears in Appendix VII.

1. Attractiveness on a ten-point scale labelled from very unattractive to very attractive.

2. Which facial feature(s) was (were) important in their rating in question #1. A checklist of seven facial features was used.

3. Would the person's appearance benefit from orthodontic treatment on a six-point scale from no benefit to greatly benefit.

4. Which facial feature(s) did they base their decision on in question #3. A checklist of five features which orthodontic treatment may influence was used.

I gave the following verbal instructions to all raters.

"You will be looking at 50 slides of people between the ages of 10 and 18 who have had their pictures taken to help determine if they need orthodontic treatment. There will be three different views for most of the subjects: a frontal view with lips together, a smile and a profile view. The order of these views will vary, however, and they will also be spread out in the slide series. You are asked to view each slide independently and answer the four questions based only on what you see in that particular slide. Please concentrate on the person's face in each slide and try to ignore such things as hairstyle,

complexion, ears or any birthmarks. Also, I'm interested in seeing how long it takes the five different groups to respond to each slide. I don't know whether the groups with more experience will take more or less time to respond to each slide. So, as you go through each slide I will be timing your response. You may take as much time, however, as you need for each slide."

The rater then read the Rating Form top sheet (Appendix VII) with the following additional instructions provided to all but the high school students:

"For question #3, you may include orthognathic surgery as part of orthodontic treatment if you feel it is necessary. But plastic surgery involving the nose would not be included."

The following sequence was used for rating the slides:

1. I advanced to the first slide and started the timer (the raters advanced the slides on their own in the general practitioner and orthodontic groups and some of the dental students as described above).

2. The rater(s) answered the four questions (ratings for that slide).

3. The rater(s) then pressed the lighted button momentarily when finished with that slide. (Again, when there was only one rater, he/she advanced to the next slide when finished.)

4. I recorded the time(s) and reset the timer.

5. I advanced to the next slide (when there were two raters) and started the timer.

6. The above steps were repeated for all 50 slides.

Data Reduction

Ratings for Attractiveness and Benefit of Orthodontic Treatment (Questions 1 and 3) were converted to numerical scores: 1-10 for Attractiveness and 1-6 for Benefit of Treatment. For each rater group, the mean and standard deviations were determined three ways: 1) for each slide, 2) groups by view (F,S,P) and 3) for all 50 slides together. Response time means (per slide) and standard deviations were calculated for each group.

In order to analyze the data obtained for Questions 2 and 4 (facial features on which the ratings in Questions 1 and 3, respectively, were based), the frequency of each facial feature checked for all 50 slides was determined for each rater. The actual and mean frequencies and standard deviations for each feature by group were then calculated.

Data Analysis

To determine differences between rater groups, and between frequency means for views and facial features, a one-way analysis of variance was used. Tukey's-HSD multiple comparison test was then applied to determine which means were different from each other. Differences in mean ratings, for all 50 slides, between the five rater groups were analyzed with regard to attractiveness (Question 1), benefit of orthodontic treatment (Question 2) and response time (per

slide). With regard to Questions 2 and 4 (facial features), the mean frequency of each feature, for all 50 slides, was tested in the same manner for differences between the rater groups. The mean ratings for Question 1 by view (Frontal, Smile, Profile) were compared between each rater group. For Question 3 the mean ratings within each group by view were also compared. Both the analysis of variance and Tukey's-HSD tests were performed using the SPSS (Statistical Package for the Social Sciences) available on the DEC system-2060 TOPS-20 at the Jennings Computer Center facility in Case Western Reserve University's Medical School.

All correlational analyses (Questions 1 and 3), using 50 separate (slide) means for each rater group, were done on a statistical printing calculator (Canon FP-11P).

RESULTS

The data collected for Questions 1-4 on the rating form and response time was reduced and analyzed as previously described under Methods and Materials. The mean ratings for attractiveness (Question 1) for each rater group appear in Table III and Figure 1. The mean for the HSO group was significantly lower ($p<.01$) than the DS, GP and O groups. The HSO group rated the subjects as being less attractive than did the DS, GP and O groups. Although not statistically significant, the mean attractiveness rating for the HS group was higher than that for the HSO group, and there was a gradual increase in attractiveness ratings from the DS to the O group.

With regard to benefit of orthodontic treatment (Question 3), there were no significant differences between any of the group means (Table IV and Figure 2). All five rater groups showed similar ratings as to how much the appearance of the subjects would benefit from orthodontic treatment.

In terms of response time (i.e. time to answer the four questions for each slide) there was a highly significant ($p<.0001$) difference between the HS and HSO groups and the DS, GP and O groups (Table V, Figure 3). These professional groups (DS, GP, O) required approximately 50% more time (mean 26.8 seconds) to respond than did the HS and HSO groups (mean 17.2 seconds). There was also a slight

TABLE III

MEAN ATTRACTIVENESS RATINGS (1-10 SCALE) FOR EACH RATER GROUP

GROUP	HS	HSO	DS	GP	O
Mean	4.52	4.17	5.24	5.44	5.49
S.D.	.93	1.15	1.11	1.33	1.36
N	17	19	20	20	17

ANOVA AND TUKEY'S HSD TEST:

	HS	HSO	DS	GP	O
HS					
HSO			**	**	**
DS					
GP					
O					

SOURCE	D.F.	SS	MS	F Ratio	F. Prob.
Between Groups	4	25.88	6.47	4.59	0.0021 ($p < .01$)
Within Groups	88	124.09	1.41		
Total	92	149.98			

*Denotes pairs of groups significantly different ($p < .01$).

FIGURE 1

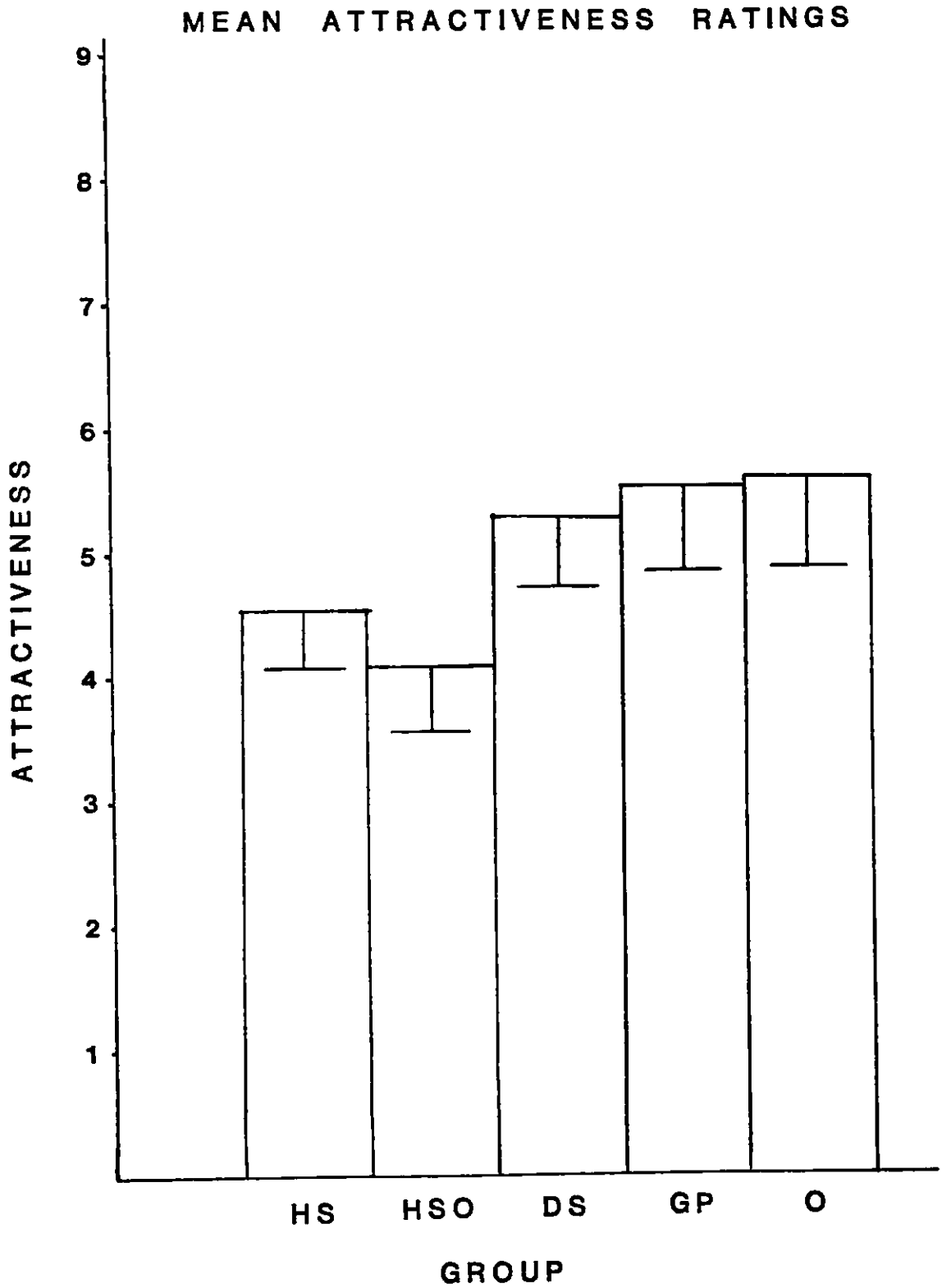

MEAN ATTRACTIVENESS RATINGS
ATTRACTIVENESS
9
8
7
6
5
4
3
2
1
HS
HSO
DS
GP
O
GROUP

TABLE IV

MEAN BENEFIT OF ORTHODONTIC TREATMENT
RATINGS (1-6 SCALE) FOR EACH RATER GROUP

GROUP	HS	HSO	DS	GP	O
Mean	3.56	3.78	3.62	4.18	3.68
S.D.	.99	1.00	1.07	1.16	1.17
N	17	19	20	20	17

ANOVA AND TUKEY'S HSD TEST:

No two groups are significantly different (.05 level)

SOURCE	D.F.	SS	MS	F Ratio	F. Prob.
Between Groups	4	4.64	1.16	.994	.415
Within Groups	88	102.83	1.17		
Total	92	107.47			

FIGURE 2

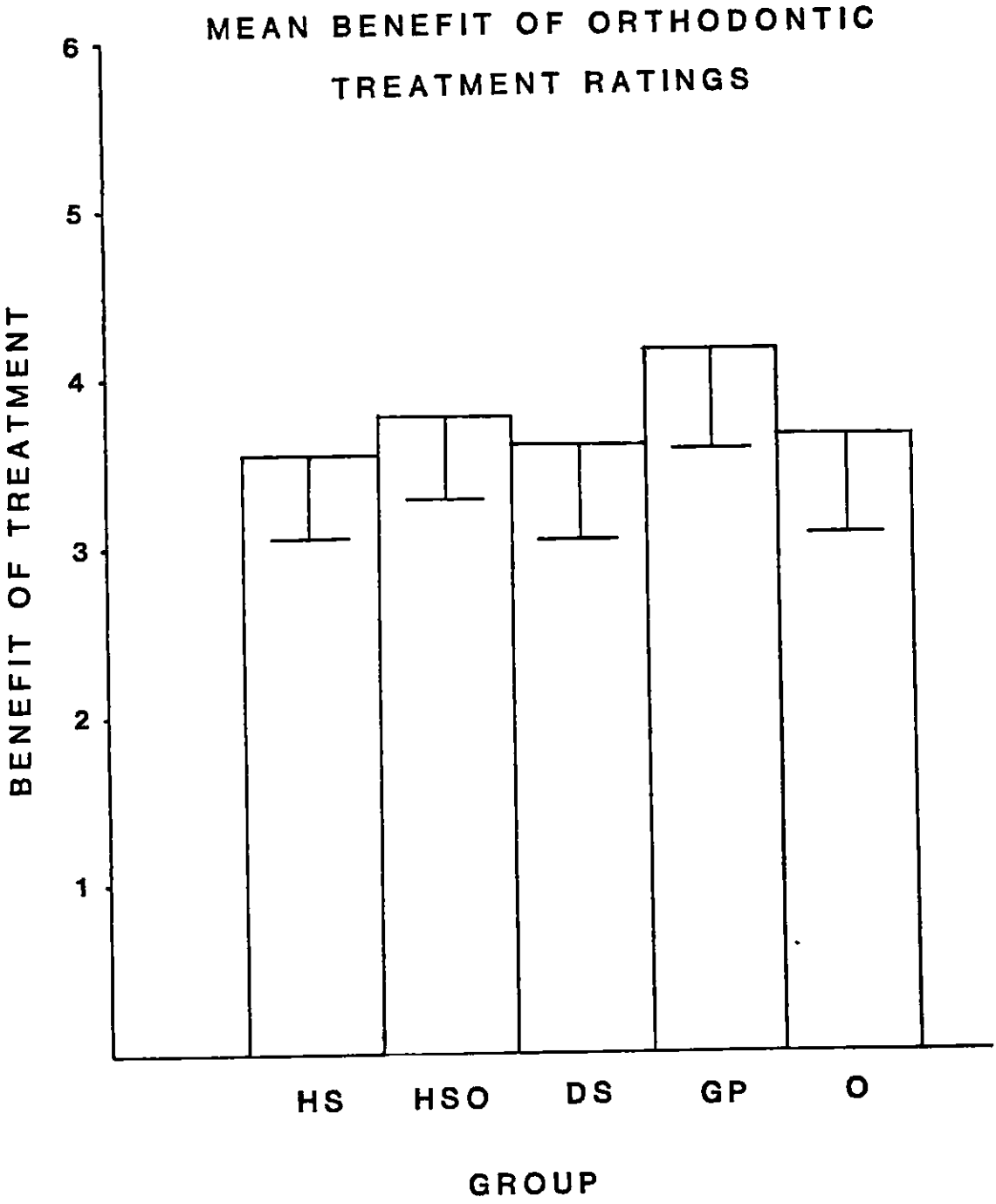

MEAN BENEFIT OF ORTHODONTIC TREATMENT RATINGS
BENEFIT OF TREATMENT
6
5
4
3
2
1
HS
HSO
DS
GP
O
GROUP

TABLE V

MEAN RESPONSE TIME FOR EACH RATER GROUP

GROUP	HS	HSO	DS	GP	O
Mean (sec)	17.19	17.29	25.11	26.44	28.98
S.D. (sec)	3.38	2.76	4.32	4.90	9.25
N	17	19	20	20	17

ANOVA AND TUKEY'S HSD TEST:

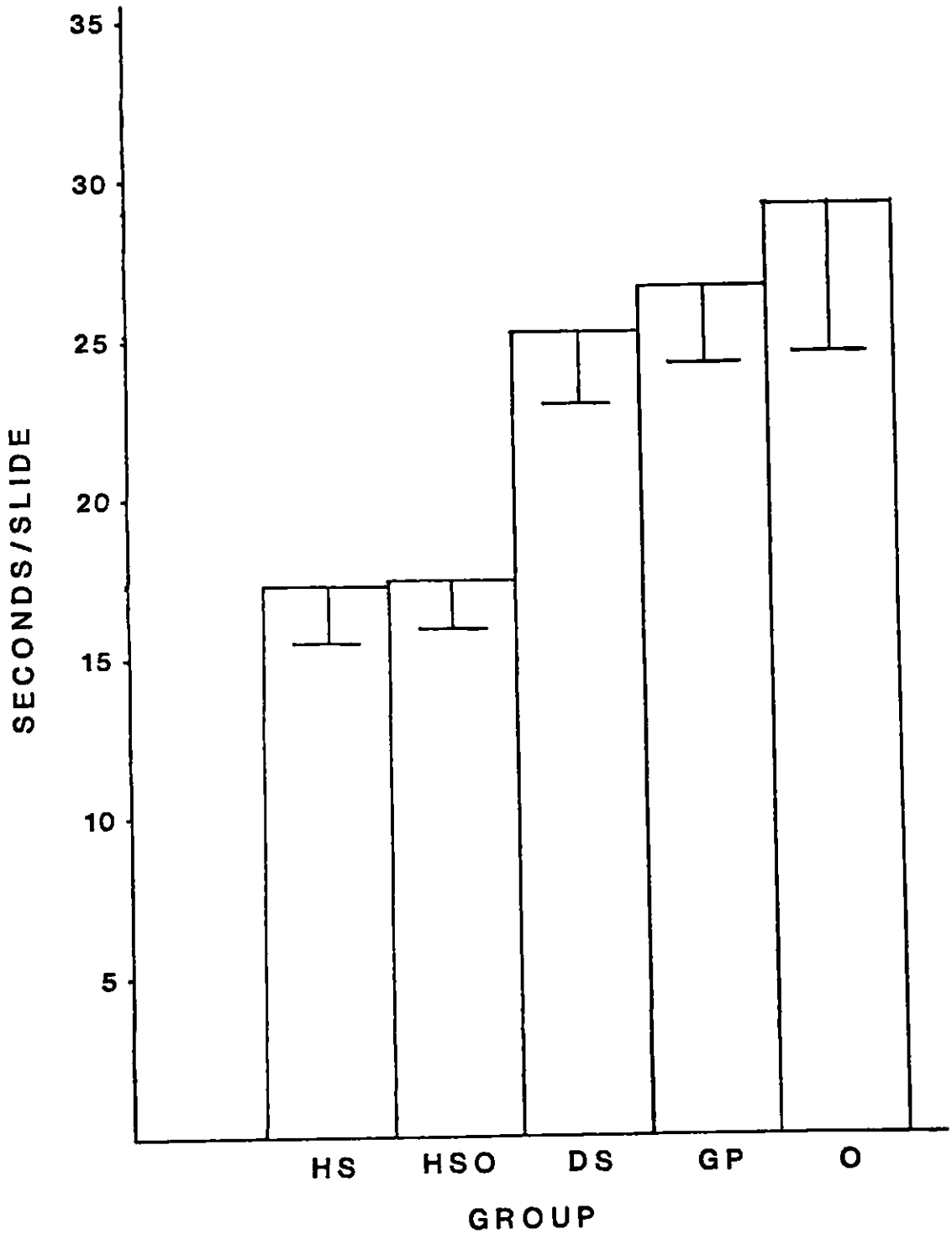
	HS	HSO	DS	GP	O
HS			***	***	***
HSO			***	***	***
DS					
GP					
O					

SOURCE	D.F.	SS	MS	F Ratio	F. Prob.
Between Groups	4	2126.66	531.66	18.717	0.0000 ($p < .0001$)
Within Groups	88	2499.68	28.41		
Total	92	4626.34			

*Denotes pairs of groups significantly different ($p < 0.0001$).

FIGURE 3

MEAN RESPONSE TIME



increase in response time from the DS to the O group with the O group having the longest response time.

As a second means of analysis, correlation coefficients were determined for both attractiveness and benefit of orthodontic treatment to measure the strength of the association between the O group's ratings and those of the other four groups. Using the mean rating for each group, the correlation coefficients appear in Table VI. The O group rating correlated well with the HS and HSO group ratings and even better with the DS and GP group ratings for attractiveness, but no significant differences between these correlations were found. For benefit of orthodontic treatment, the O group rating correlated highly with all the other four groups' ratings at approximately the same strength.

Questions 2 and 4 (facial features on which the ratings in questions 1 and 3, respectively, were based) were included in the study in an attempt to identify those features which were more (most) salient in the decisions about attractiveness and benefit of orthodontic treatment. For each feature, the mean frequency (for all 50 slides) by group for Question 2 appears in Table VII. There were significant differences between the groups with regard to two features: mouth (lips) and chin. The GP and O groups checked mouth (lips) more frequently than the HSO group. For the chin, the DS, GP and O groups had frequencies that were significantly ($p<.001$) greater than for the HS group. In addition, the GP and O groups had frequencies greater than the HSO group.

TABLE VI

CORRELATION BETWEEN O GROUP AND HS, HSO, DS AND GP GROUPS FOR ATTRACTIVENESS AND BENEFIT OF ORTHODONTIC TREATMENT RATINGS

	GROUP	HS	HSO	DS	GP
Attractiveness	0	.769	.778	.898	.907
Benefit of Ortho treatment	0	.864	.817	.844	.868

All correlations are significant at $p < .01$.

No two correlations are significantly different.

TABLE VII

MEAN FREQUENCY OF EACH FACIAL FEATURE
(CHECKED IN QUESTION 2) FOR ALL SLIDES BY GROUP

FEATURE	STAT.	GROUP				
		HS	HSO	DS	GP	O
EYES (E)	Mean	11.41	9.79	12.55	13.55	12.00
	S.D.	10.68	4.98	7.33	12.06	9.47
	(f)	(194)	(186)	(251)	(271)	(204)
NOSE (N)	Mean	11.76	14.11	15.65	12.85	12.59
	S.D.	8.44	8.03	10.27	9.60	10.96
	(f)	(200)	(268)	(313)	(257)	(214)
MOUTH (M) (LIPS)	Mean	17.65	14.47	20.60	22.50	25.29
	S.D.	9.01	9.83	8.08	8.75	8.60
	(f)	(300)	(275)	(412)	(450)	(430)
TEETH (T)	Mean	13.41	11.63	13.00	14.35	12.35
	S.D.	7.67	5.31	5.53	8.05	5.51
	(f)	(228)	(221)	(260)	(287)	(210)
CHIN (C)	Mean	8.88	11.63	17.80	21.15	20.29
	S.D.	7.11	7.56	9.77	9.69	8.70
	(f)	(151)	(221)	(356)	(423)	(345)
JAW(S) (J)	Mean	11.06	7.74	11.20	10.80	10.76
	S.D.	7.41	6.14	10.17	7.17	9.65
	(f)	(188)	(147)	(224)	(216)	(183)
CHEEKS (CH)	Mean	9.71	10.89	10.80	8.25	4.53
	S.D.	8.95	8.31	8.08	7.02	5.32
	(f)	(165)	(207)	(216)	(156)	(77)
NONE IN PARTICULAR (NP)	Mean	8.65	7.00	5.05	4.85	3.18
	S.D.	8.76	8.54	5.48	6.22	3.84
	(f)	(147)	(133)	(101)	(97)	(54)

(f) = Actual frequency for all 50 slides.

TABLE VII (Cont.)

ANOVA AND TUKEY'S HSD TEST:

Two features showed significant differences by group:

		HS	HSO	DS	GP	O
MOUTH (LIPS)	HS				**	**
	HSO					
	DS					
	GP					
	O					

SOURCE	D.F.	SS	MS	F Ratio	F. Prob.
Between Groups	4	1282.34	320.58	4.079	0.0044 (p< .01)
Within Groups	88	6916.69	78.60		
Total	92	8199.03			

*Denotes pairs of groups significantly different (p <.01).

		HS	HSO	DS	GP	O
CHIN	HS			***	***	***
	HSO				***	***
	DS					
	GP					
	O					

SOURCE	D.F.	SS	MS	F Ratio	F. Prob.
Between Groups	4	2131.10	533.03	7.058	0.0001 (p< .001)
Within Groups	88	6646.27	75.53		
Total	92	8778.37			

*Denotes pairs of groups significantly different (p <.001).

Table VIII shows frequencies (for all 50 slides) by group for Question 4. Three features had significantly different means. For the chin, the GP group mean was significantly ($p<.05$) greater than the HS mean. The O group mean for jaw(s) was significantly less than the HS group mean ($p=.05$). Also, the O group mean for nose was significantly less than the HSO group mean ($p<.05$).

Graphic representations of the results from questions 2 and 4 are provided in Figure 4 and Figure 5, respectively. Figure 4 shows the frequencies (corrected) for each feature in Question 2 by group. It is apparent that the GP and O groups (as well as perhaps the DS group) utilized the mouth and chin features more than did the HS and HSO groups in decisions about attractiveness. From Figure 5, which illustrates the frequencies (corrected) for each feature in Question 4 by group, two observations could be made. The GP group showed a preference for the chin feature compared to the HS group and the O group showed much less preference for the nose and jaw(s) features compared to the HSO and HS groups, respectively, in decisions about the benefit of orthodontic treatment to improve the appearance of the subjects.

The last variable analyzed in this study was the type of view of the subject (either Frontal, Smile or Profile) and whether it influenced the ratings. Not only were comparisons done between the rater groups for each view but also within each rater group between views. Regarding attractiveness (Question 1), the mean rating by view for each group is shown in Table IX and Figure 6. Significant

TABLE VIII

MEAN FREQUENCY OF EACH FACIAL FEATURE
(CHECKED IN QUESTION 4) FOR ALL SLIDES BY GROUP

FEATURE	STAT.	GROUP				
		HS	HSO	DS	GP	O
MOUTH (M) (LIPS)	Mean	18.00	16.00	15.25	21.10	22.71
	S.D.	11.26	8.75	10.02	10.23	6.71
	(f)	(306)	(304)	(305)	(422)	(386)
TEETH (T)	Mean	17.65	17.53	17.05	20.35	17.18
	S.D.	6.02	3.49	4.48	6.98	4.60
	(f)	(300)	(333)	(341)	(407)	(292)
CHIN (C)	Mean	12.53	16.26	17.90	21.10	14.18
	S.D.	8.00	7.74	7.43	9.09	5.15
	(f)	(213)	(309)	(358)	(422)	(241)
JAW(S) (J)	Mean	16.12	12.16	13.00	12.70	8.41
	S.D.	7.18	6.99	8.66	8.29	6.33
	(f)	(274)	(231)	(260)	(254)	(143)
NOSE (N)	Mean	3.82	5.11	1.35	3.00	0.18
	S.D.	5.22	7.84	2.03	2.79	.53
	(f)	(65)	(97)	(27)	(60)	(3)

(f) = Actual frequency for all 50 slides.

TABLE VIII (Cont.)

ANOVA AND TUKEY'S HSD TEST:

Three features showed significant differences by group:

		HS	HSO	DS	GP	O
CHIN	HS				*	
	HSO					
	DS					
	GP					
	O					

SOURCE	D.F.	SS	MS	F Ratio	F. Prob.
Between Groups	4	822.15	205.53	3.515	0.0104 ($p < .05$)
Within Groups	88	5145.52	58.47		
Total	92	5967.68			

*Denotes pairs of groups significantly different ($p < .05$).

		HS	HSO	DS	GP	O
JAW(S)	HS					*
	HSO					
	DS					
	GP					
	O					

SOURCE	D.F.	SS	MS	F Ratio	F. Prob.
Between Groups	4	515.15	128.79	2.233	0.0719
Within Groups	88	5076.10	57.68		
Total	92	5591.24			

*Denotes pairs of groups significantly different ($p = .05$).

TABLE VIII (Cont.)

		HS	HSO	DS	GP	O
NOSE	HS					
	HSO					*
	DS					
	GP					
	O					

SOURCE	D.F.	SS	MS	F Ratio	F. Prob.
Between Groups	4	277.87	69.47	3.448	0.0115 ($p < .05$)
Within Groups	88	1773.04	20.15		
Total	92	2050.92			

*Denotes pairs of groups significantly different ($p < .05$).

FIGURE 4

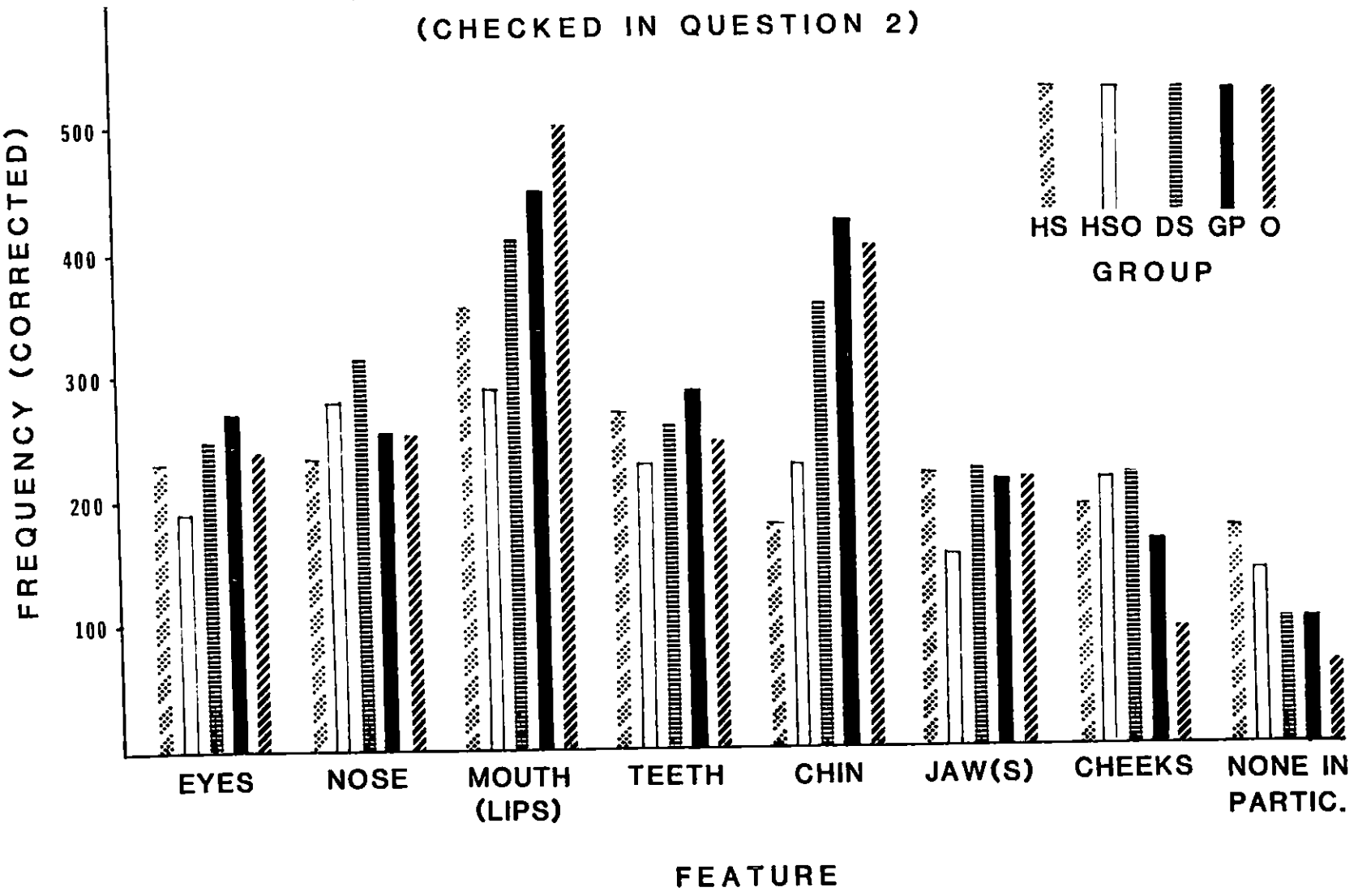

FREQUENCY OF FACIAL FEATURES
(CHECKED IN QUESTION 2)
FREQUENCY (CORRECTED)
500
400
300
200
100
HS HSO DS GP O
GROUP
EYES
NOSE
MOUTH (LIPS)
TEETH
CHIN
JAW(S)
CHEEKS
NONE IN PARTIC.
FEATURE

FIGURE 5

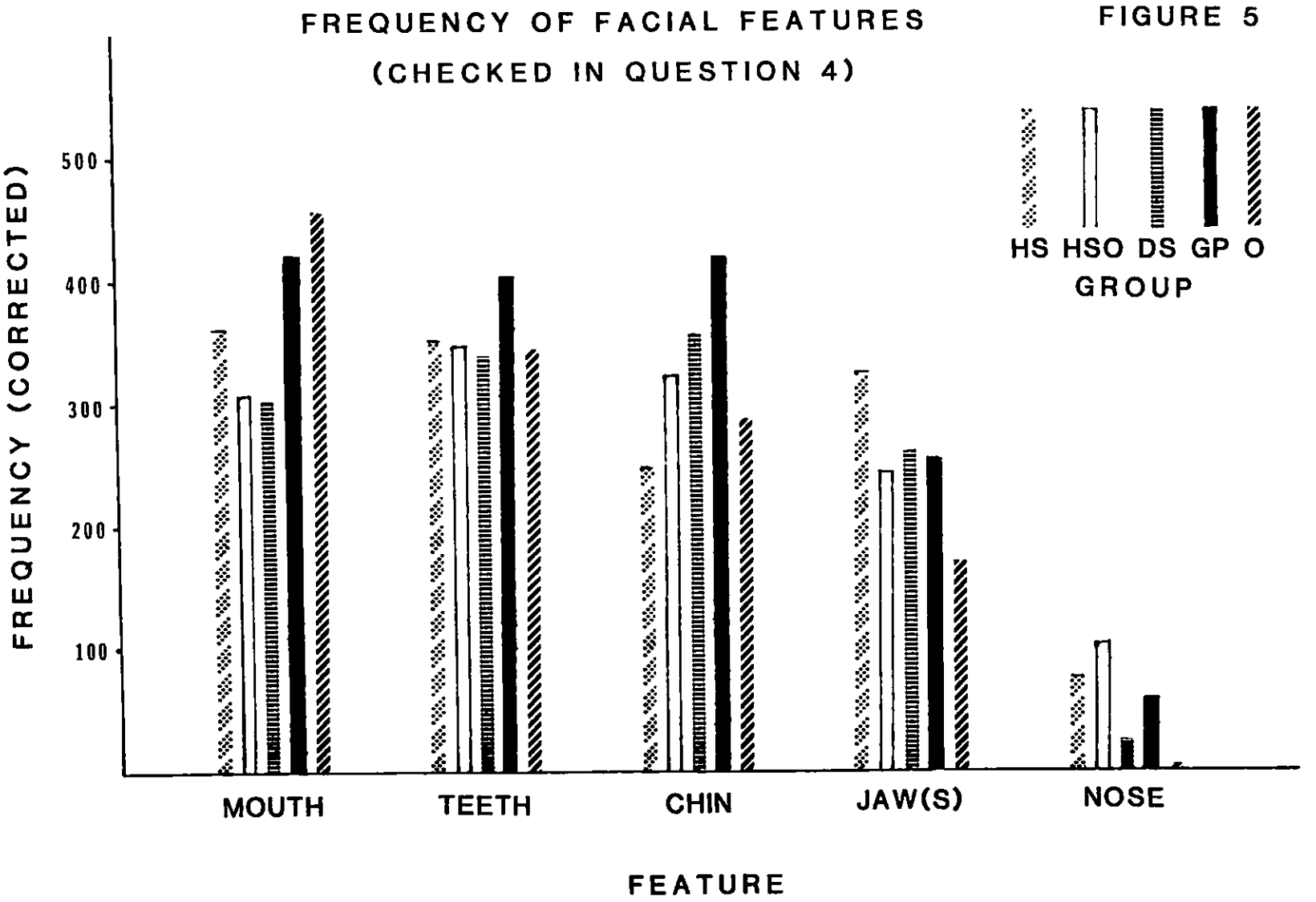

FREQUENCY OF FACIAL FEATURES
(CHECKED IN QUESTION 4)
FREQUENCY (CORRECTED)
500
400
300
200
100
HS HSO DS GP O
GROUP
MOUTH
TEETH
CHIN
JAW(S)
NOSE
FEATURE

TABLE IX

MEAN ATTRACTIVENESS RATINGS (1-10 SCALE)
BY VIEW FOR EACH RATER GROUP

VIEW	STAT.	GROUP				
		HS	HSO	DS	GP	O
FRONTAL (N = 16)	Mean	4.57	4.17	5.20	5.31	5.39
	S.D.	.95	1.22	1.21	1.31	1.31
SMILE (N = 17)	Mean	4.40	4.12	5.33	5.54	5.74
	S.D.	1.12	1.31	1.12	1.43	1.43
PROFILE (N = 17)	Mean	4.59	4.23	5.19	5.46	5.34
	S.D.	.73	.96	1.05	1.30	1.39

Significant differences by group were obtained for all three views for some groups:

ANOVA AND TUKEY'S HSD TEST

		HS	HSO	DS	GP	O
FRONTAL	HS					
	HSO				**	**
	DS					
	GP					
	O					

SOURCE	D.F.	SS	MS	F Ratio	F. Prob.
Between Groups	4	21.12	5.28	3.599	0.0092 (p < .01)
Within Groups	88	129.11	1.47		
Total	92	150.23			

*Denotes pairs of groups significantly different (p < .01).

TABLE IX Cont.

ANOVA AND TUKEY'S HSD TEST

		HS	HSO	DS	GP	O
SMILE	HS					***
	HSO			***	***	***
	DS					
	GP					
	O					

SOURCE	D.F.	SS	MS	F Ratio	F. Prob.
Between Groups	4	38.05	9.51	5.720	0.0004 (p < .001)
Within Groups	88	146.37	1.66		
Total	92	184.42			

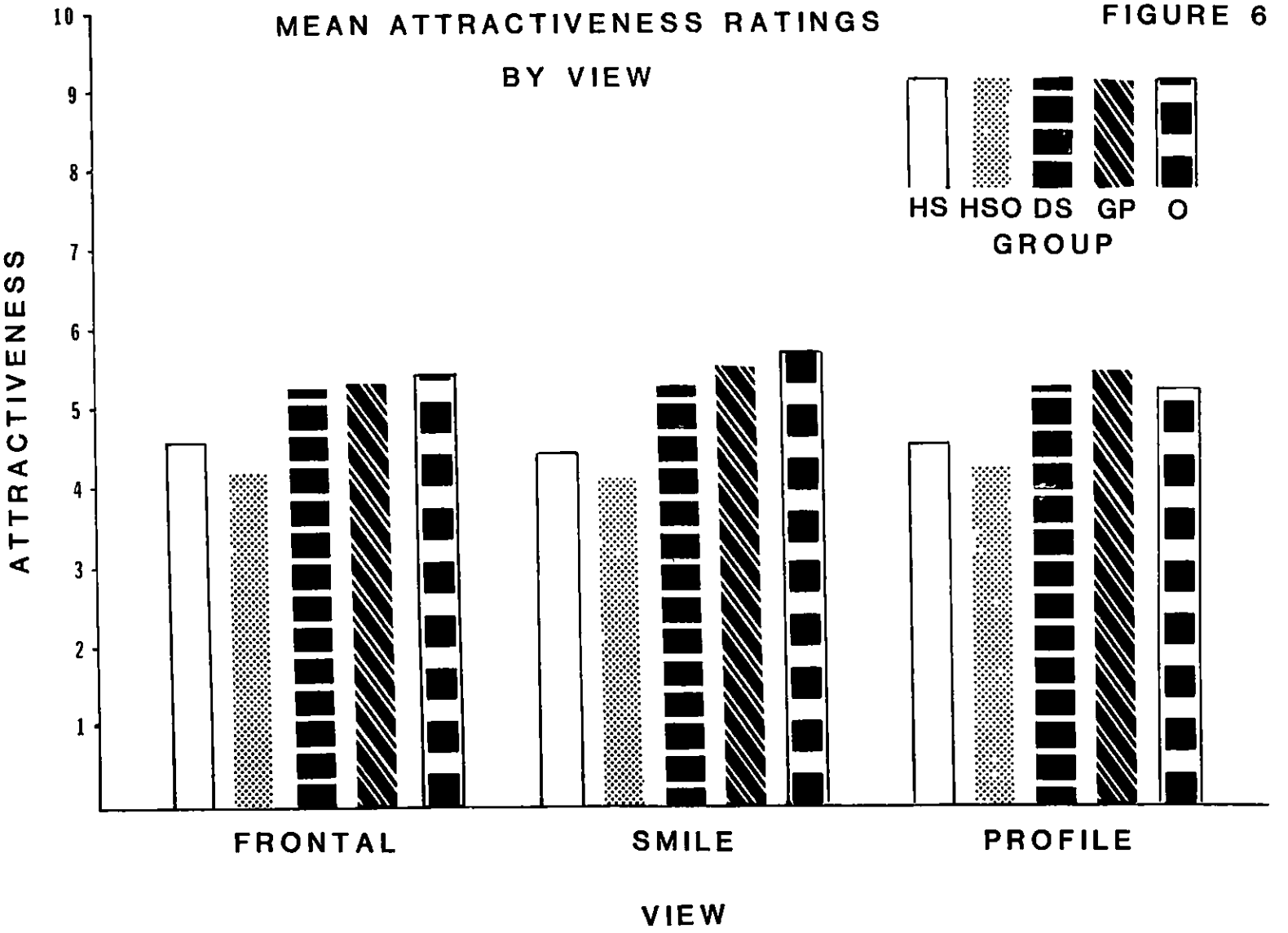
*Denotes pairs of groups significantly different (p < .001).

		HS	HSO	DS	GP	O
PROFILE	HS					
	HSO				**	**
	DS					
	GP					
	O					

SOURCE	D.F.	SS	MS	F Ratio	F. Prob.
Between Groups	4	20.96	5.24	4.226	0.0035 (p < .01)
Within Groups	88	109.09	1.24		
Total	92	130.04			

*Denotes pairs of groups significantly different (p < .01).

FIGURE 6


MEAN ATTRACTIVENESS RATINGS
BY VIEW
HS HSO DS GP O
GROUP
ATTRACTIVENESS
10
9
8
7
6
5
4
3
2
1
FRONTAL
SMILE
PROFILE
VIEW

differences were obtained for all three views between some of the groups. First, the frontal view was significantly ($p<.01$) less attractive for the HSO group than for the GP and O groups. Second, for the smile view, the HSO group mean was significantly ($p<.001$) less than the means for DS, GP and O groups and the HS group mean was less than for the O group. Finally, the HSO group mean for the profile view was significantly ($p<.01$) less than the GP and O group means. These results are very similar to those presented in Table III, since they are based on the same data. The only difference being that they are grouped by view in Table IX. Overall, the HSO group rated the subjects as being less attractive, regardless of view, than did the DS, GP and O groups. Again the HS group consistently rated the subjects as more attractive than did the HSO group, even though no statistically significant. For benefit of orthodontic treatment (Question 3), however, no differences were found by view when the groups were compared. Also, for Question 1, no differences within groups were observed between the three views. However, within group differences, were found for Question 3, between the views, in three groups: HSO, DS and GP (Table X and Figure 7). In each of the three groups the mean rating for the smile views was significantly ($p<.05$) higher than for frontal views. These groups rated the subjects' appearances as benefitting more from orthodontic treatment in smile views than in frontal views. Further, for the HSO group the smile view had a significantly ($p<.01$) greater mean than the profile view. Thus, the HSO group indicated a greater benefit of

treatment based on smile views than on either the frontal or profile view.

TABLE X

MEAN BENEFIT OF ORTHODONTIC TREATMENT RATINGS
(1-6 SCALE) WITHIN EACH GROUPS BY VIEW

VIEW	STAT.	VIEW		
		FRONTAL	SMILE	PROFILE
HS	Mean	3.24	4.02	3.42
	S.D.	.91	1.12	.72
HSO	Mean	3.35	4.46	3.50
	S.D.	.93	.92	.81
DS	Mean	3.21	4.10	3.53
	S.D.	1.05	1.04	.98
GP	Mean	3.70	4.69	4.12
	S.D.	1.20	1.05	1.10
O	Mean	3.18	4.12	3.71
	S.D.	1.12	1.06	1.20

Significant differences by view were obtained for three groups:

HSO GROUP		FRONTAL	SMILE	PROFILE
	FRONTAL			
	SMILE	**		**
	PROFILE			

SOURCE	D.F.	SS	MS	F Ratio	F. Prob.
Between Groups	2	12.15	6.08	7.777	0.0012 ($p < .01$)
Within Groups	47	36.72	0.78		
Total	49	48.87			

*Denotes pairs of views (groups) significantly different ($p < .01$).

TABLE X Cont.

DS GROUP		FRONTAL	SMILE	PROFILE
	FRONTAL			
	SMILE	*		
	PROFILE			

SOURCE	D.F.	SS	MS	F Ratio	F. Prob.
Between Groups	2	6.74	3.37	3.221	0.0489 ($p < .05$)
Within Groups	47	49.21	1.05		
Total	49	55.95			

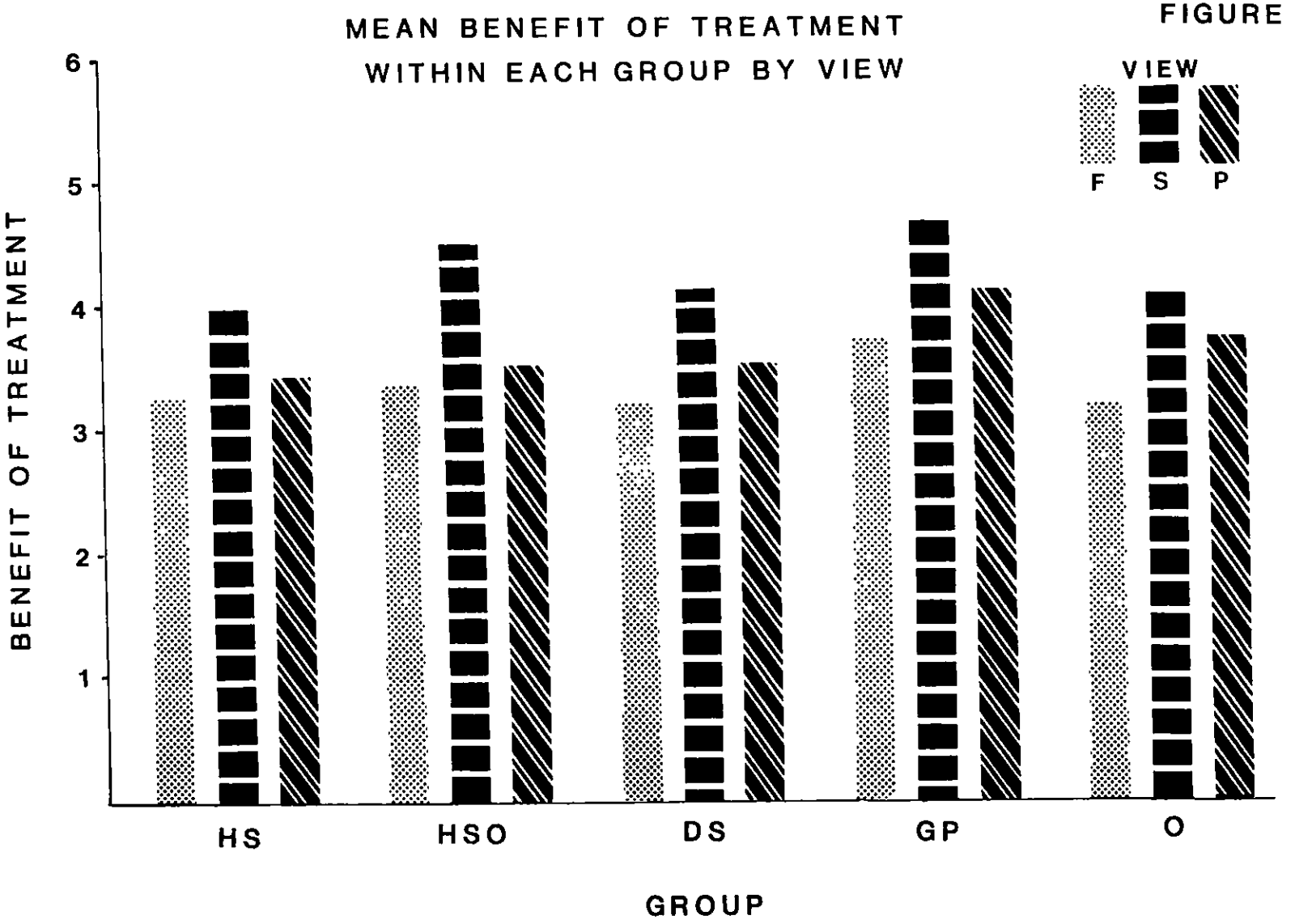
*Denotes pairs of views (groups) significantly different ($p < .05$).

GP GROUP		FRONTAL	SMILE	PROFILE
	FRONTAL			
	SMILE	*		
	PROFILE			

SOURCE	D.F.	SS	MS	F Ratio	F. Prob.
Between Groups	2	8.17	4.08	3.276	0.0466 ($p < .05$)
Within Groups	47	58.60	1.25		
Total	49	66.77			

*Denotes pairs of views (groups) significantly different ($p < .05$).

FIGURE 7


MEAN BENEFIT OF TREATMENT
WITHIN EACH GROUP BY VIEW
VIEW
F
S
P
BENEFIT OF TREATMENT
6
5
4
3
2
1
HS
HSO
DS
GP
O
GROUP

DISCUSSION

Attractiveness

The effect of dentofacial experience or facial schema complexity was evident in the attractiveness ratings. Only partial support, however, for the first hypothesis (i.e. that there is a positive correlation between experience and ratings) was provided by the results (Table III and Figure 1). Disregarding the HSO group, attractiveness ratings tended to increase with group experience, though not significantly. The differences were significant if the rater groups were differentiated on the basis of formal dental training or not. This is consistent with the findings of Tedesco et al. (1983) where dental judges rated children seeking treatment as more attractive than did non-dental judges. Professional experience with more extreme dentofacial abnormalities probably shaped the dental judges' responses (Tedesco et al., 1983). Their explanation centered around the contention that dental professionals, especially orthodontists, know how severe malocclusion can become while those with less experience, particularly the adolescent culture, might be more sensitive to highly visible, but not necessarily severe, indications of malocclusion.

This pattern of attractiveness ratings is not consistent, however, with the studies of Prahl-Anderson et al. (1979) and Bell et al.

(1985). Although these studies demonstrated disagreements between the public and dental professionals, the latter group perceived more profiles to be abnormal than did the former. Shaw et al. (1975) also found that dental professionals gave fewer favorable responses regarding appearance of teeth than did the public. Their study may be criticized however, in the context of facial attractiveness ratings, since Shaw more recently found facial appearance to be more important in attractiveness ratings than the dentition even when a cleft-lip accompanied the malocclusion (Shaw, 1981). Lindsay and Hodgkins (1983) observed that parent and child groups consistently gave lower estimates of the severity of occlusal problems than did the orthodontists. The authors felt, however, that the reliability between these groups would have been higher if the malocclusions were less severe. The present study did attempt to utilize photographs of subjects with minimal differences in appearance. In addition, two other studies, one, using an index of malocclusion (Treatment Priority Index - Albino et al., 1979) and another using a scale for socially acceptable occlusal conditions (SASOC - Jenny et al., 1982) found marked similarities in professional and public ratings of attractiveness.

The correlation analysis performed with these attractiveness ratings (Table VI) showed the consistency in ratings among the groups. Tedesco (1983) showed high correlations between lay and orthodontic raters for dentofacial attractiveness. And even though Bell et al. (1985) found lay adults more likely to assign patient

ratings in the normal range, significant correlations (.77 to .93) were found between the dental specialty groups and the lay persons with an even higher association between the two specialty groups (.86 to .97), for mean ratings of patient profiles. Very similar correlations were obtained in this study between the groups with dental training (DS, GP and O) and those without (HS and HSO groups) (Table VI). The lower attractiveness ratings for the HS and HSO groups are consistent with the lower correlation between these groups and the O group.

The reasons for the observed difference between the HSO group and the dental groups (DS, GP and O) for attractiveness ratings may lie in the type (quality), rather than quantity, of experience. It probably makes a difference if experience is gained as a patient or through practice and education. While the dental groups may have had some experience with orthodontics as patients (this was not controlled for) their primary source of experience was that of observing and/or treating others. The HSO group, however, had primarily experience as patients. The orthodontist tries to make the patient more aware of an existing malocclusion primarily in order to obtain good cooperation during treatment. Cohen and Horowitz (1970) stated that "the child acquires through others a frame of reference for judging his own and the appearance of others." Actually, the HSO group may have had an increased awareness in two subtle, yet different ways: (1) through self-experience with orthodontic treatment and (2) through having had a malocclusion. A study by

Albino and Tedesco (1981) showed children seeking treatment for malocclusions to have a less positive self-concept of their own attractiveness than those not seeking treatment. And a few follow-up studies of patients after orthodontic treatment failed to show differences in self-concept satisfaction with appearance compared with pre-treatment individuals (Klima et al., 1979 and Rutzen, 1983).

Increased awareness of malocclusions and lower self-concept regarding attractiveness probably played a role in the HSO group's lower ratings. Goffman (1963) and Virolainen (1967) found that individuals possessing an appearance problem more readily identified it in others. Graber (1980) showed that youngsters who had a malocclusion gave lower scores (wrong vs. nothing wrong) to pictures of children. Perhaps the HSO group had similar perceptions even though their malocclusions were corrected. This suggestion is supported in the context of Markus' (1977) theory of self-schema. The HSO group probably had a more complex self-schema about malocclusions and may have had lower self-perceptions about attractiveness based on their self-experience. They selectively focused on self-relevant aspects of the subjects they rated as has been shown by Fong and Markus (1982). These researchers have also shown that people tend to seek information about others that is related to their self-schemas. They further stated that others are rated more extremely when self-relevant traits are employed. This is consistent with the HSO group's ratings. Their possible lower

self-concept of attractiveness may be reflected in their lower ratings of the subjects.

Benefit of Orthodontic Treatment on Appearance

From the results in Table IV (also Figure 2), it is apparent that the groups were in agreement as to how much the appearance of the subjects would benefit from orthodontic treatment. This did not support the first hypothesis. It is not in agreement with previous research which found that dental professionals recommended treatment more than did lay persons (Shaw et al., 1975; Prahl-Anderson et al., 1979). Even though these studies assessed need for treatment (which may include other factors than esthetics), their designs emphasized appearance. One study, however, by Jenny et al. (1982) showed that orthodontist's ratings of need for treatment concurred with treatment need based on the Social Acceptability Scale of Occlusal Conditions (SASOC), a scale based on the public's perceptions of esthetic acceptability.

Another unexpected result in Table IV was that even though the HSO group rated the subjects lower in attractiveness, they did not rate them higher in benefit of orthodontic treatment for appearance. This may also be in congruence with the aforementioned explanation regarding the HSO group. They may have had low expectations, from their self-experience, regarding benefit of treatment for appearance.

Response Time

Support for the second hypothesis (i.e. response time increases with dentofacial experience or schema complexity) is exhibited in Table V and Figure 3. Even though significant differences were only found if the rater groups were differentiated on the basis of formal dental training or not (as in interpreting the attractiveness ratings), the gradual increase in response time was evident between the dental groups as well. Haxton (1985) reported somewhat similar findings utilizing four groups with different levels of familiarity with craniofacial deformities (CFD): (1) children with CFD and parents, (2) orthodontic patients and parents, (3) normal (unaffected) children and parents, and (4) dental professionals. Though not significant, some of the groups with more experience had longer reaction times to rate photos which varied slightly in interocular distance and angle of mouth. The experienced groups were also more sensitive to variations in these features. These groups probably possessed a greater facial schema complexity and were therefore able to make accurate discriminations of the fine variations in appearance (Fong and Markus, 1982). In order to do this, however, the more experienced groups may have incorporated, in their decisions, a greater number of criteria on which to judge the subjects in the photographs. Schematics, i.e. those with a complex schema about a particular domain, possess a more extensive, detailed and organized store of information about that domain than those with a less

complex schema (Fong and Markus, 1982). Thus, the more experienced rater groups probably required a longer period of time to evaluate the subjects in order to incorporate their more extensive criteria into their judgments. This is consistent with the extensive repertoire of dentofacial esthetic analyses and measurements or proportions that the dental professional, and orthodontist in particular, may utilize in judgments of this nature.

Facial Features

In evaluating facial attractiveness, the dental professional groups' utilization of the mouth (lips) and chin features significantly more frequently than the HS and HSO groups lends support to the first hypothesis (Table VII and Figure 4). Though no test of significance was done, the mouth feature was the most frequent recorded for all the groups. As experience increased, the groups also showed a decrease in frequency of the cheeks feature and none-in-particular (though not significant) for attractiveness ratings. For ratings of benefit of treatment in appearance (Table VIII and Figure 5), the O group showed significantly less preference for the jaw(s) and nose features than the HS and HSO groups, respectively.

These observations receive support from dental research as well as Markus' theory of complexity of schema. With regard to the mouth feature, Hilzenrath and Giddon (1963) found the mouth to be one of the most important determinants of attractiveness (along with

eyes). Another important characteristic in attractiveness ratings was the chin. It ranked 3rd of 34 variables in terms of saliency in ratings (Secord and Jourard, 1956). In addition, many orthodontic esthetic analyses are based on the mouth and chin, especially in "profile" views.

The two features mouth and chin are probably very relevant features in evaluations of appearance. Fong and Markus (1982) have demonstrated that those with a complex schema select and prefer information relevant to their domain. In contrast, features such as cheeks, nose and jaw(s) may be more ambiguous or irrelevant in decisions about attractiveness and benefit of treatment. As experience or facial schema complexity increased, these features were indeed utilized less in the ratings (Tables VII, VIII and Figures 4, 5).

Facial Views

In general, the results of the attractiveness ratings by view were not different from those expected (Table IX and Figure 6) since they are based on the same data as Table III. However, <u>within</u> group comparisons by view, for both attractiveness and benefit of treatment produced consistent differences for most of the groups. Smile views were not more important than frontal and profile views for attractiveness but were significantly more important in ratings of benefit of treatment for three of the five groups (Table X and Figure 7). Even though previous research has verified the significant con-

tribution that the dentition makes in judgments of facial attractiveness, these studies utilized a control group for comparison. Thus it would be expected that dental malalignment (smile views) would devaluate attractiveness ratings (Lucker and Graber, 1981). From the standpoint of benefit of treatment on appearance, however, the significantly higher ratings for smile views in the HSO, DS and GP groups may be more difficult to explain in light of the lack of effect of this view on attractiveness ratings. It would appear that although the raters' decisions about appearance were not affected by smile views, they felt there would be more benefit of treatment on appearance than in other views. Both the HS and O groups showed a similar pattern by view, though not significant. This dichotomy might be explained by the wording of the question they were responding to when rating the subjects. The raters may have interpreted the question to mean that treatment may improve the subjects' dental appearance, per se, but not necessarily overall facial appearance (as was rated in the attractiveness question).

In the present study, only six subjects had all three photographic views by which to compare these effects reliably. Therefore any inferences from these results may be based on spurious relationships between one view of a subject and another view of a different subject. It would be necessary to have three views for all subjects and compare each subject's views separately by rater group means to better determine the influence of different views.

General

Some limitations and compromises in the design of this study place certain restrictions in drawing far-reaching conclusions from the results obtained. The sample of photo subjects was not compared to a control group not seeking treatment nor were the subjects a representative sample of people seeking orthodontic treatment in the general population. For instance, only photographs of Caucasian children were used. It is possible, however, to carefully infer some information from the group differences to learn more about the effect of dentofacial experience on attractiveness and benefit of orthodontic treatment decisions as well as which facial features are more salient in making these judgments. The effect of different views on ratings has to be evaluated with caution considering the aforementioned problems with the study design. According to Lucker (1980) research of this nature should clearly identify regions of the face that are consistently correlated with esthetic judgments. As many facial types, views and age groups as possible should also be used to maximize generality.

The use of photographic material in general is a reliable and valid method to assess appearance and the other variables included in this study (Howells and Shaw, 1985). A photographic sample standardized by accepted measurements or classifications, however, would allow comparison of ratings between subjects to identify

variables which may account for similarities or differences between groups of raters.

Two related variables which may have a substantial influence on the ratings are (1) head form (from brachycephalic to dolichocephalic) and the corresponding range of facial types (from euryprosopic to leptoprosopic) and (2) sex of the subjects as well as the raters. From the standpoint of male/female differences in perception of other males and/or females, the sex of the rater may influence the ratings as well as the sex of the subjects being rated. Previous research has shown that the sex of the rater as well as that of the subject affects attractiveness ratings. Shaw (1981) found girl subjects rated more attractive than boys when rated by their peers but not when rated by lay adults. He also observed, for peer judgement only, that female judges regarded girls as better looking than boys while male judges regarded the boys as better looking. In the present study, although an attempt was made to select an equal number of male and female raters in all groups, only the HS and HSO groups met this criteria. The photographic subjects were also equally divided by sex. Therefore, the effect of sex of subject (for all rater groups) and rater (for the HS and HSO groups) could have been determined.

The other variable, head form and facial type, is related to sex in that there are typical male/female differences in head form and facial type that are consistent enough to warrant including in a study design for future investigations. Since females tend to have brachycephalic features in general and males tend to have the

corresponding dolichocephalic features, controlling for this variable in the selection of photographic subjects may play an important role in judge's decisions. For example, a group of dolichocephalic females may be rated significantly different than a group of brachycephalic females.

The design of the rating form could also be improved to minimize any misinterpretations or inconsistencies in responses, especially considering the subjective nature of the judgments. A continuous line method (visual analogue scale - Howells and Shaw, 1985) may be more accurate to determine differences between ratings than the scale used in this study. Regarding the rater group selection, the influence of type (quality) of experience, as in the HSO group, on ratings, could be eliminated by using a different group of similar age such as high school students in dental assistant programs. Haxton (1985) utilized such a group in her study. Parents and other lay persons should be considered in selecting rater groups to obtain a better idea of public opinions.

There are some other variations in the analyses performed that may warrant investigating in light of the findings. One is the possibility that due to time constraints, attention span and fatigue, the raters may have given more thorough or "accurate" judgments at the beginning of the slide series than near the end. The response times tended to be longer at the beginning than near the end, although this may be due to a practice effect. The first ten slides, for example, may have shown more consistent or significant

differences between the rater groups. A second variation relates to the facial features selected and response time. Part of the reason for the dental groups' longer response times may be due to utilization of more total facial features for each slide than the HS and HSO groups. By looking at the total number of features checked for each group, this idea may be supported or not. Finally, it would be interesting and informative, in light of the variability (standard deviations) in ratings within groups as in Table VI, to determine if there is a difference in inter-rater reliability between the rater groups. Table VI suggests that as experience increases, so does the variability in the mean ratings. An analysis comparing the mean standard deviations for each rater between groups would be much more sensitive to any differences than simply comparing the standard deviations for the mean ratings.

SUMMARY AND CONCLUSIONS

The purpose of the present investigation was to determine a possible association between orthodontic experience (i.e. dentofacial schema complexity) and judgments about attractiveness and benefit of orthodontic treatment on appearance. Five groups of people with presumably different relative levels of dentofacial esthetic experience viewed frontal, smile and profile facial photographs of people seeking orthodontic treatment and evaluated three main variables: (1) facial attractiveness, (2) the benefit of orthodontic treatment on appearance and (3) the most important facial features on which they based their responses regarding the first two variables.

The rater groups consisted of the following (listed in order of presumably decreasing level of dentofacial schema complexity): (1) orthodontists (O), (2) general practitioners (GP), (3) second year dental students (DS), (4) high school students who had orthodontic treatment (HSO), and (5) high school students with no orthodontic treatment experience (HS). Each rater evaluated 50 slides consisting of different views of 22 subjects with regards to the three variables and their responses were timed for each slide.

Mean ratings for attractiveness, benefit of orthodontic treatment on appearance and mean response time were determined for each group. Correlation coefficients were calculated between the O group and the other four groups for mean attractiveness and benefit of treatment ratings. Actual and mean frequencies for facial features

were also determined for each group. One-way analyses of variance and Tukey's HSD multiple comparison tests were performed to evaluate differences between group means. For mean ratings of attractiveness and benefit of treatment, both within and between group analyses by facial view were done.

The results of this study suggest the following implications in assessing appearance and benefit of treatment in potential orthodontic patients:

1. The degree and type of dentofacial experience (i.e.dentofacial schema complexity) influences attractiveness ratings and to some extent the facial features on which these ratings were based.

2. Experience apparently does not play a role in determining the benefit of orthodontic treatment on appearance.

3. As experience increases, in general, so do attractiveness ratings. This is contrary to data of most previous research.

4. Self-experience (vs. practice and/or educational experience) with orthodontic treatment may have a negative influence on perceptions of facial attractiveness.

5. The time required to make esthetic judgments increases with experience, possibly due to the possession of a more complex facial schema.

6. The mouth (lips) and chin may be more relevant features to dental professionals than to high school students in evaluating appearance.

7. Smile views may be more important than frontal or profile views to experienced groups in determining the benefit of orthodontic treatment on dental appearance <u>per se,</u> but this is apparently not true in rating facial

> attractiveness. Orthodontists and those with presumably the least experience, however, may not be influenced as much as the other groups by the different views in these ratings.

Considering the importance of facial appearance in our society, the orthodontist has a formidable task to accomplish with each and every patient he accepts for treatment. One of his/her primary goals should be to achieve as much improvement in facial appearance as is possible in shaping a healthy, well-functioning dentofacial complex. In order to do this, he/she must consider how others view appearance and the benefit of treatment as well as the influence of his/her own experiences on perceptions of others.

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APPENDIX I

LETTER OF INFORMATION AND CONSENT TO USE PHOTOGRAPHS IN SLIDE-VIEWING STUDY

Dear _____:
Parent

We're conducting a study in the Orthodontic Department at Case Western Reserve University to benefit people seeking treatment for themselves or their children, and orthodontists. I would like to use your son/daughter's facial photographs, that were previously taken at the Orthodontic Department, in my study. The photos will be viewed by orthodontists, general dentists, dental students and high school students, some of whom have had braces before. These persons will be rating appearance and whether or not they feel the person in the photo needs orthodontic treatment. The responses will be kept confidential and only used for the purpose of this research and any publication in professional journals that may arise from this study. The photos will not be identified by name, just by a number, with the possibility of some photos being used in publishing this study.

Purpose of study: The aim of this project is to see if the public views facial appearance and the need for orthodontic treatment any differently than do dentists, and particularly orthodontists. The reason for doing this study is to help orthodontists and other health professionals better understand their patients' (and parents') reasons for and desires in seeking orthodontic treatment. Previous research has shown that there are differences between the public and professional views with regard to what is normal or acceptable appearance and whether or not orthodontic treatment is needed.

If you have any questions regarding this project, please feel free to call me at the Orthodontic Department: 368-3249. Please read the consent form below and sign and detach that portion and mail it in the enclosed envelope. Thank you for your time.

Sincerely,

David A. Lewicki

David A. Lewicki, D.D.S.

APPENDIX I (Cont.)

CONSENT FORM FOR USE OF PHOTOGRAPHS IN SLIDE-VIEWING STUDY

Your consent to allow the use of your son/daughter's photographs in this study is optional of course. You are also free to withdraw this consent at any time without prejudice to present or future treatment at the CWRU School of Dentistry.

I have been satisfactorily informed of the study procedure through the letter sent by Dr. Lewicki and realize he is available to answer any question I may have. I give my consent to allow the use of my son/daughter's _____ photographs in this study. If I feel my questions have not been adequately answered I may call Dr. Robert Cederquist (faculty supervisor for this study) at 368- . I have been offered a copy of this form.

_____
Signature of son/daughter

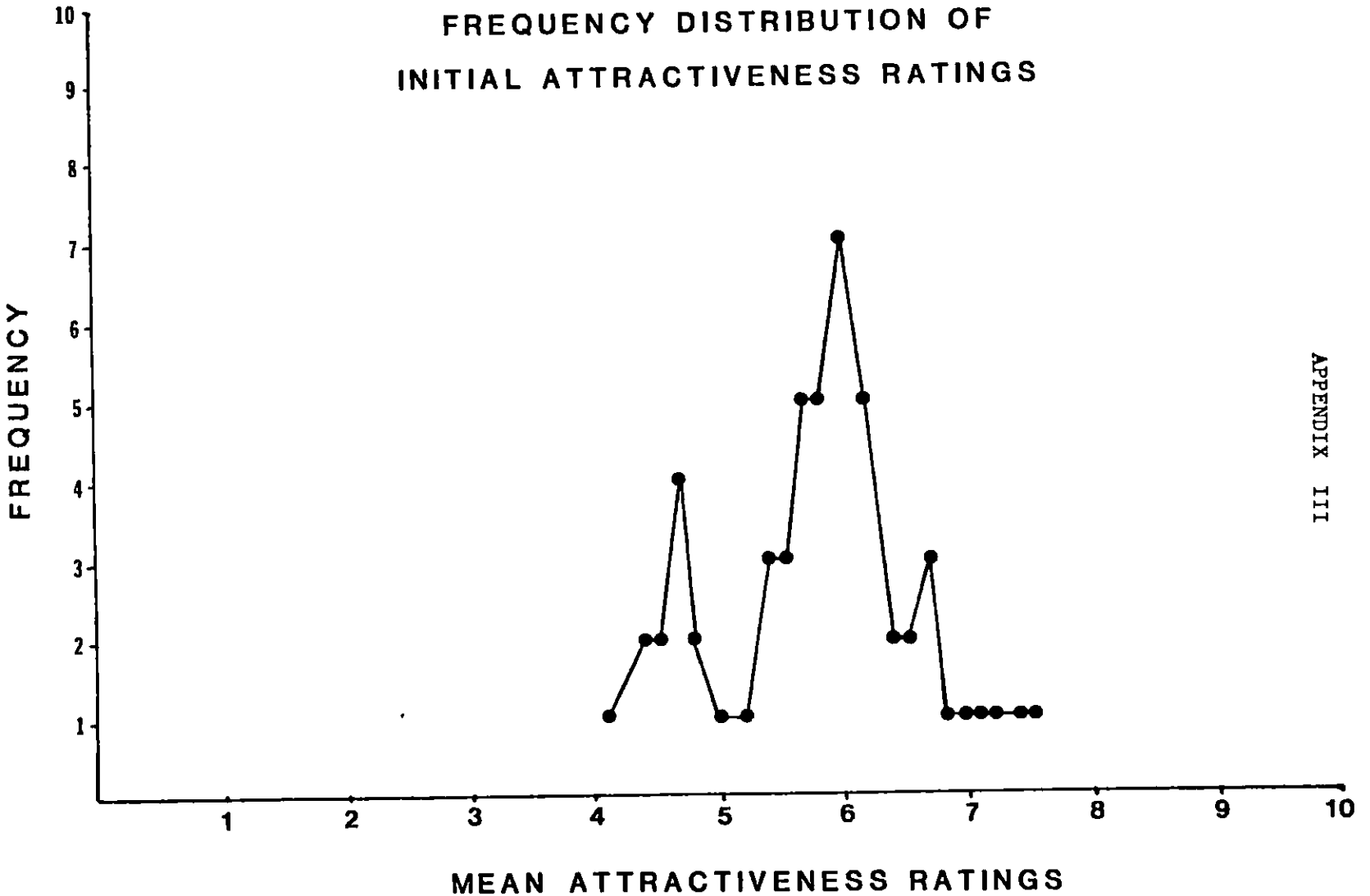
_____
Signature of parent/guardian

☐ Please check if you wish a copy of this form. One will be returned to you.

APPENDIX II

ATTRACTIVENESS RATING FORM

(#1)	X Very attractive	X	X	X	X	X	X	X	X	X Very unattractive
(#2)	X Very attractive	X	X	X	X	X	X	X	X	X Very unattractive
(#3)	X Very attractive	X	X	X	X	X	X	X	X	X Very unattractive
(#4)	X Very attractive	X	X	X	X	X	X	X	X	X Very unattractive
(#5)	X Very attractive	X	X	X	X	X	X	X	X	X Very unattractive
(#6)	X Very attractive	X	X	X	X	X	X	X	X	X Very unattractive
(#7)	X Very attractive	X	X	X	X	X	X	X	X	X Very unattractive
(#8)	X Very attractive	X	X	X	X	X	X	X	X	X Very unattractive
(#9)	X Very attractive	X	X	X	X	X	X	X	X	X Very unattractive
(#10)	X Very attractive	X	X	X	X	X	X	X	X	X Very unattractive
(#11)	X Very attractive	X	X	X	X	X	X	X	X	X Very unattractive
(#12)	X Very attractive	X	X	X	X	X	X	X	X	X Very unattractive
(#13)	X Very attractive	X	X	X	X	X	X	X	X	X Very unattractive
(#14)	X Very attractive	X	X	X	X	X	X	X	X	X Very unattractive
(#15)	X Very attractive	X	X	X	X	X	X	X	X	X Very unattractive
(#16)	X Very attractive	X	X	X	X	X	X	X	X	X Very unattractive
(#17)	X Very attractive	X	X	X	X	X	X	X	X	X Very unattractive
(#18)	X Very attractive	X	X	X	X	X	X	X	X	X Very unattractive


FREQUENCY DISTRIBUTION OF
INITIAL ATTRACTIVENESS RATINGS
FREQUENCY
10
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MEAN ATTRACTIVENESS RATINGS

APPENDIX IV

SLIDE SUBJECTS: NAME, AGE, SEX, RACE,
DATE OF PHOTOGRAPHS AND VIEWS USED

NAME	AGE	SEX	RACE	DATE	VIEWS
1. Gina Cesari	12-8	F	C	7/85	F S
2. Jennifer Seiler	13	F	C	8/85	F S P
3. Brian Yorko	12-10	M	C	7/85	F S P
4. David Harvey	12	M	C	8/85	S P
5. Adrian Moore	14	M	C	8/85	F P
6. Joyce Ashman	10-2	F	C	7/85	F S
7. Bradley Kessler	11	M	C	7/85	F S P
8. Cynthea Bednar	13	F	C	7/85	S P
9. Robert Davis	14-3	M	C	7/85	F S
10. Kristi Dahm	12	F	C	9/85	S P
11. Robert Estep	15	M	C	7/85	F P
12. Raymond Cesari	14-11	M	C	7/85	F S P
13. Jennifer Ishmael	12	F	C	7/85	F S P
14. David Ficke	12	M	C	8/85	F P
15. Carol Klima	14	F	C	9/85	S P
16. Angie McMenamin	16-7	F	C	8/85	F S
17. Michael Oster	14-8	M	C	8/85	F P
18. Scott Pascu	13	M	C	9/85	S P
19. Mary K. Smith	10	F	C	8/85	S P
20. Christin Carlton	11-9	F	C	9/85	F P
21. Matt Chappel	14	M	C	7/85	F S P
22. Margaret Sweeney	14-10	F	C	8/85	F S

Screening Questionnaire for Study

Your name _____

Period _____

ODD ___ EVEN ___ ALL ___

1. Have you had orthodontic treatment (braces)?

Yes ___ No ___

2. Did anyone else in your family have orthodontic treatment?

Yes ___ No ___

3. Are you currently undergoing any orthodontic treatment at this time?

Yes ___ No ___

4. Did you or anyone else in your family desire orthodontic treatment but your family could not afford it?

Yes ___ No ___

APPENDIX VI

LETTER OF INFORMATION AND CONSENT TO PARTICIPATE IN SLIDE-VIEWING STUDY

Dear Parent/Guardian:

We're conducting a study at Case Western Reserve University to benefit people seeking orthodontic treatment for themselves or their children, and orthodontists. This letter was prepared for you to explain our interest in having your son/daughter participate in the project and to serve as a consent form. Partication in this study will only involve your son/daughter looking at some photographs (slides) of faces and rating their appearance. Please take a few minutes to read this.

I am in my last year of a graduate orthodontic residency program at Case Western Reserve University. We're interested in finding out if a person who has had orthodontic treatment (braces) views facial appearance and the need for treatment any differently than someone who hasn't had braces before. We also plan on determining if there are any differences between the public and professional views by having dental students and orthodontists participate in the study.

The reason for doing this study is to help orthodontists and other health professionals better understand their patients' (and parents') reasons for, and desires in seeking orthodontic treatment. Some previous work has shown differences between the public and professional views with regard to what is normal or acceptable appearance and whether or not treatment is needed.

To participate in this study, your son/daughter would be asked to view a series of photos (slides) of faces of mostly children in their teen and some adults. He/she will then be asked to rate the appearance of the faces on a continuous scale of attractiveness as well as whether they need orthodontic treatment or not. There are no right or wrong responses. Also, these pictures are of normal children with no disfigurements or features that might be disturbing.

In order to learn how long it takes someone to make a decision about the pictures, each response will be timed. Using slides and the rating forms, the entire session will last approximately ½ hour. There are no known risks or discomforts with this study. Your son/daughter would not have to miss any classes in order to participate. I will arrange to be available either during free periods or after school for the session.

Your son/daughter's responses on the rating forms will be used only for the purpose of the study and he/she will not be putting his/her name on the response form. I will ask your son/daughter to let me know if he/she recognizes any person in the photos.

APPENDIX VI (Cont.)

If you have any questions regarding this project or your child's participation, please feel free to call me at Case Western Reserve's orthodontic clinic 368-3249.

Your son/daughter's participation in this study is optional. You are also free to withdraw this consent and not have your child participate, even after signing this form.

Thank you for your time. Please read the consent form below and sign and detach this portion to give to your son/daughter to return it to school. The consent form should be given to Dr. Lewicki.

Sincerely,

David A. Lewicki

David A. Lewicki, D.D.S.

CONSENT FORM FOR PARTICIPATION IN SLIDE-VIEWING STUDY

I have been satisfactorily informed of the study procedure through the letter sent by Dr. Lewicki and realize he is available to answer any questions I may have. I give my permission for my son/daughter _____(name of son/daughter) to participate in this study. If I feel my questions have not been adequately answered I may call Mr. Farinacci* . I also understand I am free to withdraw my consent at any time and not have my son/daughter participate in this study, even after signing the form, without prejudice to present or future treatment at the CWRU School of Dentistry. I have been offered a copy of this form.

(* Associate Principal for Curriculum, 79 Office 442-2200 Ext 242)

_____
Signature of son/daughter

_____
Signature of parent/guardian

☐ Please check if you wish a copy of this form. (One will be returned to you).

APPENDIX VI (Cont.)

APPENDIX VII

RATING FORM O GP DS HSO HS

M F

Instructions:

For each of the following slides, please respond to the four questions either by circling the "X" you choose (questions 1, 3) or by checking the facial feature(s) you based your decision on (questions 2, 4). Please concentrate only on the person's face and try to ignore such things as hairstyle, complexion, ears or any birthmarks.

These questions are the same for all the slides:

Question #1 Please rate this person's attractiveness.

X X X X X X X X X X

very unattractive very attractive

Question #2 In question #1, which facial feature(s) was/were important in your rating?

Eyes___ Nose___ Mouth(lips)___ Teeth___

Chin___ Jaw(s)___ Cheeks___ None in particular___

Question #3 Do you feel this person's appearance would benefit from orthodontic treatment?

X X X X X X

no benefit greatly benefit

Question #4 In question #3, on which facial feature(s) did you base your decision?

Mouth(lips)___ Teeth___ Chin___ Jaw(s)___ Nose___

APPENDIX VII (Cont.)

Slide 1

#1 X X X X X X X X X X
very unattractive very attractive

#2 Eyes___ Nose___ Mouth(lips)___ Teeth___
Chin___ Jaw(s)___ Cheeks___ None in particular___

#3 X X X X X X
no benefit greatly benefit

#4 Mouth(lips)___ Teeth___ Chin___ Jaw(s)___ Nose___

Slide 2

#1 X X X X X X X X X X
very unattractive very attractive

#2 Eyes___ Nose___ Mouth(lips)___ Teeth___
Chin___ Jaw(s)___ Cheeks___ None in particular___

#3 X X X X X X
no benefit greatly benefit

#4 Mouth(lips)___ Teeth___ Chin___ Jaw(s)___ Nose___

Slide 3

#1 X X X X X X X X X X
very unattractive very attractive

#2 Eyes___ Nose___ Mouth(lips)___ Teeth___
Chin___ Jaw(s)___ Cheeks___ None in particular___

#3 X X X X X X
no benefit greatly benefit

#4 Mouth(lips)___ Teeth___ Chin___ Jaw(s)___ Nose___

APPENDIX VIII

GROUP O

QUESTION 1

SLIDE	MEAN	S.D.	SLIDE	MEAN	S.D.
1	7.12	1.41	26	6.59	1.70
2	5.41	1.23	27	6.88	1.54
3	6.94	1.56	28	3.82	1.88
4	6.71	.99	29	5.59	1.46
5	3.41	1.18	30	6.18	1.85
6	4.47	1.42	31	3.76	1.52
7	3.65	1.27	32	5.82	1.63
8	7.24	1.35	33	6.88	1.54
9	6.41	2.21	34	4.59	1.73
10	5.35	1.87	35	5.12	1.41
11	7.00	1.27	36	7.35	1.41
12	4.76	2.02	37	6.44	2.00
13	2.71	1.72	38	2.82	1.63
14	6.00	1.46	39	7.38	1.15
15	7.76	1.15	40	5.65	1.80
16	4.12	1.93	41	4.88	1.58
17	6.06	1.78	42	3.65	1.69
18	6.94	1.39	43	5.82	1.67
19	6.29	1.16	44	4.12	1.36
20	5.59	1.54	45	5.76	1.52
21	5.58	1.78	46	4.00	1.58
22	4.71	2.05	47	5.41	2.15
23	6.29	2.05	48	2.53	1.46
24	4.53	1.33	49	4.41	2.06
25	6.59	1.50	50	7.06	1.78

APPENDIX VIII Cont.

GROUP O

QUESTION 3

SLIDE	MEAN	S.D.	SLIDE	MEAN	S.D.
1	2.59	1.77	26	2.24	1.39
2	2.59	1.18	27	4.47	1.23
3	3.00	1.37	28	5.12	.86
4	2.12	1.22	29	4.12	1.41
5	5.24	.83	30	3.71	1.69
6	3.94	1.30	31	4.94	.83
7	4.88	.86	32	2.13	1.36
8	2.53	1.33	33	2.13	1.26
9	1.82	1.19	34	4.29	1.05
10	4.76	.83	35	4.76	.90
11	2.47	1.33	36	1.69	1.01
12	2.65	1.46	37	1.94	1.06
13	5.53	1.01	38	5.53	.62
14	2.53	1.28	39	3.94	1.30
15	2.59	1.58	40	4.29	1.36
16	2.94	1.60	41	4.81	.75
17	4.53	.87	42	4.65	1.17
18	2.50	1.55	43	4.53	1.18
19	4.53	.80	44	4.31	1.25
20	3.38	1.36	45	2.18	1.42
21	4.47	1.28	46	4.18	1.70
22	4.94	1.03	47	5.24	.75
23	3.47	1.70	48	5.69	.48
24	3.88	1.50	49	3.59	1.42
25	3.06	1.60	50	2.59	1.28

APPENDIX VIII Cont.

GROUP G.P.

QUESTION 1

SLIDE	MEAN	S.D.	SLIDE	MEAN	S.D.
1	7.20	1.32	26	6.35	1.84
2	5.90	1.55	27	6.55	1.99
3	7.65	1.73	28	4.75	1.71
4	6.95	1.54	29	5.68	1.67
5	3.40	1.14	30	5.65	1.69
6	4.10	1.37	31	4.30	1.59
7	4.25	1.48	32	6.05	1.64
8	6.85	1.93	33	5.65	2.25
9	6.15	1.90	34	5.63	1.83
10	4.00	2.08	35	3.90	1.55
11	7.35	1.39	36	6.79	1.84
12	3.90	1.55	37	5.90	1.92
13	2.60	1.67	38	2.90	1.48
14	5.70	1.81	39	6.95	1.61
15	6.95	1.57	40	6.25	1.25
16	4.55	1.47	41	5.15	1.60
17	6.55	1.88	42	3.75	1.71
18	6.65	1.46	43	5.63	1.95
19	6.47	1.31	44	4.35	1.27
20	5.00	1.69	45	5.30	1.72
21	5.60	2.35	46	4.10	2.15
22	5.55	2.42	47	4.84	2.24
23	5.45	1.57	48	2.45	1.47
24	4.15	1.79	49	5.35	1.93
25	7.45	1.43	50	7.30	1.78

APPENDIX VIII Cont.

GROUP G.P.

QUESTION 3

SLIDE	MEAN	S.D.	SLIDE	MEAN	S.D.
1	2.20	1.47	26	2.30	1.22
2	2.95	1.76	27	4.95	1.05
3	2.30	1.30	28	4.95	.97
4	3.25	1.48	29	4.85	1.04
5	5.60	.68	30	3.95	1.19
6	4.10	1.45	31	5.55	.60
7	5.20	.62	32	2.55	1.43
8	3.25	1.59	33	4.15	1.53
9	2.90	1.48	34	4.65	1.31
10	5.50	1.15	35	5.50	.61
11	2.40	1.27	36	2.65	1.73
12	4.90	1.41	37	3.30	1.81
13	5.90	.45	38	5.70	.47
14	3.30	1.38	39	5.00	.97
15	3.05	1.57	40	4.10	1.45
16	4.35	1.18	41	4.45	1.32
17	5.50	.61	42	5.70	.47
18	2.55	1.50	43	4.55	1.28
19	4.60	1.23	44	4.65	1.42
20	3.50	1.47	45	2.25	1.29
21	4.50	1.43	46	5.25	1.16
22	5.45	.60	47	5.45	.83
23	4.70	1.17	48	5.95	.22
24	3.60	1.76	49	4.90	1.33
25	3.05	1.57	50	3.05	1.50

APPENDIX VIII Cont.

GROUP DS

QUESTION 1

SLIDE	MEAN	S.D.	SLIDE	MEAN	S.D.
1	7.00	1.17	26	6.50	1.47
2	4.75	1.29	27	6.90	1.68
3	6.55	1.28	28	4.55	1.70
4	6.10	1.68	29	5.95	1.70
5	3.95	1.61	30	5.60	1.73
6	4.00	1.75	31	4.60	1.76
7	4.65	1.53	32	4.70	1.66
8	6.30	1.69	33	6.05	1.47
9	5.85	1.76	34	4.90	1.71
10	4.40	1.88	35	4.65	1.76
11	6.65	1.76	36	6.10	1.52
12	4.20	1.79	37	6.65	1.76
13	3.00	1.86	38	2.90	1.48
14	5.20	1.82	39	6.60	1.60
15	7.20	1.20	40	5.85	1.53
16	5.00	2.08	41	4.55	1.90
17	5.75	1.68	42	4.00	2.34
18	5.75	1.45	43	4.80	1.82
19	5.25	1.74	44	4.60	1.85
20	4.60	1.64	45	4.60	1.93
21	5.35	1.73	46	4.00	1.92
22	5.05	1.64	47	5.20	1.54
23	6.25	1.33	48	2.65	1.69
24	4.00	1.72	49	5.05	1.67
25	6.95	1.39	50	6.15	1.50

APPENDIX VIII Cont.

GROUP DS

QUESTION 3

SLIDE	MEAN	S.D.	SLIDE	MEAN	S.D.
1	1.95	1.10	26	2.20	1.20
2	3.00	1.30	27	3.45	1.54
3	2.15	1.35	28	4.45	1.00
4	3.45	1.57	29	3.90	1.12
5	5.00	1.03	30	3.00	1.49
6	3.62	1.16	31	4.95	1.15
7	4.20	1.20	32	2.65	1.42
8	2.35	1.46	33	3.35	1.50
9	2.70	1.59	34	3.80	1.54
10	5.45	.69	35	4.65	1.18
11	1.75	1.29	36	2.80	1.38
12	3.65	1.39	37	2.25	1.48
13	5.85	.49	38	5.00	.86
14	3.55	1.61	39	3.40	1.70
15	2.90	1.92	40	3.15	1.50
16	3.35	1.50	41	3.40	1.39
17	5.00	1.03	42	4.70	1.53
18	2.05	1.47	43	3.50	1.93
19	4.05	.97	44	3.65	1.50
20	2.30	1.58	45	2.00	1.26
21	4.50	1.32	46	4.70	1.17
22	5.00	.79	47	5.00	1.26
23	3.70	1.17	48	5.65	.67
24	3.60	1.54	49	4.40	1.05
25	2.70	1.42	50	2.80	1.58

APPENDIX VIII Cont.

GROUP HSO

QUESTION 1

SLIDE	MEAN	S.D.	SLIDE	MEAN	S.D.
1	5.95	1.27	26	4.47	1.95
2	3.84	1.64	27	5.05	1.99
3	5.58	1.89	28	3.84	1.77
4	5.63	2.22	29	5.32	1.70
5	3.47	1.61	30	3.95	1.68
6	2.84	1.42	31	3.32	1.95
7	3.74	1.52	32	3.74	1.79
8	5.89	1.59	33	4.68	1.63
9	5.42	2.12	34	3.11	1.82
10	3.00	1.53	35	3.16	1.54
11	4.63	2.11	36	3.94	1.52
12	3.11	1.73	37	5.74	2.16
13	1.79	1.08	38	2.28	1.45
14	4.53	1.81	39	5.42	2.52
15	6.05	1.78	40	4.84	1.89
16	5.42	2.09	41	3.89	2.16
17	4.21	1.32	42	3.32	1.86
18	5.16	2.01	43	3.11	1.85
19	4.63	1.98	44	3.58	1.68
20	3.16	1.42	45	3.79	2.12
21	4.74	1.66	46	3.72	2.40
22	2.89	1.59	47	3.58	1.71
23	4.58	1.87	48	1.74	1.28
24	3.00	1.49	49	3.47	1.78
25	6.42	1.80	50	5.84	1.71

APPENDIX VIII Cont.

GROUP HSO

QUESTION 3

SLIDE	MEAN	S.D.	SLIDE	MEAN	S.D.
1	2.58	1.17	26	2.74	1.10
2	3.53	1.12	27	4.11	1.20
3	2.16	.90	28	4.05	1.08
4	3.05	1.35	29	3.42	1.22
5	4.84	1.26	30	3.37	1.07
6	3.89	1.49	31	5.21	1.32
7	4.16	1.61	32	3.33	1.46
8	3.89	.99	33	2.84	1.30
9	2.32	1.16	34	3.68	1.45
10	5.37	1.30	35	5.11	1.29
11	2.47	1.12	36	3.00	1.08
12	3.61	1.61	37	2.63	1.34
13	4.94	.24	38	4.68	1.42
14	2.95	1.39	39	3.42	1.61
15	3.11	1.33	40	2.84	1.30
16	2.53	1.43	41	3.63	1.46
17	4.89	1.10	42	5.26	1.05
18	2.68	1.11	43	4.79	1.36
19	4.47	1.17	44	3.53	1.61
20	3.84	1.42	45	2.84	1.34
21	4.00	1.33	46	4.89	1.24
22	4.89	1.37	47	5.32	1.11
23	2.53	1.17	48	5.74	1.15
24	3.84	1.26	49	4.42	1.26
25	2.32	1.16	50	3.16	1.64

APPENDIX VIII Cont.

GROUP HS

QUESTION 1

SLIDE	MEAN	S.D.	SLIDE	MEAN	S.D.
1	5.41	1.33	26	5.41	1.66
2	4.35	1.37	27	4.94	1.48
3	5.53	1.23	28	4.00	1.50
4	5.53	1.18	29	5.71	1.49
5	3.65	.93	30	4.13	1.45
6	3.94	.97	31	4.19	1.56
7	3.88	1.05	32	4.71	1.72
8	6.53	1.12	33	4.94	1.78
9	5.88	2.09	34	4.71	1.83
10	3.18	1.78	35	3.71	1.21
11	5.12	1.96	36	4.65	2.15
12	3.82	1.70	37	5.47	2.48
13	2.12	1.27	38	3.00	1.70
14	5.06	1.68	39	5.24	2.25
15	5.76	1.99	40	4.56	1.79
16	5.35	1.93	41	4.18	1.59
17	4.65	1.39	42	3.88	1.96
18	5.47	1.50	43	3.29	1.40
19	4.94	1.25	44	3.88	1.41
20	4.00	1.32	45	3.82	1.47
21	5.24	1.79	46	4.24	2.02
22	3.76	1.60	47	3.65	1.50
23	4.94	1.44	48	2.18	1.07
24	4.24	1.03	49	4.29	1.93
25	5.47	1.91	50	5.47	2.15

APPENDIX VIII Cont.

GROUP HS

QUESTION 3

SLIDE	MEAN	S.D.	SLIDE	MEAN	S.D.
1	2.76	1.25	26	2.59	1.28
2	2.65	1.41	27	4.06	1.68
3	2.59	1.23	28	4.53	1.01
4	2.53	1.33	29	3.14	1.30
5	4.41	1.06	30	3.38	1.36
6	3.53	1.12	31	5.12	1.05
7	4.06	1.34	32	2.71	1.40
8	2.06	1.20	33	3.82	1.13
9	2.47	1.23	34	4.12	1.50
10	4.94	1.48	35	4.82	1.13
11	2.24	.90	36	2.71	1.53
12	3.71	1.40	37	1.94	.90
13	5.76	.56	38	5.12	.93
14	2.59	1.28	39	3.41	1.70
15	2.53	1.28	40	3.18	1.33
16	2.65	1.00	41	3.41	1.58
17	4.18	1.47	42	5.18	1.29
18	2.71	1.21	43	4.12	2.03
19	4.18	1.24	44	3.76	1.52
20	2.59	1.42	45	2.76	1.03
21	3.53	1.50	46	3.88	1.54
22	4.82	.92	47	4.88	.99
23	3.00	1.37	48	5.53	.62
24	3.53	1.59	49	4.18	1.01
25	2.65	1.37	50	3.12	1.62

APPENDIX IX

MEAN RESPONSE TIMES (SECONDS PER SLIDE) FOR EACH RATER BY GROUP

RATER	HS	HSO	DS	GP	O
1. Mean	17.31	14.31	19.84	25.49	17.03
S.D.	5.01	5.54	4.80	8.44	6.23
2. Mean	16.41	14.43	19.59	30.06	22.50
S.D.	5.30	4.30	5.57	11.52	7.72
3. Mean	14.31	20.31	23.17	19165	19.27
S.D.	4.39	7.22	6.87	7.26	5.94
4. Mean	21.49	14.63	21.47	25.80	22.42
S.D.	7.78	3.81	6.28	10.26	8.04
5. Mean	11.63	15.33	29.31	26.00	26.45
S.D.	3.67	4.36	8.23	6.10	10.68
6. Mean	12.49	19.59	24.20	29.47	25.66
S.D.	3.29	5.91	9.22	10.42	7.24
7. Mean	16.35	19.51	24.39	37.08	40.06
S.D.	4.82	7.67	9.44	12.60	12.62
8. Mean	16.12	21.82	20.49	30.53	41.73
S.D.	4.34	6.16	6.21	9.21	10.37
9. Mean	20.04	19.33	24.57	19.37	35.63
S.D.	6.58	5.55	6.67	4.61	15.75
10. Mean	21.78	17.06	21.92	25.49	35.55
S.D.	7.23	4.46	6.42	9.39	19.20
11. Mean	11.20	12.85	23.24	33.10	36.53
S.D.	4.50	4.38	6.49	13.61	8.22
12. Mean	15.49	16.44	27.43	30.29	16.24
S.D.	5.77	4.96	8.98	13.11	6.58
13. Mean	15.96	14.55	22.65	21.22	35.29
S.D.	5.20	4.08	9.59	6.56	13.17
14. Mean	15.76	17.67	31.80	23.16	43.04
S.D.	5.36	5.02	8.60	11.59	11.53
15. Mean	20.16	21.10	30.27	19.96	27.80
S.D.	5.73	7.00	8.32	6.56	9.26
16. Mean	24.51	14.96	27.37	31.92	18.41
S.D.	8.25	5.16	8.15	12.19	5.02
17. Mean	16.14	15.20	24.33	23.29	26.43
S.D.	3.18	4.82	6.52	8.70	8.91
18. Mean	--	18.94	26.18	25.18	--
S.D.		4.07	7.47	9.44	
19. Mean	--	20.51	36.59	43.51	--
S.D.		4.40	10.71	14.90	
20. Mean	--	--	23.37	25.35	--
S.D.			7.16	9.71	

APPENDIX X

CORRECTED* FREQUENCIES (f) FOR EACH FEATURE IN QUESTIONS 2 AND 4 BY GROUP

FEATURE	GROUP				
QUESTION 2	HS	HSO	DS	GP	O
EYES	229	195	251	271	241
NOSE	236	281	313	257	253
MOUTH (LIPS)	354	289	412	450	507
TEETH	269	232	260	287	248
CHIN	178	232	356	423	407
JAW(S)	222	154	224	216	216
CHEEKS	195	217	216	165	91
NONE IN PARTICULAR	173	140	101	97	64
QUESTION 4					
MOUTH	361	319	305	422	455
TEETH	354	350	341	407	345
CHIN	251	324	358	422	284
JAW(S)	323	243	260	254	169
NOSE	77	102	27	60	4

*HS, HSO, O groups corrected to n = 20.