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# Formulation and Administration of an Attitude Scale for Orthodontic Patients

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FORMULATION AND ADMINISTRATION OF AN  
ATTITUDE SCALE FOR ORTHODONTIC  
PATIENTS

BY

MICHAEL F. GANNON

A Thesis Submitted to the Faculty of the Graduate School  
of Loyola University in Partial Fulfillment of  
the Requirements for the Degree of  
Master of Science

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1964

LOYOLA UNIVERSITY MEDICAL CENTER

## LIFE

Michael F. Gannon was born in Eau Claire, Wisconsin on December 31, 1934. He graduated from Washington High School in Rice Lake, Wisconsin in June, 1952.

He took his pre-dental studies at the University of Marquette in Milwaukee and completed his pre-dental work in June, 1955.

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From 1959 to 1960, he served as a surgery intern at Tripler Army Hospital in Oahu, Hawaii. He then served two years in the U. S. Army Corps after which he began his graduate studies at Loyola University, Chicago in 1962.

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## CHAPTER I

### INTRODUCTION AND STATEMENT OF THE PROBLEM

#### A. Introductory Remarks:

Orthodontics has had an interesting history. Beginning as a mechanical art, it has forged its way through clinical and biologic research to a highly specialized scientific discipline of biophysics. Treatment objectives and methods have advanced rapidly to a point where the appliance should no longer dominate the scene as it once did. Among some of the problems still needing solution is the one dealing with patient cooperation. Past and present experiences with children suggest that one of the major considerations for orthodontic success is the patient's attitude toward treatment, and the manner in which they fulfill their duties. Since the subject of patient cooperation is comparatively new in orthodontic research, it might be well to define it before any attempt is made to discuss its assessment.

Orthodontic cooperation may be defined as a multi-function discipline. The multiple functions are: meticulous hygiene, the wearing of rubber bands attached to the appliances for specifically prescribed periods of time, and the wearing of headgears attached

to the appliances for discrete forces which can only be fulfilled by these force systems.

Failure of the child patient to fulfill this discipline in its entirety deprives the orthodontists of those forces necessary to correct the malocclusion. Since the correction of the malocclusion is predicated on the wearing of the various force producing devices mentioned above, their fullest measure of usage will bring treatment to an early successful termination. Apathy causes treatment to drag on for years, often at the expense of much destruction to tooth material through decay.

The fullest measure of cooperation is usually dependent on motivation. What motivates some people while others remain unmotivated has been a subject of extensive psychological research in education, in industry, and in business.

This research was designed to ascertain what motivates some children to lend the fullest measure of cooperation to the orthodontist and to determine what deters others from cooperation. These are important considerations which should be ascertained before treatment begins if early success is anticipated, and they should serve as rapport between the child and the orthodontist when treatment is begun.

Cooperation has been defined, certain statements have been made about motivation, and we are now in position to discuss attitudes which are in reality the underlying factors influencing cooperation and motivation. By definition an attitude is the sum total of an individual's beliefs, feelings, and actions toward any animate or inanimate object. In order to accomplish this assessment of attitudes certain psychological tools are needed. These are charts, questionnaires and histories.

#### **B. Statement of the Problem:**

The purpose of this study was to assess patient attitudes toward orthodontic treatment by applying known psychological disciplines. This involves the formulation of specific questionnaires appropriate to the subject at hand the the administration of this scale (see Glossary) with the intent of establishing descriptive norms.

To fulfill these objectives an attitude scale was designed for the purpose of measuring three specific areas of the patient's attitude to treatment. They are as follows:

1. strength of desire for orthodontic treatment
2. willingness to tolerate the social impediments involved during treatment, and
3. the minor discomforts coincident with orthodontic

treatment.

In addition the patients were also questioned to gain insight into some of the reasons for wanting treatment, what benefits the child expects to receive from orthodontic treatment, and some factors influencing the desire for wanting orthodontic treatment. Social history data were also gathered.

## CHAPTER II

### REVIEW OF THE LITERATURE

Since the literature on this subject is extensive, it is necessary for purposes of lucidity to limit it to two discrete areas. The first will deal with the dental literature pertinent to this subject, while the second will concern itself with psychological techniques used in assessing attitudes.

#### A. Review of Related Dental Literature:

In the review of early dental literature some efforts were made to study the influence of attitudes toward cooperation and motivation. Efforts to quantitate attitude were lacking in these early observations.

Rogers (1921) was among the first to recognize the relation of attitude to co-operation and motivation. His was an observation which was not put to scientific test. He stated that one of the first duties of an orthodontist is to learn the mental attitudes of the child. When these were found to be unfavorable, successful results could not be attained.

Similar observations were reported by Wile (1929) who found that patient attitude toward dental treatment is closely related to patient

cooperation. He found that patients with positive attitudes to treatment were more responsive than those possessing negative attitudes.

According to Richardson (1936), fear was the most important psychological factor determining favorable or unfavorable attitudes of patients toward dentistry. In his opinion, individuals possessing favorable attitudes to dentistry did not fear the ministrations associated with treatment.

Ryan (1946, p. 30) stated that the emotional reactions of the dental patient "which militate against effective treatment are best conceived as functions of patient attitude". Furthermore he stated that existing dental attitudes are determined by previous experiences to dentistry.

Only seven scientifically disciplined studies have been done on patient attitude to dental care. Shoben and Borland (1954) were the first to report on their method of assessing patient attitude toward dentistry. They studied the relationship of pain tolerance and traumatic experiences to dental attitude. They observed that parent-to-child attitudes and personality had direct influence on dental attitudes. Their study employed the open-end interview (see Glossary) technique on a sample of thirty patients. They concluded that the

attitudes and experiences of other members in the family unit to dentistry seemed to be the most important factor in determining whether an individual will cooperate and accept dental treatment procedures.

The American Dental Association (1958) conducted a social psychological study on the attitudes of 126 people attempting to assess their attitudes toward dental care. This study revealed that each social class possesses a different set of standards concerning attitudes toward dental care. The most favorable attitudes were found in the upper middle class and lower middle class because "they take a long range view of life and want to feel prepared, to know how to prevent, or at least to deter for as long as possible, the unavoidable; aging, disease, decay, death." Unfavorable dental attitudes were found in the upper lower class and the lower lower class because "their life is oriented around the present, they seek immediate gratifications and fulfillment of (often monetary) wants, and do not always or completely accept the values of the major cultural group."

In this investigation a study of attitudes toward orthodontic care was undertaken. It was concluded that individuals associated straightened teeth with the higher social status. On the other hand,



such dental deformities as "buck teeth" and "crooked teeth" are found most frequently in the lower social strata because of financial inability to afford these services.

Freidson, Eliot and Feldman (1958) concurred with the earlier findings of Richardson. Using a sample of 2,000 individuals of various ages, they concluded that fear is the most important factor causing negative attitudes to dental care.

Gablum and Kegeles (unpublished, 1959) investigated patient cooperation and its effects on orthodontic treatment. The sample included thirty-five children undergoing active orthodontic treatment. Their findings pointed to the fact that those patients with strongly motivated desires for orthodontic care cooperated well even though treatment was uncomfortable. They observed positive correlation between patient desire for the service and the level of cooperation.

In his investigation of why people seek dental care, Kegeles (1961) found favorable attitudes toward dental treatment in certain segments of the population (high social class, women, and individuals over six and under forty years of age). The lower social classes, men, and older people (forty years of age and older) demonstrated less favorable attitudes toward dentistry.

Nelson and Lester (1962) published the first attitude scale formulated to measure attitudes of children to dentistry. The age range of the subjects was seven to twelve years. Employing projective technique (sentence completion, word association) and multiple choice questions, they measured the attitudes of 360 children. Their conclusions were similar to those of the American Dental Association study. They also found a positive correlation between socio-economic status and dental attitude, concluding that the most favorable attitudes are found in the higher social economic group.

In an unpublished work, Nelson and Lester (1962) studied the relationship between the score received on a "dental attitude test" and oral hygiene of dental patients. They found that individuals possessing poor dental attitudes also had poor oral hygiene. The opposite was true when the dental attitudes were found to be favorable.

In the recent article dealing with patient attitudes toward dental care, Kegeles (1963) interviewing 430 employees of a corporation found such variables as income, education, and position were significantly related to dental attitudes. Individuals with incomes over \$6,000 having a high school education or more, and a rank of foreman or higher, all had more favorable dental attitudes than those falling

below this scale. Attitudes toward dental care were influenced by such variables as anxiety, pain tolerance and esthetics.

#### B. Review of Psychological Methods of Attitude Assessment:

The concept of attitude has been a matter of concern to social scientists for at least a century. Defoe (1720), the author of Robinson Crusoe, was among the first to recognize the importance of attitude. He stated that a person's feeling toward any person, place, or thing was largely influenced by the posture (attitude) of the mind. He pointed out that behavior is largely influenced by these postures.

Spencer was among the first psychologists to employ the term attitude. In his First Principles (1862) he stated that an individual's judgment regarding disputed controversies is predicated by the attitudes of the mind.

Similarly Bain (1868) observed that existing attitudes of an individual precondition behavior, ideas, and actions toward any object to such an extent that conflicting attitudes of another individual are not entertained.

Lange (1888) was given credit for being the first to recognize attitudes within the domain of experimental psychology. Investigating

the reaction time of thirty individuals, he observed that a subject who was consciously prepared to press a telegraph key immediately upon receiving a signal reacted more quickly than did one whose attention was not directed mainly to the incoming stimulus, and whose consciousness was not directed upon the expected reaction.

After Lange's work the concept of attitude has influenced nearly all psychological experiments. Experiments investigating perception, recall, judgment, or thought have had to control the variable of attitude. An example of such an investigation was to have subjects perform simple tasks with the intent of learning and to have some others perform the same tasks without the intent to learn. The experimenter then compares the amount of learning of the two groups.

Bogardus (1925) was the first to design an attitude scale formulated to measure and compare attitudes toward race, occupation, and religion. His "social distance scale" (see Glossary) was made up of sixty statements selected a priori to elicit responses which would assess the subject's degree of acceptance or rejection of an object. He concluded that it was possible to compare the attitude of various groups toward the same race, occupation, and religion or to compare a single attitude of an individual toward various races, occupations, and religion.

The work of Thurstone provided a theoretical basis for the measurement of attitudes. Thurstone (1927a; 1927b) published two important articles in which he developed a "law of comparative judgment". The statement of this law provided a rational method for placing attitudes toward any object on a psychological continuum.

In 1928 he devised the method of "equal-appearing intervals" (see Glossary). This method is much less time consuming than the older method of paired comparisons. Thurstone (1929, 1931) and Thurstone and Chave (1929) published a number of "equal-appearing intervals" scales measuring attitudes toward war, the church, capital punishment, evolution, and the Negro. From these studies they concluded that this method of assessment was a highly reliable and valid way of obtaining an index that would differentiate between attitudes of individuals. The measurement of attitudes now had a rational basis and a practical technique.

A different approach to the scaling of attitudes was developed by Likert (1932) in his study of various attitudes toward imperialism, internationalism, and the Negro. His method of "summated ratings" (see Glossary) was found to be a more simple approach to the scaling of attitudes than the Thurstone method of "equal-appearing intervals".

He found that scores obtained by his technique agreed closely with the scores obtained by the Thurstone method.

Likert, Roslow, and Murphy (1938) studied the possible advantage of the Likert scoring system by administering ten Thurstone and ten Likert scales to several groups. They found the reliability coefficients were higher when the scoring was done by the Likert method rather than by the Thurstone method.

Following these developments, many studies were done on attitudes toward politics, consumer products, races, religions, etc. On the theoretical side, authors have considered the problems of dimensionality and the use of projective techniques.

The problems of multidimensional scaling were studied by Guttman. Guttman (1944) formulated a new approach to scaling. The purpose of his study was to submit a rational scheme based on matrix algebra, for selecting items to measure any type of psychological trait. He found that using this "cumulative scale" (see Glossary) greater reproducibility was attained and the scale was said to constitute a unidimensional scale, that is, it will measure only one dimension of attitude.

Edwards and Kilpatrick (1948) developed the "scale-discrimination

technique" (see Glossary) incorporating Thurstone's technique of sorting the items, Likert's method of scoring the items and Guttman's technique of cumulative scaling. They stated that by synthesizing the methods of scale construction developed by Thurstone, Likert and Guttman, a more reliable and valid scale of measuring attitudes would result. They pointed out, however, that this approach has not yet been sufficiently tested to determine its strengths and weaknesses.

Several authors have also used projective techniques (see Glossary). For example, Hammond (1948) developed the "error-choice" (see Glossary) technique to measure attitudes toward labor-management. He forced subjects to choose between two alternate answers to twenty questions, each of which was made equally wrong, but in the opposite directions from the correct answer. He administered the test to a labor union group and to businessmen and found that the test differentiated the labor union group from the business group with respect to attitudes toward labor management.

Seeman (1958) used a projective technique to measure attitudes of a mixed color population of college students toward the mores of the Negro population. This technique consisted of a number of brief descriptions of the relations between the sexes in such problems as

premarital and extramarital sexual intercourse and divorce. In one half of the test forms, each item was accompanied by a picture of a white couple; in the other one half, by a picture of a Negro couple. One half of the sample of white college students was given the Negro form; the remaining half, the white form. He found that highly prejudiced subjects tended to make different moral judgments for Negroes than for whites; this indicated an unfavorable attitude toward the Negro.

Burwen, Campbell and Kidd (1957) used a sentence completion technique to assess attitudes of a group of college students toward superiors. They found the sentence completion method to be highly reliable and valid in the assessment of attitude. They also pointed out that unresolved problems in the use of such a technique remain to be worked out.



## CHAPTER III

### DESIGN OF THE RESEARCH INSTRUMENT

In the present study, the term attitude is defined as "the degree of positive or negative affect associated with some psychological object" (Thurstone, 1946, p. 46). The psychological object of interest in this study is orthodontic treatment.

#### A. Construction of the Attitude Scale:

An attitude scale consists of a number of items. These may be in the form of questions or statements. An item universe is defined as all possible statements that can be made about a psychological object. Since it is not practical to attempt to ask all possible questions about an object, an attitude scale consists of a sample of items about some psychological object-universe. The items should be a representative sample of the object-universe involved (Edwards, 1957). That is, ideally, all types of possible statements about the object should be represented. For practical purposes, this ideal solution is rarely possible. The present study, therefore, was limited to items sampling four areas: reasons for wanting treatment, strength of

desire for treatment, willingness to tolerate social impediments involved in treatment, and degree of discomfort anticipated during treatment.

#### 1. Collection of Items:

Possible scale items may be found by searching the literature concerning the psychological object, or by questioning subjects about the psychological object. The person constructing the scale may also invent statements that seem to be relevant to the psychological object. This "intuitive" approach is the easiest method. However, it has received much criticism (McNemar, 1946). For example, it would be very easy for an adult (orthodontist) to completely overlook things that a child would consider important. Hence, statements in the literature and interviews with former orthodontic patients were emphasized.

##### a) Information Derived from Literature Review:

The literature dealing with various psychological aspects of dentistry was searched for statements which could be used in the present study. Campisi (1963) and Cavanaugh (1963) studying the relationship of truthfulness to cooperation supplied some questions dealing with desire for orthodontic attention, with willingness to tolerate

social impediments and with discomforts associated with treatment. The reports of Schour (1953), Ward (1953), Edwards (1950), Towill (1959), A. S. Ash (1950), and Walker (1941), were consulted. The studies of dental attitudes by the American Dental Association (1958) and by Nelson and Lester (1962) were especially helpful. The reviews of the literature produced a list of thirty-five possible items to be used in the attitude scale.

b) Semi-structured Interview:

A semi-structured interview (see Glossary) is a method which other investigators have used successfully in previous studies (Thurstone and Chave, 1929; Likert, 1932; Webb and Kobler, 1962; and Klett, 1963). The interviewer attempted to get some comments about these four areas: reasons for wanting treatment, strength of desire for treatment, willingness to tolerate social impediments involved in treatment, and degree of discomfort anticipated during treatment. However, the subject was allowed to use his (her) own words, and was also encouraged to make comments about other aspects of orthodontic treatment.

The semi-structured interview was utilized to obtain scale items.

Twenty-one orthodontic patients currently in treatment were interviewed. Nine were patients in retention for a period of three months to two years. Both cooperative and non-cooperative patients were represented.

Each subject was interviewed individually and privately. The patients were assured that the source of statements would not be identified. The procedure followed by the interviewer was to suggest a general topic and permit the individual to express his or her opinion. This was followed by some specific questions. For example a question such as, "How do you feel about orthodontics?", was followed by a more specific question such as, "Do you think it is worth going through all the treatment procedures in order to have your teeth straightened?" The respondents' answers were recorded. See Appendix I for general format and topics discussed during the interview.

The analysis of the interview data revealed a considerable variation in the quality of responses. Not all patients interviewed expressed definite opinions regarding the four topics discussed. The responses were grouped according to similarity of content in order to select those responses which were most representative of each topic discussed. The interviews yielded a list of forty-one potential questions.

**c) Intuitive Method:**

Using this method, forty potential items were "created" by the author of the scale.

**2. Final Selection of Items:**

One hundred and sixteen items from the preliminary study were assembled, classified, and analyzed. Each item was in the form of five alternate choices printed under a question. These items were sorted into four sections.

Since no clear cut items were found designed to elicit responses regarding the reasons for wanting orthodontic treatment, benefits expected to be derived from treatment, and the salience of orthodontic treatment, no scale could be formulated. An exploratory study was deemed necessary before a scale could be developed to measure these variables. For this purpose twenty-one items were inserted into a separate section of the questionnaire. This is Section IV, of the questionnaire (see Appendix II).

The attitude scale was divided into three subscales. Section I contained thirty-two items pertaining to the strength of desire for orthodontic treatment, Section II contained twenty-eight items measuring

willingness to tolerate social impediments, Section III contained twenty items measuring the degree of discomfort anticipated during orthodontic treatment (see Appendix II).

The subscale items were edited in order to shorten questions and to substitute familiar words for abstract terms or ideas. Whenever possible, the exact words expressed by the patients were used. The items were then reviewed according to the criteria advocated by Thurstone and Chave (1929), Likert (1932) and Bird (1940). These criteria were summarized by Edwards (1957, p. 13-14). They are given below:

- (1) Avoid statements that refer to the past rather than to the present.
- (2) Avoid statements that are factual or capable of being interpreted as factual.
- (3) Avoid statements that may be interpreted in more than one way.
- (4) Avoid statements that are irrelevant to the psychological object under consideration.
- (5) Avoid statements that are likely to be endorsed by almost everyone or by almost no one.

- (6) Select statements that are believed to cover the entire range of the affective scale of interest.
- (7) Keep the language of the statement clear, simple, and direct.
- (8) Statements should be short, rarely exceeding twenty words.
- (9) Each statement should contain only one complete thought.
- (10) Statements containing universals such as "all", "always", "none", and "never" often introduce ambiguity and should be avoided.
- (11) Words such as "only", "just", "merely", and others of a similar nature should be used with care and moderation in writing statements.
- (12) Whenever possible statements should be in the form of a simple sentence rather than in the form of a compound or complex sentence.
- (13) Avoid the use of words that may not be understood by those who are to be given the completed scale.
- (14) Avoid the use of double negatives.

The editorial review of the scale items reduced the number to sixty-five. The items were then submitted to one psychologist and six orthodontists to evaluate the clarity and relevance of the items. Also, they were asked to evaluate each item in Sections I, II, and III of the questionnaire in terms of whether a strong endorsement of the statement would reflect favorable or unfavorable attitudes toward orthodontic treatment. A criterion of 100 percent agreement on the favorableness of the statement was established in order to reduce ambiguity. Six more items were eliminated.

### 3. Scoring the Items:

Having collected, classified, and edited the items, the next procedure followed was to score or weight the items in the three subscales. The procedure followed was to assign a score of five to the most favorable response to a question and a score of one to the least favorable response (see Appendix IV). Responses were weighted so that the individual selecting the most favorable category would receive the highest score for any one item. In the same manner, the individual selecting the most unfavorable category would receive the lowest score. For example, in asking the question, "Will you be embarrassed to wear



your forehead strap in front of your friends?", the responses are scored the following way: The "extremely unembarrassed" response received a weight of five, the "unembarrassed" response was weighted four, the "undecided" response received a weight of three, the "embarrassed" response received a weight of two, and the "extremely embarrassed" response received a weight of one.

#### 4. Pretest:

A preliminary attitude scale consisting of fifty-nine items was prepared and administered to ten orthodontic patients undergoing treatment. The purpose of this pretest was to correct or eliminate statements that confused the subjects. The subjects were given specific instructions to criticize and clearly mark the items that were not easily understood. Those statements which were not clear were eliminated or revised. The analysis of the pretest questions reduced the total number of scale items to fifty-four. At this time instructions for the scale were clarified and the form of the presentation was decided upon. This constituted the final refinement of the scale.

#### 5. Final Construction:

The final questionnaire of seventy-five items was divided into

four sections. Sections I, II, and III, which made up the attitude scale, contained fifty-four items. Twenty-two items in Section I were employed to assess the desire variable. Section II contained twenty items to measure the social impediment variable. In Section III twelve items were employed to measure the discomfort variable.

Section IV contained twenty-one items. This section contained items pertaining to the reasons for wanting orthodontic treatment, what benefits the child expects to receive from orthodontic treatment, and factors influencing a desire for wanting orthodontic treatment.

The final questionnaire was mimeographed on eleven separate pages. The pages were stapled together in sequence (see Appendix II).

#### 6. Reliability:

The preceding paragraphs were devoted to the design and administration of the psychological instrument. It is important to know how well this instrument performed the function for which it was designed. In order to fulfill this objective the reliability of the scale was studied by the test-retest method.

There is some degree of error in all measurements. The extent of error may be estimated in various ways. One method of

determining this degree of error, or reliability, is by readministering the same questionnaire to the same group of respondents on two separate occasions. The correlation between these scores is called the test-retest reliability or the coefficient of stability (Green, 1954, p. 338).

A coefficient of stability was obtained by administering the Orthodontic Attitude Scale (see Glossary) to sixty-three orthodontic patients on two separate occasions. Initially there were seventy-five patients in this group who completed the questionnaire form. Twelve patients were not available at the time of the second administration of the scale. The pretest was administered, avoiding any indication that there would be a retest. The group was retested two weeks later under similar testing conditions. The two sets of obtained scores were correlated by the Pearson product-moment method of correlation for grouped data.

## 7. Validity:

An important consideration in any measurement technique is its validity, that is, the extent the scale measures what it purports to measure. Validity in an attitude scale can be determined in several

ways. For purposes of this study, the validity is simply content validity. That is, in the opinion of "experts" the items of the scales assess the attitudes under study. The opinions of one psychologist and six orthodontists were used. The criterion was 100% agreement.

#### B. Subjects:

The patients used in the study were selected from the Orthodontic Department of Loyola University School of Dentistry. The distribution of group by age, sex, race and social class is presented in Tables I, II, III, and IV.

Patients wanting orthodontic treatment at Loyola's Orthodontic Clinic are first seen by the admitting orthodontist of the clinic. If the malocclusion presents an excellent teaching possibility, the patient is tentatively accepted and placed on a waiting list for a period of one to two years. Just prior to active treatment, in addition to the preliminary patient examination, the department head interviews the parent and the child before final acceptance. Those patients who indicate negative attitudes toward treatment or who show promise of being uncooperative are not accepted for treatment. The seventy-five patients used in this study received final acceptance for orthodontic

TABLE I  
DISTRIBUTION OF THE SUBJECTS BY AGE\*

	Range	Mode	Median	Mean
Total sample (n-75)	10-18	12	12.3	12.3
Males	11-16	11	12.5	12.8
Females	10-18	13	12.2	12.1

\*Age in years

TABLE II  
DISTRIBUTION OF THE SUBJECTS BY SEX

	Frequency (n-75)	Percent
Males	36	48
Females	39	52

TABLE III  
DISTRIBUTION OF SUBJECTS BY RACE

	Frequency (n-75)	Percent
Caucasion	67	89
Negro	8	11

TABLE IV  
DISTRIBUTION OF THE SUBJECTS BY SOCIAL CLASS

	Frequency (n-75)	Percent
Upper	0	0
Upper Middle	5	6
Middle	15	20
Lower Middle	38	51
Lower	17	23

treatment before the scale was administered.

### C. Administration:

The refined scale (described in the "Final Construction") was administered to seventy-five patients individually and privately. Group administration was avoided because of the age group of these subjects and the difficulties of getting good patient rapport. The scale was administered in a conference room at Loyola's Dental School. The mother of each patient was requested to be present during the administration of the scale for the purpose of filling out a social history (Appendix III). The child and mother were seated at opposite ends of a table with the interviewer situated between the two respondents.

Both the mother and child were informed that these questionnaires were part of an orthodontic research project, the purpose of which was to discover the child's beliefs or feelings toward orthodontics before treatment was started. Considerable attention was given to gain good rapport with the child. It was emphasized that the interviewer needed and wanted that information which only the respondent could give. Also, he or she should not be ashamed or afraid of answering the questions

wrongly or foolishly. The value of knowing what the patient honestly thought about orthodontics was stressed. Statements referring to accuracy and honesty in answering the questions were repeated several times throughout the interview. The subjects were informed that responses to the scale would be reported in a statistical form only. The patients were requested to sign their name, but were assured confidential treatment of the results. In all cases, appropriate appreciation was rendered to the mother and patient for their cooperation.

Because of the specialized nature of the subject matter, it was necessary to familiarize the child with some of the orthodontic treatment procedures and appliances. During this introductory period, the nature of some appliances, such as, "elastics", "rubber bands", "brackets and bands", and "headgears" was explained. Charts and pictures were found to be helpful aids in fulfilling this objective. See Figure I and Figure II. Invariably, at the conclusion of the introductory remarks, both the mother and the child had many questions about orthodontic treatment. Care was taken when answering questions so as not to influence or change the existing attitude toward the variables under consideration. The interviewer tactfully avoided



answering questions which would directly precondition the child's attitude toward orthodontics.

The mother and child were then given their respective questionnaires. The instructions for the questionnaires are in Appendix II. The subjects were instructed to take as much time as they needed to complete the questionnaire. The respondents were invited to make any verbal or written comments regarding their questionnaires. Any questions or problems which arose while answering the items were directed to the interviewer. The usual time consumed to complete the questionnaire ranged from thirty to forty-five minutes.



FOREHEAD STRAP



NECK STRAP

FIGURE I

ILLUSTRATION OF HEADGEARS

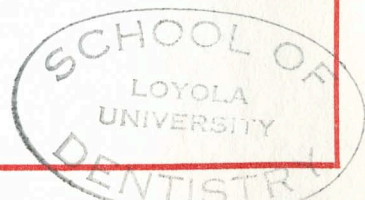




FIGURE II

ILLUSTRATION OF THE BANDS, ELASTICS AND ARCH WIRES

## CHAPTER IV

### RESULTS

For the purpose of clarity the findings are presented in three main sections. The first section will contain the results of the test-retest coefficient of reliability. The second section will be devoted to the results of the attitude scale. The third main section will present data obtained from Section IV of the questionnaire pertaining to benefits, reasons, and factors influencing a desire for wanting orthodontic treatment.

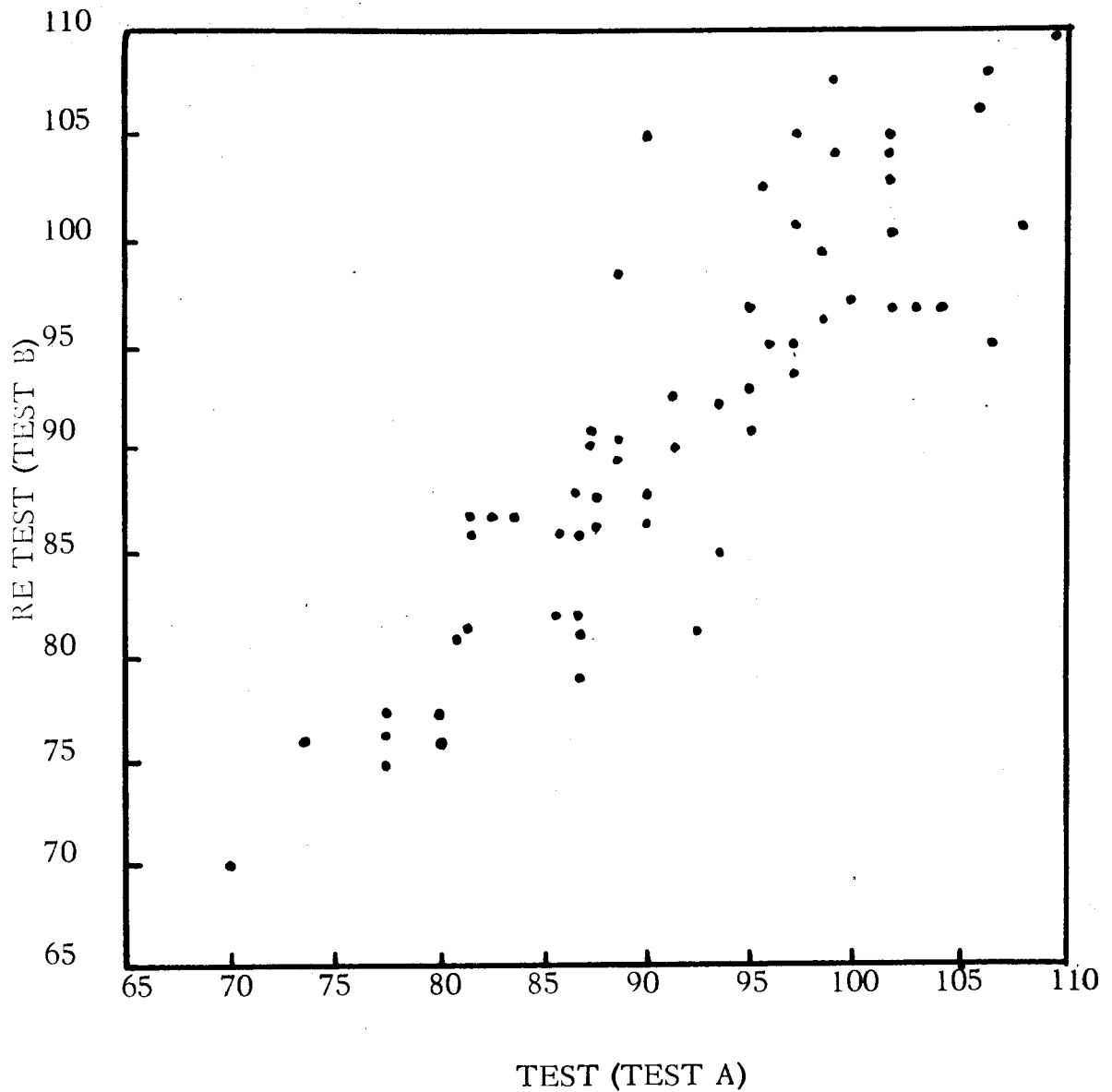
#### A. Reliability:

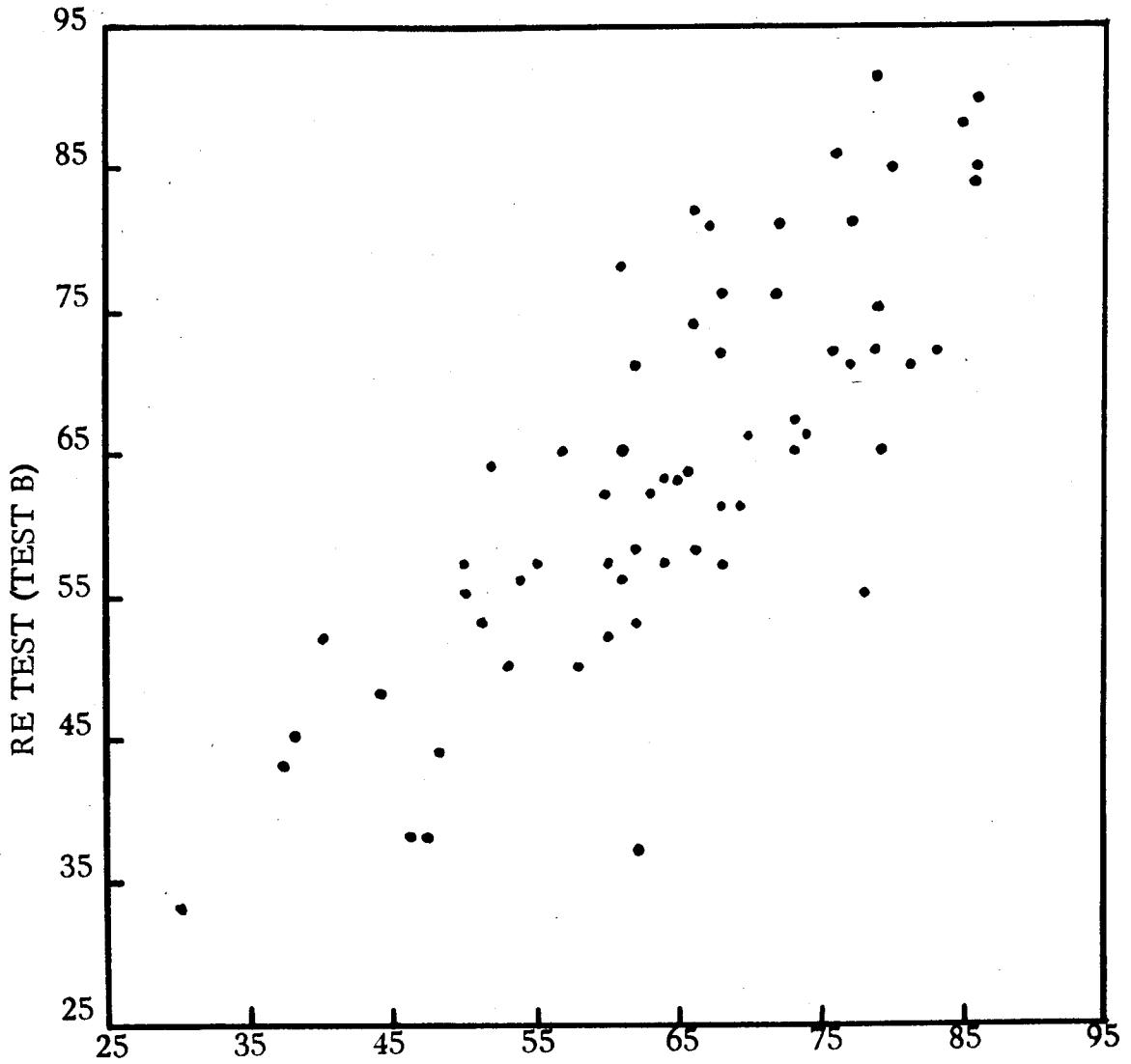
The term reliability as used in this study is defined as the extent to which the attitude subscales yield consistent measures (Krech, 1962, p. 157). Ferguson (1939) quotes Thurstone as reporting the reliabilities of attitude scales constructed under his direction as being "all over .80, most of them being over .90". Ferguson obtained reliability coefficients ranging from .52 to .80 for twenty item scales and from .68 to .89 for forty item scales. The reliabilities of the Likert and Murphy (1938) scales ranged from .90 to .92. Garrett (1953, p. 338)

pointed out that a reliability coefficient of .90 should be sought if the scale is intended to differentiate individuals. He pointed out that reliability coefficients as low as .50 are sufficient if the purpose of the scales is merely to distinguish between the means of a group of subjects.

A coefficient of stability was obtained by administering the attitude scale to sixty-three individuals on two separate occasions and correlating the scores. There was an interval of approximately two weeks between administrations of the scale. Pearson product-moment correlation coefficients were computed. Reliability coefficients on the three subscales were as follows: .91 on the desire subscale containing twenty-two items, .82 on the social impediment subscale containing twenty items, and .71 on the discomfort subscale containing twelve items. The bi-variate distributions of the scores are shown in Figures 3, 4, and 5. The result of the desire subscale indicates that the scores are extremely stable over a two week period.

If this scale would be utilized as a criterion in patient selection before treatment began, the desire scale could be employed in its present form. However, to meet Garrett's standard, higher

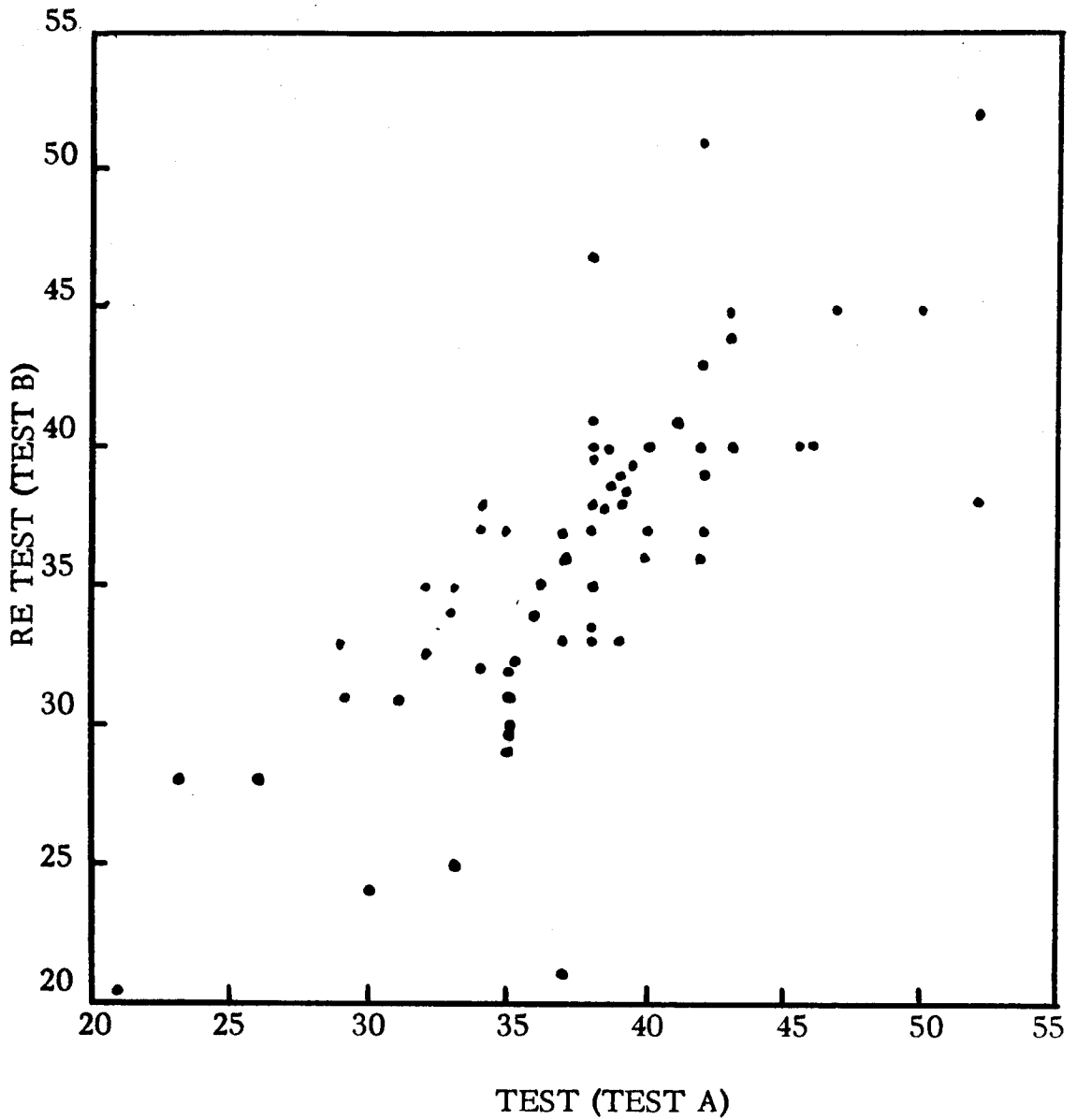
**FIGURE 3****COEFFICIENT OF STABILITY ON SUBSCALE DESIRE** **$r = .91$**



TEST (TEST A)  
**FIGURE 4**

**COEFFICIENT OF STABILITY ON SOCIAL IMPEDIMENT SUBSCALE**

**$r = .82$**



**FIGURE 5**

**COEFFICIENT OF STABILITY ON SUBSCALE DISCOMFORT**

**$r = .71$**



reliabilities would be needed on the social impediment and discomfort subscales before one patient could be differentiated from another.

Since reliability is a function of the length of a test (Gulliksen, 1950), these reliabilities can be increased by lengthening the scales. Using the Spearman-Brown equation (Gulliksen, 1953, p. 83) it was found that in order to obtain a reliability of .90 for the social impediment scale, the test must be lengthened to about thirty-eight items. To obtain a reliability of .90 on the discomfort scale, the test must be lengthened to about forty-four items.

#### B. Attitude Scale:

The item scores for each patient on each subscale were summed to obtain the scale scores on the three subscales (see Appendix V). The subscale score for each patient was divided by the number of items on each subscale. A frequency distribution of these subscale scores is presented in Figure 6. The mode, median, and mean are given in Table V. Comparisons were made between the obtained means and the score of 3.0 which would be obtained by a theoretical subject who was perfectly neutral or indifferent (see Glossary). The means of the group are not significantly different from 3.0 on the social impediment and

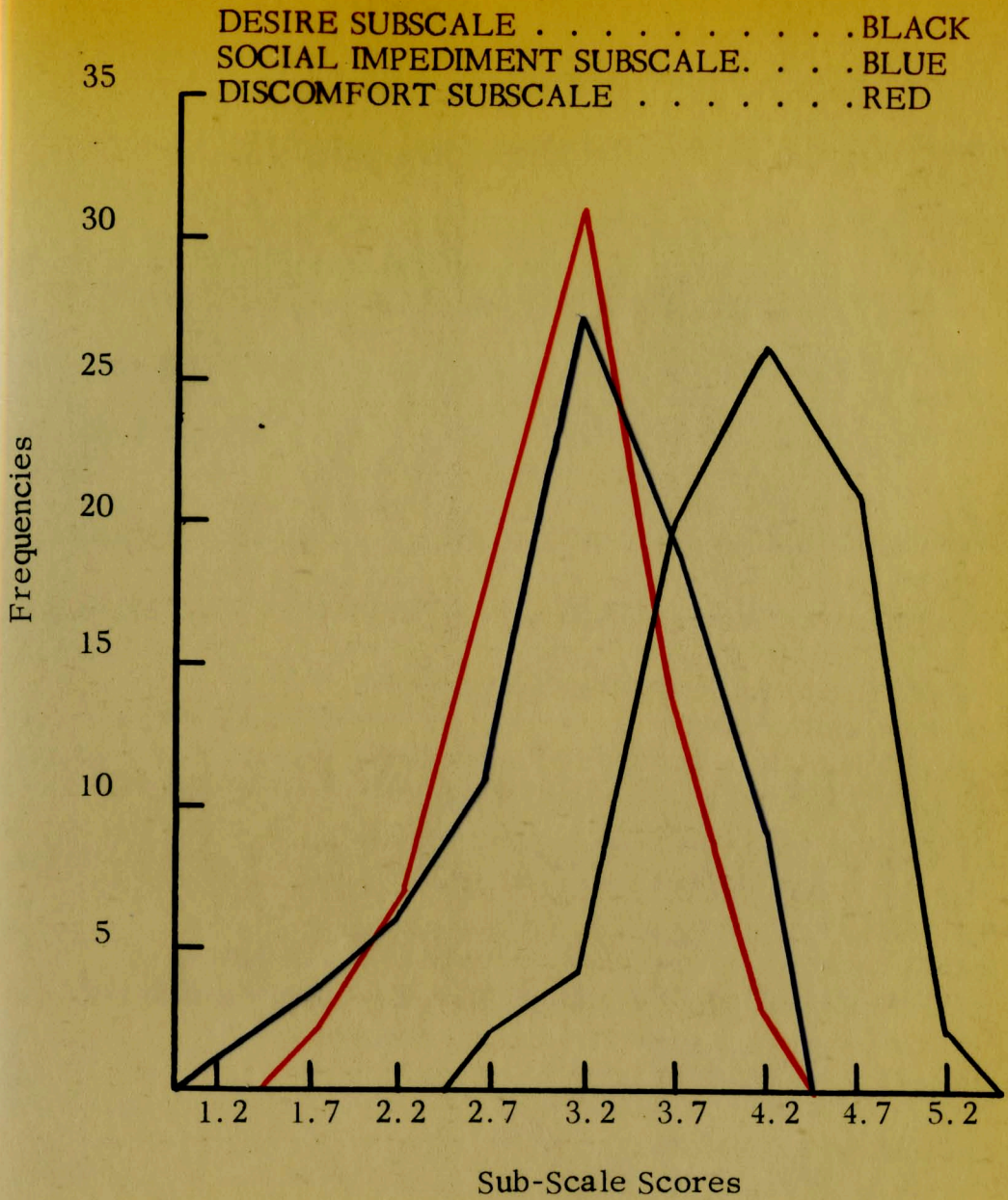


FIGURE 6

FREQUENCY DISTRIBUTION OF SCORES ON SUBSCALES

TABLE V

## MODES, MEDIANS, AND MEANS OF ATTITUDE SUBSCALES\*

	MODES	MEDIANS	MEANS
Desire	4.50	4.19	4.14
Social Impediment	3.25	3.24	3.28
Discomfort *n-75	3.30	3.18	3.08

discomfort subscales. However, the mean on the desire scale (4.14) was significantly different from 3.0 judged at the .05 level of probability.

## 1. Sex difference:

The attitudes of the boys and girls were compared. The score (sum of the item values divided by number of items) of each

TABLE VI

VARIANCES ( $s^2$ ) AND F RATIOS OF BOYS AND GIRLS ON SUBSCALES

	VARIANCES		F RATIOS*
	BOYS	GIRLS	
Desire	.2851	.2045	1.39
Social Impediment	.6200	.3300	1.88**
Discomfort	.3125	.1597	1.86**

\* degrees of freedom of 38 and 35

\*\* significantly different at .05 level of probability

subject on each subscale was computed. The significance of the difference of the means and variances of the boys and the girls were compared for each subscale at the .05 level of probability.

These variances ( $s^2$ ) and F ratios are given in Table VI. In the cases of the social impediment and discomfort subscales, the variance of the boys' attitudes was significantly greater than the variance of the girls' attitudes. The mean of the boys' was also compared to the mean of the girls' score for each subscale. Table VII gives these values and the results obtained from the use of the

TABLE VII

MEANS AND t RATIOS BOYS AND GIRLS ON SUBSCALES

	MEANS		t*
	BOYS	GIRLS	
Desire	4.00	4.27	2.36**
Social Impediment	3.10	3.35	1.40
Discomfort	3.00	3.17	1.47

\* degrees of freedom equals 73

\*\* significant at the .05 level of probability

t test.<sup>1</sup> The mean of the girls' scores on the desire subscale was significantly higher than was the mean of the boys' scores. In the cases of the social impediment and discomfort subscales, however, the boys; and girls' means were not significantly different. From a logical approach, comparison of the means based on a neutral point of undecided (3.0) reveals both boys and girls have a high desire for orthodontic treatment scoring 4.0 and 4.27 respectively. Neither mean on the social impediment and discomfort subscales is significantly different from the neutral point of 3.0. The results indicate that the average boy and the average girl had no clearly formed attitudes toward these aspects of treatment.

Figure 7 illustrates a schematic representation of the comparison of the means and variances by sex. The boys have somewhat less desire than the girls, but the boys and girls have similar variances in

<sup>1</sup>The t-test for differences in means assumes that the variances are from the same population. It has already been shown that significant differences exist in the variance of the boys' and girls' scores on the discomfort and social impediment subscales. Hence, significantly different t-ratios would have to be interpreted with great caution in these cases. However, since the differences between the means were not significant in these cases further statistical analysis did not seem to be indicated.

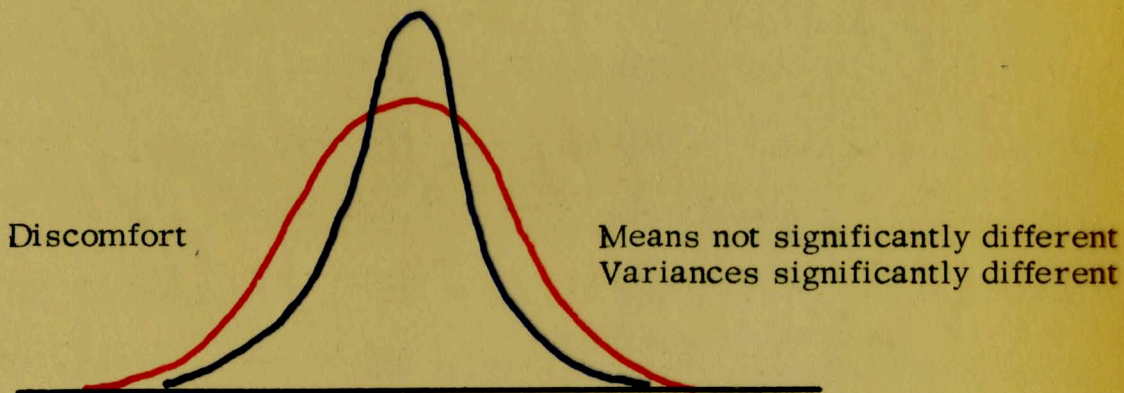
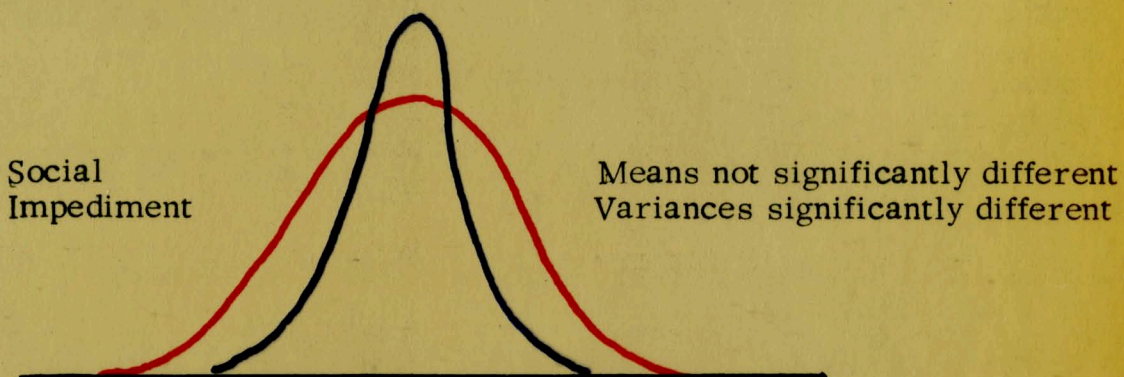
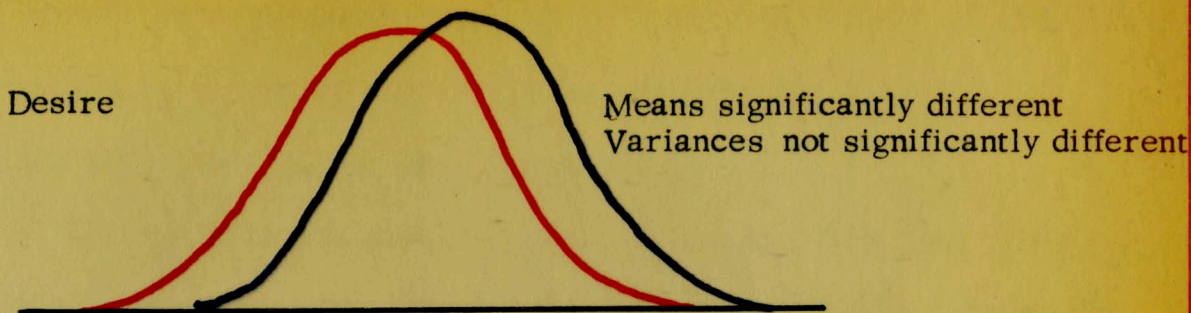


FIGURE 7

SCHEMATIC REPRESENTATION OF THE MEANS AND VARIANCES  
OF BOYS AND GIRLS SCORES ON SUBSCALES

the desire scores. On the social impediment and discomfort subscales, the sexes have similar means but the girls' scores are more homogenous than are the boys' scores.

The confidence levels (.95) of the boys' and girls' means on each subscale are given in Table VIII. This is also presented schematically in Figure 8.

TABLE VIII

.95 CONFIDENCE INTERVALS OF BOYS AND GIRLS ON SUBSCALES

	BOYS	GIRLS
Desire	4.00 <sub>+</sub> .18	4.27 <sub>+</sub> .14
Social Impediment	3.10 <sub>+</sub> .26	3.35 <sub>+</sub> .18
Discomfort	3.00 <sub>+</sub> .18	3.17 <sub>+</sub> .13

2. Age difference:

The median age (twelve years, eight months) was utilized to divide the subjects into two groups. The attitudes of the younger and older age groups were compared. The significance of the difference of the means and variances of the younger and older groups were compared for each subscale at the .05 level of probability. These variances ( $s^2$ ) and F ratios are given in Table IX. In no case was there a significant difference in the variances of the younger and

BOYS = RED

GIRLS = BLUE

Desire —————

Desire —————

Social Impediment .....  
Impediment

Social Impediment .....  
Impediment

Discomfort ————|———

Discomfort ————|———

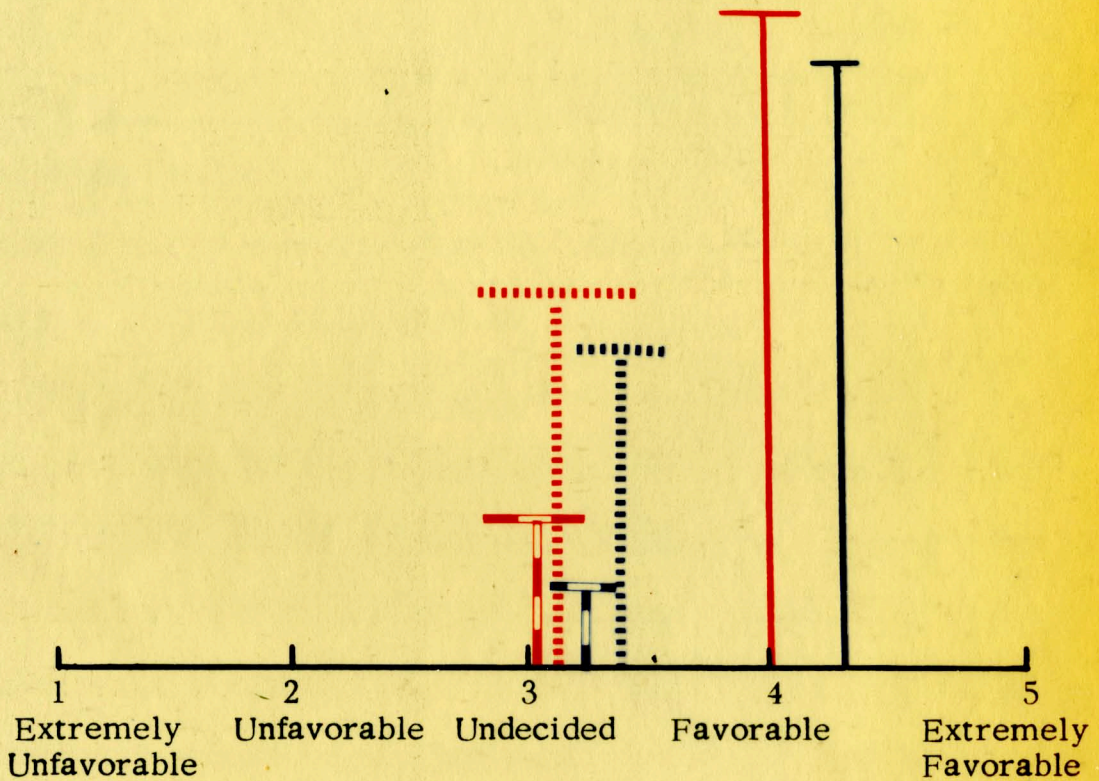


FIGURE 8

SCHEMATIC REPRESENTATION OF THE CONFIDENCE INTERVALS  
(.95) OF THE BOYS AND GIRLS SCORES ON SUBSCALES



older age groups.

TABLE IX

VARIANCES ( $s^2$ ) AND F RATIOS OF THE YOUNGER AND OLDER  
GROUPS ON SUBSCALES

	VARIANCES		F RATIOS*
	YOUNGER	OLDER	
Desire	.2601	.2304	1.12**
Social Impediment	.3969	.4225	1.07**
Discomfort	.2704	.1681	1.61**

\* degree of freedom of 36 and 36

\*\* not significantly different at .05 level of probability

The mean score of the younger group was also compared to the mean score of the older group on each subscale. Table X gives these values and the results obtained from the use of the t-test.

The mean of the scores of the younger age group on the social impediment subscale was significantly higher than was the mean of the older age group scores. In the cases of desire and discomfort subscales, however, the means of the younger and older groups were not significantly different.

TABLE X

MEANS AND *t* RATIOS OF YOUNGER AND OLDER GROUPS ON SUBSCALES  
(*n*-74)

	MEANS		<i>t</i> *
	YOUNGER	OLDER	
Desire	4.21	4.05	1.46
Social Impediment	3.37	3.02	2.33**
Discomfort	3.10	3.07	0.27

\* degrees of freedom of 72

\*\* significant at the .05 level of probability

### 3. Social Class Difference:

Using Hellingshead's (1958, p. 398-407) two factor index of education and occupation, the subjects were divided into five social classes. The attitudes of the upper, upper middle, middle, lower middle, and lower classes were compared. The means and the variances of each social class were compared on each subscale. The means are presented in Table XI. The sample frequency in each social class was given in Table IV. Although the data indicates a difference in the means between the upper middle class and the lower class, it was found that the standard error of the means was

TABLE XI  
MEANS OF SOCIAL CLASSES ON SUBSCALES

	Upper*	Upper Middle	Middle	Lower Middle	Lower
Desire	-	4.48	4.12	4.15	4.0
Social Impediment	-	3.36	3.31	3.01	2.95
Discomfort	-	3.42	3.05	3.03	2.99

\* No patients were found in the upper class.

so great that no significant difference at the .05 level of probability developed. By simple inspection of the data it was found that the results tended to support the studies (American Dental Association, 1958; Lester and Nelson, 1962; and Kegeles, 1963) which found more favorable dental attitudes in the upper social classes. The present study also agreed with these previous studies in finding greater variances in the upper middle class and the lower class, while the middle class scores were more homogenous.

#### C. Section IV of the Questionnaire:

The findings are based on the analysis of twenty-one fixed-

alternative (see Glossary) questions designed to elicit patients' responses (see Appendix II, Section IV). The frequency and the percent of the responses that were positive, neutral, and negative are given for each item in Table XII.

Items one through eight were formulated to discover whether or not this group expected to receive any benefits from orthodontic treatment. Comparison of the percentages of the positive, neutral, and negative responses revealed that this group of patients expected to receive many benefits from orthodontic care. Ninety-five percent of the group agreed that both their dental and facial appearance would be improved by undergoing orthodontic treatment. Questions nine, ten, and eleven revealed that these subjects were not satisfied with the appearance of their teeth but were "undecided" as to the pleasantness of their smile.

Items twelve, thirteen, and fourteen were designed to find out whether treatment was desired by the patient, or his (her) parents. The results indicate that the patient and both parents wanted orthodontic treatment.

Items fifteen through nineteen were designed to investigate some of the factors influencing the reasons for wanting orthodontic treatment.

Item	Frequency (n-75)			Percent		
	+	0**	-***	+	0	-
1	41	16	18	55	21	24
2	60	6	9	80	8	12
3	56	9	10	75	12	13
4	32	24	19	43	32	25
5	48	15	12	64	20	16
6	71	3	1	95	4	1
7	73	1	1	98	1	1
8	69	5	1	92	7	1
9	34	24	17	45	33	22
10	16	9	50	21	13	66
11	56	1	18	75	1	24
12	69	3	3	92	4	4
13	75	0	0	100	0	0
14	72	3	0	96	4	0
15	57	8	10	76	10	14
16	20	22	33	27	30	43
17	61	7	7	82	9	9
18	35	8	32	47	10	43
19	40	10	25	52	13	35
20	26	7	42	36	9	55
21	59	10	6	79	13	8

\* number of positive responses

\*\* number of undecided responses

\*\*\* number of negative responses

TABLE XII

ITEM RESPONSES TO SECTION IV OF QUESTIONNAIRE

The Table reveals that the child's parents and family dentist were the most frequently indicated influences. The responses to questions twenty and twenty-one indicated that the children wanted not only the anterior but also the posterior teeth aligned.

## CHAPTER V

### DISCUSSION

For the purpose of clarity the discussion of the methods and results is presented in two main sections.

#### A. Method Discussion:

Past and present experiences with orthodontic patients suggest that one of the major considerations for orthodontic success is the patient's attitude toward orthodontic treatment. It seems that patients who possess favorable attitudes toward treatment demonstrate a high level of cooperation and vice versa. Little or no data on dental attitudes has been described in the dental literature. A descriptive study into the attitudes of children before treatment was deemed necessary before more elaborate studies leading to increasing motivation for treatment could be performed.

Basically then, the purpose of this study was to determine the attitudes of a group of prospective patients to orthodontic treatment. An attitude scale was devised and administered to each prospective subject selected previously for orthodontic treatment. Subscales

explored the areas of strength of desire for treatment, willingness to accept social impediments during treatment, and willingness to tolerate discomforts during treatment. In addition, questions were also asked about the patients reasons for wanting orthodontic treatment, what benefits they expected to receive from treatment, and factors influencing their decision to seek orthodontic treatment.

The experimental results of the test-retest study of reliability indicate that the desire subscale developed in this study is highly reliable. The reliabilities of the social impediment and discomfort subscales are somewhat lower. Ideally these subscales should be revised if one wants to talk about the differentiation of individuals in a group. They are sufficiently reliable, however, for the purpose of this study, which is the description of groups. If an experimenter wishes to differentiate attitudes of individuals, an increased reliability can be obtained in a number of ways. The simplest way would be to just lengthen the subscales.

Although content validity was established, further studies concerning the validity of the scale items could be performed. This might be done, for example, by the use of two groups which on a priori basis, should react in an expected way in their attitudes.



The time each patient consumed for the completion of the questionnaire ranged from thirty to forty-five minutes. It was surprising to observe how little difficulty the children had comprehending the questions, and for the most part, they required little assistance from the interviewer. In the light of these findings group administration of the questionnaire seems to be possible.

Since the subjects used in this study were selected from a teaching institution, their attitudes toward orthodontic treatment may differ from those found in a private practice situation. Age and sex distribution were about the same as would be encountered in a private practice. However, the social class distribution was skewed. Seventy-five percent of the subjects were found in the lower social classes. Also, these patients had been selected by the clinic and the patient's apparent motivation was an influencing factor in the decision of the clinician to accept the case.

#### B. Results:

Although the primary purpose of the semi-structured interview of patients already in treatment was to obtain items for the scale, interesting findings developed. The majority of the patients recalled

that tooth separation, band placement, and arch wire adjustment were the cause of the greatest amount of pain. They also indicated the treatment time was too long. Nine patients indicated that they would be unwilling to undergo treatment if they had to do it over, six were undecided and five were willing. Only eight patients informed the interviewer that they desired treatment and orthodontic treatment was initiated against their wishes on parent compulsion.

In the opinion of the interviewer, the majority of patients in active orthodontic treatment seemed to hold negative attitudes toward orthodontic treatment. In fact, it was difficult to elicit positive responses from the uncooperative patients and patients in appliances longer than one and one half years. Not only were these patients unwilling to accept the social impediments and discomforts derived from the appliances (headgears, elastics, treatment procedures, etc.), they also indicated that benefits derived were not reward enough for the physical discomforts, social embarrassments and personal sacrifices encountered.

On the contrary, the results of the desire subscale indicated that the selected prospective patients used in this study possessed a great desire for orthodontic treatment. Only three children received

scores below the neutral point of undecided on the desire subscale. In all three cases, the patients were boys. The mean score on the social impediment (3.28) and discomfort (3.08) subscales were not significantly different from the neutral or undecided point (3.0). This is important to the orthodontist because some of the early treatment procedures (separation and banding) could easily trigger a conscious or unconscious attitude change from neutral to negative. This could in turn affect cooperation levels adversely. It is generally recognized that individuals who are neutral to any psychological object (willingness to tolerate social impediments and discomforts) can be swayed positively or negatively more readily than those individuals possessing definite positive or negative attitudes. Further investigation into the change of attitudes toward orthodontic treatment might provide valuable clues as to why so many patients do not cooperate fully.

A sex difference emerged on the desire subscale with girls possessing a greater desire for treatment than boys. The variances of the boys' scores were higher than those of the girls on the social impediment and discomfort subscales, indicating that the boys received more extreme scores. The girls' scores were more homogenous. It is generally recognized that girls have more interest in personal

appearance compared to boys. Maturing earlier than boys, girls may realize more fully what an asset a pleasing smile can be to their appearance and personality.

It is often stated that girls can withstand more pain than boys but the results revealed no significant sex difference on the discomfort subscale. Also both boys and girls were undecided as to whether or not they would accept the social impediments associated with orthodontic treatment. The reason for the boys and girls being undecided or neutral in their attitude toward willingness to tolerate social impediments and discomfort could be due to the fact that they did not know what orthodontic treatment would involve.

It is interesting to observe that the younger age group (ten years to twelve and one half years) indicated a more favorable attitude for accepting the social impediments involved while undergoing orthodontic treatment. Transition from childhood to adolescence could explain these findings. Wearing orthodontic appliances may threaten the older groups' (twelve and one half years to eighteen years) social drives, consequently they are unwilling to accept those things which may place them at a disadvantage socially. Since the younger group does not yet possess these social drives, the appliances would have less effect

on their mode of life.

Dividing the subjects by social class, the results on all three subscales indicated that the upper social classes all have more favorable attitudes toward orthodontics than those of the lower social classes. These results agree with the studies of the American Dental Association (1958), Lester and Nelson (1962), and Kegeles (1963), which pointed out that people from the higher classes are more keenly aware of the importance of teeth in relation to ones appearance, personality and health.

The data of Section IV of the questionnaire revealed that the majority of these children expected to receive many benefits from treatment, most notably, improvement in facial appearance. Yet the scores on the discomfort and social impediment subscales indicate that they were undecided as to whether they would undergo physical discomforts, social embarrassments and personal sacrifices that would be encountered.

Although much has been learned about the attitudes of children toward orthodontic treatment in this research, it is obvious that further work needs to be done. Future research should not consist of surveys of existing attitudes and beliefs. More specifically, further

investigations should be undertaken to determine the following:

1. the relationship of attitudes of these patients before treatment compared with their attitudes after the "newness" of orthodontics wears off,
2. to explore methods of maintaining current levels of positive attitude and to develop still unknown "tools" for increasing these positive attitudes.

## CHAPTER VI

### SUMMARY AND CONCLUSIONS

#### A. Summary:

Applying accepted techniques developed by psychological disciplines, the present study was conducted in order to determine the attitudes of a group of children toward orthodontic treatment. Basically, the problem was two-fold. First, to construct a test that could effectively evaluate children's psychological attitudes toward orthodontics, and second, to apply this test to a number of children to obtain descriptive norms.

Although an orthodontic attitude test has never been reported in the literature, knowledge of the children's attitudes toward orthodontic treatment would seem to be an essential part of evaluating the cooperation potential of the orthodontic patient. The review of the dental literature, related to the attitudes of individuals toward dental care, indicated a need for a more systematic method of investigating this important variable. With this purpose in mind, an attitude scale<sup>1</sup> was developed to measure patients' attitudes toward orthodontic treatment before treatment was initiated.

The attitude scale was constructed with questions derived from three major sources:

1. review of the related dental and psychological literature
2. use of a semi-structured interview
3. intuitive method

The questions obtained by these three methods were compiled and classified into three subscales measuring the strength of desire for treatment, willingness to tolerate the social impediments encountered during treatment, and the degree of discomfort anticipated during treatment. The items were edited and submitted to "experts" to obtain content validity. An attitude scale containing fifty-four items divided into three subscales resulted. An additional twenty-one items were inserted into the questionnaire to gain insight into some of the reasons for wanting treatment, what benefits the child expects to receive from orthodontic treatment, and some factors influencing a desire for wanting orthodontic treatment.

The scale was administered privately and individually to seventy-five patients from the Orthodontic Department of Loyola University School of Dentistry before orthodontic treatment was initiated. The responses to the questions on each subscale were scored according to



the method of "summated ratings".

A reliability study was performed on each subscale utilizing the test-retest method. Scores obtained by sixty-three patients on two different occasions indicated that the scale was sufficiently reliable for the purposes of this study. The results of the attitude subscales were compared by sex, age, and social class distribution. The reasons for wanting orthodontic treatment, benefits the child expected to receive from treatment, and some factors influencing a desire for wanting orthodontic treatment were presented.

#### B. Conclusions:

1. The scale developed in this study was found to be a reliable method of assessing attitudes of a group of orthodontic patients.
2. The subjects used in this study possessed a great desire for wanting orthodontic treatment but demonstrated indefinite (neutral) attitudes toward willingness to tolerate the social impediments and to tolerate the discomforts anticipated during treatment.
3. The girls expressed a greater desire for wanting orthodontic care.

4. The boys' score obtained on the social impediment and discomfort subscales were more variable (tended more to the extremes) than the scores received by the girls.
5. The older age group (twelve years eight months to eighteen years) was less willing to tolerate the social impediments involved during treatment than the younger age group (ten years two months to twelve years eight months).
6. Although the evidence tends to indicate that children from the upper social classes possess more favorable attitudes toward orthodontic care than those of the lower classes, this was not found to be statistically significant because of insufficient sample size.
7. The subjects expected to receive many benefits from orthodontic treatment, especially improvement in their appearance. Improvement in appearance was found to be the most important reason for wanting orthodontic treatment. The family dentist and parents were found to be the originating factors in influencing the child's desire for wanting orthodontic treatment.

## GLOSSARY

**cumulative scaling method.** In a cumulative scale the items can be so ordered that a subject who responds positively to any particular item also responds positively to all items of lower rank. A perfect cumulative scale has a coefficient of reproducibility of 1.0 and is a unidimensional scale.

**error-choice method of attitude assessment.** This is a projective method in which the subjects are forced to choose between two alternative questions, each of which is made equally wrong, but in opposite directions from the correct answer. The subjects are not aware of what attitude is being measured. The test is usually not directly connected with the object in question.

**equal-appearing interval scaling method.** In this method judges sort a large and representative pool of statements about an object into groups separated by equal steps or intervals. The median of their judgements defines the scale value of a statement.

Statements which are not judged consistently are discarded as ambiguous. The surviving statements are then given to subjects who are asked to check the ones with which they agree. If a statement is frequently checked by subjects who also check other statements differing widely in scale value, it is discarded as irrelevant.

**fixed-alternative question.** A survey interview question (item) which offers the respondent a choice between two or more specified alternative answers.

**item.** An item is any statement or question that can be made about a psychological object.

**neutral region.** The neutral region is the region of transition from negative to positive attitudes. If an individual's score on a unidimensional scale falls in the neutral region and therefore indicates neither a negative nor a positive evaluation of an object, the individual cannot be said to have an attitude toward the object.

**object-universe.** This is a term used to refer to the number and

varity of the elements or parts making up an attitude toward an object.

open-end interview. An open-end interview consists of questions designed to permit the respondent to answer freely in his own words.

open-end question. An open-end question is an interview question which permits the respondent to answer freely in his own words.

orthodontic attitude scale. This was the title given to the attitude scale developed in this research to measure the strength of desire, willingness to tolerate the social impediments encountered, and degree of discomfort anticipated during treatment.

projective technique. This is a method which involves asking subjects to react to ambiguous stimuli (untitled pictures, ink-blot designs, sentence completion, word association, etc.). This method assumes that the attitudes of the subject will be influenced by the way he perceives these ambiguous stimuli and that he will "project" his conscious and unconscious attitudes upon the stimuli.

scale. An attitude scale consists of a set of statements or questions

(items) to which a person responds in order to assign the individual on a continuum, a position which indicates his attitude.

**scale-discrimination technique.** This is an attitude scaling technique developed by Edwards and Kilpatrick. It attempts to synthesize in one method the advantages of the methods of equal-appearing intervals, summated rating, and the cumulative scale.

**semi-structured interview.** A semi-structured interview is one which employs both fixed-alternative and open-end questions in no set order.

**social-distance scaling method.** This is an attitude scaling method developed to measure attitudes toward social groups. It consists of a number of items which permit the subject to indicate the closest social intimacy he will accept between himself and a typical member of the social group in question.

**summated-rating scaling method.** Subjects are asked to indicate on a five-step scale the degree of their agreement or disagreement with each of a large and representative set of items. The total score of each subject is computed by summing his item scores.

Only the most discriminating items are retained for inclusion in the final scale.

unidimensional scale. It is a scale which measures only one attitude dimension. In a unidimensional scale a person with a higher total score will have on every item a score equal to, or higher than, that of a person with a lower total score.

Krech, Crutchfield and Ballachey (1962, p. 137-255).

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## APPENDIX I

### SEMI-STRUCTURED INTERVIEW OUTLINE

**Introduction:** Mister or Miss \_\_\_\_\_, I am conducting a survey to find out what your feelings and beliefs are about orthodontic treatment. This is part of a research project. I need to know what people think about orthodontic treatment. I would greatly appreciate your cooperation. Feel free to say what you think because you will not be identified and all information will remain confidential.

#### TOPICS DISCUSSED DURING INTERVIEW

- A. Reasons for wanting treatment
  - 1. What was (is) your main reason for wanting orthodontic treatment?
  - 2. Was the decision to have your teeth straightened yours and yours alone?
  - 3. If the answer to question two (2) was no, whose decision was it?
  
- B. Discomforts during treatment
  - 1. Did any of the treatment procedures cause you pain?
  - 2. What treatment procedure caused you the most pain or discomfort?
  - 3. What one thing did you dislike most about treatment?
  - 4. What one thing did you like about treatment?
  
- C. Social impediments encountered during treatment
  - 1. Were (are) you ever embarrassed because of wearing your braces?

2. Did you or are you always wearing your headgear as prescribed?
3. Did you or are you always wearing your elastics as prescribed?
4. Did you dislike your orthodontist or ever wish to have another orthodontist treat you?
5. Did you ever wear your headgear out in public (shopping, sports activity, school, church, etc.)?

**D. Desire for wanting orthodontic treatment**

1. Before the braces were placed on your teeth, did you really want your teeth straightened?
2. Do you think treatment is too long?
3. Knowing what you know now, would you be willing to have your teeth straightened?
4. Do you think having straight teeth is worth going through all treatment procedures (discomforts, embarrassments, pain, sacrifices, school absences, etc.)?

## APPENDIX II

### ORTHODONTIC ATTITUDE SCALE

Please read all questions and circle only one answer which you think best applies to each question. If you do not understand any question, please ask them to be explained. Thank you.

#### SECTION I

1. How important do you think "straight" or "even" teeth are for a pleasing appearance?
  - a) Very important
  - b) Important
  - c) Undecided
  - d) Unimportant
  - e) Very unimportant
  
2. How much do you want your teeth straightened?
  - a) Want very much
  - b) Want
  - c) Undecided
  - d) Do not want
  - e) Strongly do not want
  
3. How much do you think you need your teeth straightened?
  - a) Need very much
  - b) Need
  - c) Undecided
  - d) Do not need
  - e) Strongly do not need
  
4. How anxious are you to begin orthodontic treatment?
  - a) Very anxious
  - b) Anxious

- c) Undecided
  - d) Not very anxious
  - e) Strongly not very anxious
5. How important do you think it is to have your teeth straightened?
- a) Very important
  - b) Important
  - c) Undecided
  - d) Unimportant
  - e) Very unimportant
6. How much of your allowance (spending money) would you be willing to give up to help pay for your orthodontic treatment?
- a) All of the entire amount
  - b) More than half of the entire amount
  - c) Undecided
  - d) Less than half of the entire amount
  - e) None of the entire amount
7. Would you be willing to give up participation in sports and play because you have to wear your headgear?
- a) Very willing
  - b) Willing
  - c) Undecided
  - d) Unwilling
  - e) Very unwilling
8. How often would you be willing to brush your teeth in order to keep them clean while undergoing orthodontic treatment?
- a) 4 or more times a day
  - b) 2 times a day
  - c) Undecided
  - d) Only once a day
  - e) Only when I feel like it
9. How willing will you be to wear your elastics and headgear eighteen months or two years in order to have your teeth straightened?
- a) Very willing

- b) Willing
  - c) Undecided
  - d) Unwilling
  - e) Very unwilling
10. How willing would you be to wear your elastics (rubber bands) twenty-four hours a day (except while eating)?
- a) Very willing
  - b) Willing
  - c) Undecided
  - d) Unwilling
  - e) Very unwilling
11. How willing would you be to wear your headgear (neck strap) from the time school is out until school begins the next day, during the course of your entire treatment?
- a) Very willing
  - b) Willing
  - c) Undecided
  - d) Unwilling
  - e) Very unwilling
12. During the course of your entire treatment, how willing would you be to wear your headgear (forehead strap) from the time school is out until school begins the next day?
- a) Very willing
  - b) Willing
  - c) Undecided
  - d) Unwilling
  - e) Very unwilling
13. Will you be willing to carry a toothbrush with you at all times in order to maintain proper cleanliness of your teeth?
- a) Definitely no
  - b) Probably no
  - c) Undecided
  - d) Probably yes
  - e) Definitely yes



14. How willing would you be to give up two afternoons a month of school time in order to have your teeth straightened?
- a) Very willing
  - b) Willing
  - c) Undecided
  - d) Unwilling
  - e) Very unwilling
15. How fortunate do you think you are to have the opportunity to have your teeth straightened?
- a) Very fortunate
  - b) Fortunate
  - c) Undecided
  - d) Unfortunate
  - e) Very unfortunate
16. How essential do you think it is to keep your orthodontic appointments while undergoing treatment?
- a) Very essential
  - b) Essential
  - c) Undecided
  - d) Unessential
  - e) Very unessential
17. How happy will you be to have straight teeth?
- a) Very happy
  - b) Happy
  - c) Undecided
  - d) Unhappy
  - e) Very unhappy
18. How much will you like coming to the dental school for your appointments?
- a) Like very much
  - b) Like
  - c) Undecided
  - d) Dislike
  - e) Dislike very much

19. How willing will you be to give up gum and candy in order to have your teeth straightened?
- a) Very willing
  - b) Willing
  - c) Undecided
  - d) Unwilling
  - e) Very unwilling
20. How willing will you be to tolerate speech difficulties caused by wearing rubber bands, headgears, and bands on your teeth?
- a) Very willing
  - b) Willing
  - c) Undecided
  - d) Unwilling
  - e) Very unwilling
21. How willing will you be to suffer the discomfort (pain) of wearing your rubber bands?
- a) Very willing
  - b) Willing
  - c) Undecided
  - d) Unwilling
  - e) Very unwilling
22. How willing will you be to suffer the discomfort (pain) of wearing either the forehead strap or neck strap?
- a) Very willing
  - b) Willing
  - c) Undecided
  - d) Unwilling
  - e) Very unwilling

## SECTION II

23. How self-conscious are you about the way your teeth look now?
- a) Very self-conscious
  - b) Self-conscious
  - c) Undecided
  - d) Unself-conscious
  - e) Very unself-conscious

24. How embarrassed will you be about your appearance while you're wearing braces?
- a) Very embarrassed
  - b) Embarrassed
  - c) Undecided
  - d) Not embarrassed
  - e) Very not embarrassed
25. How much do you think wearing braces will effect your social activities (parties, dating, sports, outdoor activities, indoor activities, etc.)?
- a) Affect very much
  - b) Affect
  - c) Undecided
  - d) Not affect
  - e) Very not affect
26. How willing will you be to tolerate the appearance of your braces while at parties, dating, etc.?
- a) Very willing
  - b) Willing
  - c) Undecided
  - d) Unwilling
  - e) Very unwilling
27. How willing will you be to give up some after school activities in order to have your teeth straightened?
- a) Very willing
  - b) Willing
  - c) Undecided
  - d) Unwilling
  - e) Very unwilling
28. How embarrassed will you be to wear your headgear (neck strap) while you are in school?
- a) Very embarrassed
  - b) Embarrassed
  - c) Undecided
  - d) Not embarrassed
  - e) Very not embarrassed

29. How embarrassed will you be to wear your headgear (neck strap) in front of friends in both your home and theirs?
- a) Very embarrassed
  - b) Embarrassed
  - c) Undecided
  - d) Not embarrassed
  - e) Not very embarrassed
30. How embarrassed will you be to wear your headgear (forehead strap) while you are in school?
- a) Very embarrassed
  - b) Embarrassed
  - c) Undecided
  - d) Not embarrassed
  - e) Very not embarrassed
31. How embarrassed will you be to wear your headgear (forehead strap) in front of friends in both your home and theirs?
- a) Very embarrassed
  - b) Embarrassed
  - c) Undecided
  - d) Not embarrassed
  - e) Very not embarrassed
32. How distracting do you think your headgear will be to you while you are studying?
- a) Very distracting
  - b) Distracting
  - c) Undecided
  - d) Not distracting
  - e) Very not distracting
33. How distracting do you think your elastics will be to you while you are studying?
- a) Very distracting
  - b) Distracting
  - c) Undecided
  - d) Not distracting
  - e) Very not distracting

34. Will wearing your elastics in class distract you?
- a) Definitely yes
  - b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no
35. Do you think the headgear is unsightly or ugly?
- a) Definitely yes
  - b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no
36. Do you think your friends will think your headgear is unsightly?
- a) Definitely yes
  - b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no
37. Do you think that your friends will think that your braces detract from your appearance?
- a) Definitely yes
  - b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no
38. Will you be self-conscious about the appearance of your braces?
- a) Definitely yes
  - b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no
39. Do you think your school grades will suffer by being absent from school in order to have your teeth straightened?
- a) Definitely yes

- b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no
40. Do you think the appearance of your friends who wear braces has been unfavorably changed?
- a) Definitely yes
  - b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no
41. Do you think the personality of your friends who wear braces has been unfavorably changed?
- a) Definitely yes
  - b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no
42. How willing will you be to tolerate speech difficulties caused by wearing rubber bands, headgears, and bands on your teeth?
- a) Very willing
  - b) Willing
  - c) Undecided
  - d) Unwilling
  - e) Very unwilling

### SECTION III

43. Do you think wearing the rubber bands will cause pain?
- a) Definitely yes
  - b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no
44. How pleasant do you think it will be to wear your forehead strap

or neck strap while sleeping?

- a) Very pleasant
- b) Pleasant
- c) Undecided
- d) Unpleasant
- e) Very unpleasant

45. Will you continue to wear your headgear (forehead strap or neck strap) even though it may cause a great amount of pain?
- a) Definitely yes
  - b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no
46. How much do you think the bands and wires will irritate your cheeks, tongue, and lips?
- a) Very much
  - b) Slightly
  - c) Undecided
  - d) Not very much
  - e) Not at all
47. How painful do you think it will be to undergo orthodontic treatment?
- a) Very painful
  - b) Painful
  - c) Undecided
  - d) Not painful
  - e) Very not painful
48. Do you think that your teeth can be straightened without any pain?
- a) Definitely yes
  - b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no
49. How worried are you about having your teeth straightened?
- a) Very worried

- b) Worried
  - c) Undecided
  - d) Unworried
  - e) Very unworried
50. Do you fear the thought of having your teeth straightened?
- a) Definitely yes
  - b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no
51. How comfortable do you think it will be to wear your elastics while sleeping?
- a) Very comfortable
  - b) Comfortable
  - c) Indifferent
  - d) Uncomfortable
  - e) Very uncomfortable
52. How comfortable do you think it will be to wear your headgear (forehead or neck strap) while sleeping?
- a) Very comfortable
  - b) Comfortable
  - c) Undecided
  - d) Uncomfortable
  - e) Very uncomfortable
53. How willing will you be to suffer the discomfort (pain) of wearing your rubber bands?
- a) Very willing
  - b) Willing
  - c) Undecided
  - d) Unwilling
  - e) Very unwilling
54. How willing will you be to suffer the discomfort (pain) of wearing either the forehead strap or neck strap?
- a) Very willing
  - b) Willing



- c) Undecided
- d) Unwilling
- e) Very unwilling

#### SECTION IV

1. Do you think you will have fewer cavities because your teeth are straightened?
  - a) Definitely yes
  - b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no
  
2. Do you think it will be easier to brush your teeth and keep them clean if they are straightened?
  - a) Definitely yes
  - b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no
  
3. Do you think it will be easier to chew food if your teeth are straightened?
  - a) Definitely yes
  - b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no
  
4. Do you think it will be easier to breathe if your teeth are straightened?
  - a) Definitely yes
  - b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no
  
5. Do you think it will be easier to speak more clearly if you

have your teeth straightened?

- a) Definitely yes
- b) Probably yes
- c) Undecided
- d) Probably no
- e) Definitely no

6. How important do you think straight teeth are for a pleasing appearance?
- a) Very important
  - b) Important
  - c) Undecided
  - d) Unimportant
  - e) Very unimportant
7. How much improved do you think your teeth would look if they were straightened?
- a) Extremely improved
  - b) Improved
  - c) Undecided
  - d) Unimproved
  - e) Extremely unimproved
8. Do you think having your teeth straightened will change the appearance of your face?
- a) Definitely yes
  - b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no
9. How pleasant do you think your smile is presently?
- a) Very pleasant
  - b) Pleasant
  - c) Undecided
  - d) Unpleasant
  - e) Very unpleasant
10. How satisfied are you with the appearance of your teeth presently?
- a) Very satisfied

- b) Satisfied
- c) Undecided
- d) Unsatisfied
- e) Very unsatisfied

11. Which of the following statements applies?
- a) I dislike the appearance of my teeth and wish them to be straightened?
  - b) I dislike the appearance of my teeth but do not want them to be straightened.
  - c) I like the appearance of my teeth and do not want them straightened.
  - d) I like the appearance of my teeth and still want them to be straightened.
  - e) None of the above.
12. Does your father think that you need to have your teeth straightened?
- a) Definitely yes
  - b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no
13. Does your mother think that you need to have your teeth straightened?
- a) Definitely yes
  - b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no
14. Do you think that you need to have your teeth straightened?
- a) Definitely yes
  - b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no

15. How important was your dentist's influence on your decision to have your teeth straightened?
- a) Very important
  - b) Important
  - c) Undecided
  - d) Unimportant
  - e) Very unimportant
16. How important was your friends' influence on your decision to have your teeth straightened?
- a) Very important
  - b) Important
  - c) Undecided
  - d) Unimportant
  - e) Very unimportant
17. How important was your parent's influence on your decision to have your teeth straightened?
- a) Very important
  - b) Important
  - c) Undecided
  - d) Unimportant
  - e) Very unimportant
18. Was the decision to have your teeth straightened yours and your alone?
- a) Definitely yes
  - b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no
19. Was your own desire the main influence for having your teeth straightened?
- a) Definitely yes
  - b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no

20. Do you want only your front teeth (the teeth that show) straightened?
- a) Definitely yes
  - b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no
21. Do you want both the front and the back teeth straightened?
- a) Definitely yes
  - b) Probably yes
  - c) Undecided
  - d) Probably no
  - e) Definitely no

APPENDIX III  
SOCIAL HISTORY QUESTIONNAIRE

Please answer all the questions as accurately as possible.

PART I

1. Name \_\_\_\_\_
2. Address \_\_\_\_\_  
street
3. Telephone \_\_\_\_\_  
city state
4. Marital Status (check one)  
a( ) Married  
b( ) Widowed  
c( ) Separated  
d( ) Divorced
5. What is the length of your present marriage? \_\_\_\_\_ years
6. Do you own your own home? Yes No
7. What type of dwelling do you live in presently?  
a( ) single dwelling  
b( ) less than five dwellings  
c( ) 5 to 19 dwellings  
d( ) 20 or more dwellings
8. Number of children in family:  
a( ) Boys  
b( ) Girls
9. Ages of children:  
a( ) ( ) ( ) ( ) Boys  
b( ) ( ) ( ) ( ) Girls

PART II -- Please circle or check the correct answer.

FATHER                  MOTHER

10. (yes) (no)                  (yes) (no)                  10. Were you born in the United States
11. (     )                  (     )                  11. Birth of Parents  
year                          year

- | FATHER    | MOTHER |  |
|-----------|--------|--|
| 12. _____ | _____  | 12. Nationality of parents (Polish, Irish, German, etc.)   |
| 13.       |        | 13. What are your religious affiliations?  |
| a( )      | a( )   | a. None  |
| b( )      | b( )   | b. Catholic  |
| c( )      | c( )   | c. Protestant  |
| d( )      | d( )   | d. Jewish  |
| e( )      | e( )   | e. Other   |
| 14.       |        | 14. Health of parents  |
| a( )      | a( )   | a. Excellent   |
| b( )      | b( )   | b. Good  |
| c( )      | c( )   | c. Fair  |
| d( )      | d( )   | d. Poor  |
| 15. _____ | _____  | 15. Occupation of parents (be specific as to position, job, or title).   |
| 16.       |        | 16. Education of parents   |
| a( )      | a( )   | a. elementary or less  |
| b( )      | b( )   | b. Some High School but did not graduate.  |
| c( )      | c( )   | c. Completed High School   |
| d( )      | d( )   | d. Some college but did not graduate.  |
| e( )      | e( )   | e. Completed college.  |
| f( )      | f( )   | f. More than college but no graduate degree.   |
| g( )      | g( )   | g. Completed graduate or professional school   |
| 17.       |        | 17. Which of the following best describes either the father's and/or the mother's employment in the last five years. |
| a( )      | a( )   | a. Worked full time  |

FATHER      MOTHER

b( )          b( )

c( )          c( )

d( )          d( )

- b. Worked part time  
 c. Worked both full time and part time  
 d. Unemployed

18.

a( )          a( )

b( )          b( )

c( )          c( )

d( )          d( )

e( )          e( )

f( )          f( )

g( )          g( )

18. Which of these general groups best fits your estimate of the father's and/or the mother's income each year?

- a. Under \$2000  
 b. \$2000 to \$4999  
 c. \$5000 to \$7999  
 d. \$8000 to \$9999  
 e. \$10,000 to \$14,999  
 f. \$15,000 to \$19,999  
 g. \$20,000 and over

PART III -- The following questions apply to the son or daughter undergoing orthodontic treatment.

19. Age of child \_\_\_\_\_

20. Date of birth of child \_\_\_\_\_

21. Sex of child \_\_\_\_\_

22. What was the approximate average of this child's grades last year?

- a. ( )A  
 b. ( )B  
 c. ( )C  
 d. ( )D  
 e. ( )F

23. Is this child adopted? Yes No

24. What type of occupation or vocation would you like your child to have after he or she finishes school?



25. How much schooling do you anticipate for this child?
- a( ) Grade school
  - b( ) High school
  - c( ) College
  - d( ) Graduate school
  - e( ) Professional school
  - f( ) Other (vocational, trade school, etc.)

APPENDIX IV

SCORE SHEET

ITEM	ITEM SCORE					ITEM	ITEM SCORE				
	a	b	c	d	e		a	b	c	d	e
			DESIRE								
1	5	4	3	2	1	28	1	2	3	4	5
2	5	4	3	2	1	29	1	2	3	4	5
3	5	4	3	2	1	30	1	2	3	4	5
4	5	4	3	2	1	31	1	2	3	4	5
5	5	4	3	2	1	32	1	2	3	4	5
6	5	4	3	2	1	33	1	2	3	4	5
7	5	4	3	2	1	34	1	2	3	4	5
8	5	4	3	2	1	35	1	2	3	4	5
9	5	4	3	2	1	36	1	2	3	4	5
10	5	4	3	2	1	37	1	2	3	4	5
11	5	4	3	2	1	38	1	2	3	4	5
12	5	4	3	2	1	39	1	2	3	4	5
13	1	2	3	4	5	40	1	2	3	4	5
14	5	4	3	2	1	41	1	2	3	4	5
15	5	4	3	2	1	42	5	4	3	2	1
16	5	4	3	2	1				DISCOMFORT		
17	5	4	3	2	1	43	1	2	3	4	5
18	5	4	3	2	1	44	5	4	3	2	1
19	5	4	3	2	1	45	5	4	3	2	1
20	5	4	3	2	1	46	1	2	3	4	5
21	5	4	3	2	1	47	1	2	3	4	5
22	5	4	3	2	1	48	1	2	3	4	5
		SOCIAL IMPEDIMENT				49	1	2	3	4	5
23	5	4	3	2	1	50	1	2	3	4	5
24	1	2	3	4	5	51	5	4	3	2	1
25	1	2	3	4	5	52	5	4	3	2	1
26	5	4	3	2	1	53	5	4	3	2	1
27	5	4	3	2	1	54	5	4	3	2	1

APPENDIX V

SCORES OF PATIENTS ON SUBSCALES

PT.	SCORES ON SUBSCALES			PT.	SCORES ON SUBSCALES		
	DESIRE	SOCIAL IMPEDIMENT	DISCOMFORT		DESIRE	SOCIAL IMPEDIMENT	DISCOMFORT
1.	107	86	47	39.	103	83	38
2.	87	61	33	40.	102	68	39
3.	87	79	34	41.	102	72	41
4.	90	52	39	42.	102	76	37
5.	88	66	42	43.	78	50	26
6.	71	38	23	44.	93	61	42
7.	93	50	32	45.	96	65	42
8.	98	62	34	46.	88	57	31
9.	86	66	42	47.	110	79	52
10.	87	68	29	48.	97	77	40
11.	92	68	37	49.	82	54	28
12.	94	61	38	50.	99	69	33
13.	94	65	39	51.	97	73	36
14.	88	62	36	52.	67	60	35
15.	80	63	37	53.	78	48	35
16.	102	79	43	54.	89	58	33
17.	79	43	25	55.	80	62	39
18.	82	66	42	56.	59	27	22
19.	95	75	37	57.	78	44	33
20.	83	54	34	58.	84	60	40
21.	95	54	38	59.	95	60	35
22.	89	74	39	60.	99	77	38
23.	95	73	38	61.	110	72	38
24.	74	46	35	62.	92	68	35
25.	106	85	52	63.	108	69	46
26.	100	70	43	64.	97	86	50
27.	81	47	35	65.	89	64	38
28.	82	53	30	66.	96	76	38
29.	102	81	38	67.	108	89	46
30.	74	37	25	68.	107	80	42
31.	87	62	35	69.	97	67	38
32.	104	78	46	70.	87	40	32
33.	55	30	29	71.	90	55	37
34.	90	79	42	72.	95	51	40
35.	98	61	38	73.	80	65	39
36.	98	64	38	74.	86	60	35
37.	102	86	43	75.	99	71	38
38.	99	73	39				

## APPROVAL SHEET

The thesis submitted by Dr. Michael F. Gannon has been read and approved by members of the Departments of Anatomy and Oral Biology.

The final copies have been examined by the director of the thesis and the signature which appears below verifies the fact that any necessary changes have been incorporated, and that the thesis is now given final approval with reference to content, form, and mechanical accuracy.

The thesis is therefore accepted in partial fulfillment of the requirements for the Degree of Master of Science.

March 25, 1964  
DATE

Joseph R. Jansak  
Signature of Adviser