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RELATIONSHIPS BETWEEN BODY SIZE ESTIMATES, BODY IMAGE BOUNDARIES, AND HEALTH PRACTICES IN PREADOLESCENTS.

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RELATIONSHIPS BETWEEN BODY SIZE ESTIMATES, BODY IMAGE BOUNDARIES, AND HEALTH PRACTICES IN PREADOLESCENTS

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

by

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1970

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DEDICATION

To my husband, Gordon D. Cremer, who made it all possible.
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CHAPTER I

INTRODUCTION

Few of those many studies pertaining to human growth and development presented in the literature have been concerned with the meanings that body size or proportional dimensions might have for the individual. Much information has been gathered on normal growth parameters, growth deficiencies, growth excesses, and growth failures. Data have been accumulated not only in relation to growth statuses and expectancies, but also on that relating to growth determinants. Characteristic developmental behaviors have been identified and much has been learned about psychosocial progression. It is curious that in the midst of accumulating such a vast store of data we have so often failed to ask the child himself to estimate his own growth or developmental status and to tell us how he feels about it.

Are these important questions to ask children? As Bayer and Bayley point out, a child's own appraisal of his body size or its developmental progress may influence his body images, his interpersonal relationships, or his social status.¹ Growth problems, for example, are a common source of worry during preadolescence. It is reasonable to assume that the self-evaluations of a child of this age

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group might be reflected in his selection of the health practices he chooses to adopt, or in those that he himself considers to be most characteristic of his own behavior.

Of the relationships between health practices and future health status there can be little doubt, yet for many of us the choices we make as to health practices are quite personal ones, reflecting our values and the meanings that the body may have for us.²

During the first twenty years or so of life many internal and external changes occur in an individual's body. To these the individual responds, as do those people with whom he must interact. As the physiological aspects of his body change, an individual assesses these changes and reorganizes his perceptions of his body and his concepts of himself.

In order to gain a more complete understanding of the health practices of an individual, we need to know the meanings that his body and its changes have or have had for him.

It is these body meanings which, although shifting at times, coalesce to form the body concept.³ Not only is the body a participant in the process of perception, it is also an object of perception, an object in self-awareness. The concept of the body becomes an

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²Joseph H. Douglass, "Is man free to make choices for health?" School Health Review, 1 (September, 1969), 4-14.

³As Witkin uses the term: "... the systematic impression an individual has of his body, cognitive and affective, conscious and unconscious, formed in the course of growing up." See Witkin's discussion of the development of the body concept and the processes of psychological differentiation in The Body Percept, ed. by Seymour Wapner and Heinz Werner (New York: Random House, 1965), p. 27.
integral fraction of the total self-concept and an important aspect of self-esteem; it is built from all of the sensations arising from the interior of the body or its surface areas, from its postural changes and movement directions, from those emotional experiences and illusions of the individual that incite self-appraisal.

Such self-appraisals reflect assessment of body functioning as well as structure; they are judgments concerning the body's instrumental worth. As De Witt Parker suggested, the physical body assumes, for the individual, some of the characteristics of a tool, and certain levels of performance come to be expected from it.

The body's role as a tool--an extension of the self--becomes increasingly evident as the child enters the preadolescent period, when the influence of his peer group deepens. As the child grows on into these preadolescent years he intensifies his concern for his own adequacy; he begins to use all of his available physical resources to enhance his self-image and reinforce his self-esteem. In its role

5 Witkin, op. cit., p. 39. As Witkin explains, the term 'self' may be used to represent "... the systematized awareness a person has of activities and qualities he experiences as his own." Moustakas stresses the role of experience in the emergence of the self; he emphasizes that the maintenance of the real self is the most stable and consistent value in an individual's life, in: The Self, edited by Clark E. Moustakas (New York: Harper and Row, Publishers, 1956), pp. 3-14.
as a tool that can lead to self-enhancement, the preadolescent's body takes on increased personal meaning, for it influences not only his view of himself but also his perception of his interpersonal world.

A short, stocky, preadolescent girl, for example, coming from a family of overweight people, needs to learn and adopt ways of living that will enable her to maintain a desirable weight-height balance for the rest of her life. However, she also needs to recognize that her problem of weight-height proportion is a common one, shared by many others, and that these others will probably experience many of the same difficulties she will encounter in maintaining a desirable balance between the two.

The preadolescent, becoming concerned with his own all too evident problems of physical growth and development, needs to recognize that there are wide variations in the body sizes and proportional dimensions of healthy boys and girls of the same age, and that most of these are within quite 'normal' ranges.

Each late-maturing boy (or girl) probably needs some reassurance that he is not abnormal in his growth patterns, but is simply following his own unique timetable of development. As the child learns to accept differences in himself, he learns also to accept differences in others of his own group, although apparently, as several investigators

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have pointed out, the healthy individual's ability to accept himself depends in part on being able to see himself as others see him.

Preadolescents often seem to be deeply concerned with what they appear to be in the eyes of their classmates, as compared with what they feel themselves that they really are. Since their bodily changes are accelerating, differences in height and weight may become a source of some anxiety.

The annual assessment of the elementary school child's height and weight status is a common practice. There seems little merit in such measurement unless these procedures are accompanied by learning experiences that reduce anxiety and foster healthy behavior.

Measurement of selected aspects of physical growth and developmental status does provide an opportunity to help each child recognize and accept his own body, to understand his own basic body structure and the uniqueness of his growth patterns.

These learning experiences may also be used to help children to understand their own health problems and to realize that while there are many different patterns of healthy growth and development, there are also certain health problems and concerns common to all persons growing through a particular stage of maturation.

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10 Seltzer and Mayer, op. cit., p. 679.
There are some biological and social advantages accruing from the achievement and retention of a desirable weight-for-height balance and these may be jeopardized when disproportion occurs.

It may be difficult for some individuals to understand and accept a self-responsible role for the development and retention of satisfactory levels of physiological functioning because of the attitudes they hold about their own body and its appearance. To adopt healthier behavior patterns an individual may need to change not only his eating or activity patterns but also his attitudes and misconceptions about himself, his bodily structure, and his body's functional abilities.

Many of the studies relating to body image and the perception of body boundary lines tend to reveal that an individual's awareness of his body and its size is influenced by his attitudes toward himself.\(^{11}\) It has long been recognized that such attitudes emerge from a complex of sensori-motor and social experiences.\(^{12}\)

Self-perception is a continuous process, an expression of the total personality, and the individual identifies and evaluates himself in many different ways.

After the crystallization of body and self images (which apparently tend to stabilize during the adolescent period)\(^{13}\) it probably

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becomes increasingly difficult to induce the behavioral changes which would be conducive to the enhancement of health status.

Carl Rogers$^{14}$ has frequently stressed that efforts to alter behavior should be directly focused upon changing the perceptions of the self; perhaps one of the more fertile periods in which to encourage the individual to reorganize his field of perception and to see himself as the organizing agent is during the last year or so of childhood.

Coopersmith underscored a basic purpose underlying all effort in school health education when he pointed out that: "The question is no longer how to avoid maladjustment and insecurity but rather how to generate those capacities that enable an individual to function effectively in his private, personal and public activities . . . ."$^{15}$

For a growing number of individuals in our society, one barrier to effective functioning is an undesirable weight-height relationship. It is generally recognized that an excess of body fat constitutes a menace to total health, and that quite often obese children and adolescents tend to remain obese as adults.$^{16}$

Children as well as adults with obesity frequently suffer from disturbances of body image as well as from impairment of physiological


functioning, and these disturbances are often reflected in their figure drawings.

For example, one of the problems encountered in health counselling the markedly overweight young college woman is that many of these young women have difficulty in acknowledging the difference between their own body size and proportional dimensions and that associated with a desirable weight-height relationship.

It is not unreasonable to assume that perhaps this inability to estimate the body size or proportional dimensions realistically has its roots in the preadolescent period, when the child may begin to be more aware of the shared group norms for ideal dimensions of body size and proportional relationships. Certainly, approval from peers for possession of physical attributes considered desirable by the group would enhance the self esteem of the preadolescent, as well as contribute to the stability of the internalized picture of the physical appearance of the body.

The ability of the preadolescent to estimate his own body size or its proportional dimensions realistically may be seen as a function of the individual's awareness of the group norms for desirable

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body proportions. These body attitudes may well find expression in the adoption of desirable health practices related to body care and safety.

The major hypotheses of this study are derived from the assumption that the adult individual's attitudes toward his body and himself are reflected in the choices he makes insofar as his own health practices are concerned, and that a crucial period for the crystallization of these attitudes, and the adoption of desirable health practices, is probably during the preadolescent period of life.

An attempt was made to create test instruments that would provide objective scores of the preadolescent's ability to perceive and delineate own-body size and proportional dimensions.

Since, as Bayer and Bayley have emphasized, the child's appraisal of his body size or developmental progress influences his body images and his interpersonal relationships, valid test instruments that would provide objective scores could be used in the teaching-learning situation to motivate students toward the adoption of desirable health practices. Through the use of these drawing task instruments as teaching aids, a teacher may help the preadolescent to gain increased understanding of the growth and developmental processes; the student may become more aware of the functional aspects of his basic body structure, and develop an appreciation of the range of individual differences found in the onset and duration of the bodily changes associated with puberty.

Use of these instruments in a family life education setting in which prepubescent girls are taught about menstruation would help
in establishing the reasons for the bodily changes which accompany the onset of this bodily process, and would foster frank and open discussion of the meanings of the bodily changes as well as the feelings which accompany them.

In an individual counseling situation, use of the drawing-tasks and skillful interpretation of the test results would help overweight or underweight youngsters to view themselves with more objectivity, and might motivate them toward a more self-responsible role in the achievement of a desirable weight-height balance.

Validation of the drawing-task instruments may well provide a technique which might prove valuable in early identification of a preadolescent with a disturbance of body image (i.e., marked overestimation of body size might indicate need for professional help). As a research tool, such an instrument would be of interest.

**Statement of the Problem**

It is the purpose of this study to develop and try out a set of drawing-task test instruments that can be used to objectively measure the ability of preadolescent school children to estimate their body size and its proportional dimensions.

Subparts of the problem are the following: (a) to determine whether or not a significant relationship exists between indicators of body size and estimates of body size made by preadolescents; (b) to determine whether or not significant relationships exist between scores made on body image boundary dimensions and accuracy of estimations of body size; and (c) to determine whether or not significant
relationships exist between accuracy of estimations of body size and self-reported health practices related to body care and safety.

Hypotheses

In studying body attitudes, various techniques have been used. Most of these are based on the assumption that the physical body, the body images, and the individual's external representation of his body are in isomorphic relationship to one another. Body attitudes, then, may well be reflected in the self-reported health practices of individuals as these relate to aspects of body care and safety.

Hypothesis 1. A significant relationship (to the .05 level of confidence) will be found to exist between scores representing the accuracy of body size estimates made on the front view drawing tasks and those made on the side view drawing tasks.

Hypothesis 2. Significant relationships (to the .05 level of confidence) will be found to exist between scores representing self estimates of body size and proportional dimensions and those indicating actual size and proportional dimensions of the body.

Hypothesis 3. A significant relationship (to the .05 level of confidence) will be found to exist between scores representing accuracy of estimations of body size and those representing body image boundary dimensions.

Hypothesis 4. A significant relationship (to the .05 level of confidence) will be found to exist between scores representing accuracy of self estimates of body size and proportional dimensions and those obtained through descriptions of various health practices.
Hypothesis 5. A significant relationship (to the .05 level of confidence) will be found to exist between scores describing self-reported health practices and those representing the body image boundary dimensions.

Hypothesis 6. No significant differences will be found to exist between scores made by preadolescent boys and those made by girls on the body size estimation tests.

Hypothesis 7. No significant differences will be found to exist between scores made by boys and those made by girls on the body boundary dimension scores.

Hypothesis 8. No significant differences will be found to exist between scores made by boys and those made by girls on the Health Behavior Inventory.

Limitations of the Study

One of the limitations of the study was recognized early in the planning stages, when it became apparent that it would be necessary to obtain signed consent from the parent or guardian of each child in the classrooms selected for participation. It was recognized that consent forms would be lost or unsigned, and that it would not be practical, within the confines of the study, to determine more than surface reasons for any apparent rejections. Bias, it was recognized, would limit the representativeness of the study sample if the rejections occurred in substantial numbers, or if they occurred primarily when the child had some physiological or psychological impairment.
Another limitation of the study was the survey instrument\textsuperscript{21} selected as the vehicle for the assessment of self-reported health practices. The instrument is valid, well-standardized and has been widely used, but it was constructed for use with children in grades 3 to 6, and at the fifth grade level, the responses may well indicate more of an awareness of the desirability of a selected health practice than of habitual behavior. The inventory was developed as a teaching aid, and while it has been used for other purposes, the content which relates directly to body care or safety is not extensive.

The body image boundary dimension indices, as represented by the Barrier and Penetration indices,\textsuperscript{22} provide objective scores that relate to selected aspects of body image. In developing the Holtzman Inkblot Test (and in subsequent administrations of the test), groups of elementary school children and various adult population samples were studied. A range of test-retest reliability values has been obtained.\textsuperscript{23} Since administration of the total complex of paper and pencil tests, body measurements, and the photographing of subjects in bathing suits required several hours of regularly scheduled classroom time, it was decided to omit the collection of the test-retest data which would have strengthened the study's findings. Further research is planned with these same subjects when they have reached the seventh grade level.

\textsuperscript{21}Sylvia Yellen, Health Behavior Inventory: Elementary (Monterey, Calif.: California Test Bureau, 1964).


\textsuperscript{23}Fisher and Cleveland, \textit{op. cit.}, p. 391.
A further limitation of the study resides in the fact that the subjects were all attending parochial schools. While the Health Behavior Inventory and the Holtzman Inkblot Test have been widely used, their use in schools has been limited primarily to public schools. It is not known whether religious preference would be an influential factor in the comparison of such test scores between school populations; this must await further study.

Definitions of Terms Used

Body image. The mental picture each individual has of his body at any given point in time.

Body concept. The evaluative picture each individual has of his own body and its functional capacity at any moment.

Total Front Discrepancy Index (TFDI). The score which represents the difference between the estimated and the real body breadths on five front dimensions: bustline, waistline, hipline, right thighline, left thighline.

Total Side Discrepancy Index (TSDI). The score which represents the difference between the estimated and the real body breadths on four side view dimensions: the bustline, waistline, hipline, and thighline.

Body Size Estimation Test. The drawing-task instruments, which when objectively scored according to prescribed techniques, produce a numerical index of the individual's ability to perceive and delineate his body contour lines and proportional dimensions.

Barrier Score. An objectively scored index of body boundary dimension obtained through administration of the Rorschach or Holtzman Inkblot
Test. As used in this study, the score refers to that elicited from an individual's responses to the administration of the first 25 inkblots of the Holtzman Inkblot Test as these relate to the boundary or container-like qualities of the inkblot.

Penetration Score. An objectively scored index of penetration of body boundary dimension obtained through administration of the Rorschach or Holtzman Inkblot Test. As used in this study, the score refers to that elicited from an individual's responses to the administration of the first 25 inkblots of the Holtzman Inkblot Test as these relate to the intrusion into, breaking up, or wearing away of the surface of things perceived in the inkblots.

Ponderal Index. The indication of body volume, or surface area expressed by the formula: height divided by the cubed root of the weight of an individual.
CHAPTER II

REVIEW OF RELATED RESEARCH

The review of the research literature that follows is organized around the basic ideas determining the selection of the specific tests and measurements used during this investigation.

First, a major portion of the study was related to and concerned with the use of line drawing tasks as projective devices from which aspects of personality functioning might be inferred, and the present investigation is thus an extension of an earlier study* in which the basic techniques of the Body Size Estimation Test were developed.

The possible meanings inferred from representations of body space in child drawings and in figure drawings obtained from children and adults have intrigued investigators for many years. Aspects of certain of these studies which contribute to the present work are reviewed, insofar as they are pertinent to the understanding of the preadolescent growth period.

Second, the Ponderal Index, used to indicate body surface area or volume, has been utilized in many studies in order to compare an index of body size with others which purport to measure self con-

cept, body concept, ideal self concept, etc. Those which seem most relevant to the purposes of the present study are discussed, as are other studies concerned with the estimation of body size or proportional dimensions.

Third, the research related to the body image boundary dimensions (characterized by Fisher and Cleveland as the Barrier and Penetration Indices) is reviewed, since in one sense, body attitudes may be inferred from an individual's characteristic life style.

In developing a method for objectively measuring the degree of definiteness an individual ascribes to the boundaries of his body, Fisher and Cleveland turned to projective tests as a means of eliciting data concerning the body image from subjects, and in doing so they utilized both the conventional Rorschach and the Holtzman Inkblot Tests. Since 1958, many research papers have appeared which are concerned with the investigation of the body boundary dimensions, and those which seem to have bearing on the present study are reviewed.

Fourth, the review of the literature considers the various attempts to measure the attitudes, knowledges and practices related to health and disease as these have focused upon elementary school children.

Health instruction is primarily concerned with providing learning experiences that favorably influence the actions people take in relation to their own health status. To motivate individuals toward the adoption of desirable health practices, health scientists must be

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aware of many factors, among them the periods of growth and crisis, the commonality of developmental tasks, and the influence of cultural pressures as these interact and condition the attitudes and actions of target populations.

Although many factors other than attitudes condition behavior, one of the assumptions made by the author was that an individual's basic attitudes toward his body, himself, and other persons in his environment probably find expression in the adoption or rejection of specific health practices.

**Representation of Body Space**

In the development and construction of the Body Size Estimation Test, the assumption was that accuracy of perception of size and shape was a reflection of developmental progression and as such would be a function of maturation as well as experience.

In learning to differentiate 'me' from 'not me', children go through a series of developmental stages. Piaget's studies clearly indicate that in perceiving the world around him, and in learning and organizing the various aspects of his culture, the individual's development proceeds in an orderly sequential process of growth and change.\(^3\)

While these developmental stages are to some extent age-bound, they are also, in their order of sequence, age-free. According to the

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cognitive theories of Piaget, progress in development continues through a series of generalizations and differentiations, each level of development being rooted in a previous phase and branching into the next.

Piaget postulates five developmental phases: the sensory-motor, the preconceptual, the phase of intuitive thought, the stage of concrete operations, and the formal operations phase. It is during the phase of operational thought that the child apparently develops the capacity to order or classify, and to relate his experiences to an organized whole.

The child in the seven to eleven year age range cannot perform mental operations unless he can perceive their inner patterns and relationships. The developmental processes contributing to the understanding of spatial relationships take place at both the sensory-motor and the symbolic levels, as the child, for example, moves from the perception of shapes to their representation in his drawings.

It is thought that the different properties of space are mastered in a definite sequence: first, size in terms of length; second, size in terms of weight; and third, near the end of the phase of concrete operations, size in terms of volume.

The investigations by Piaget and Inhelder which are of most concern for the present study are those which deal with the development of representational space. These involve the study of drawing in children between the ages of two and twelve years.

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As Piaget emphasized, representational space construction depends upon the development of complex co-ordinate systems; these may not be fully developed until the age of eight or nine. Before the child organizes projective and euclidean space, he must build up and use primitive relationships—proximity and separation, order and enclosure. Children are apparently able to recognize and represent only the shapes that they can reconstruct through their own actions.

Once the child can copy a rectangle and square, the triangle is soon mastered, but the rhombus is not successfully copied until about the age of seven.

Piaget's early studies of the ability of children to copy squares and rectangles show that rhombus achievement comes only after the child has learned to copy figures involving abstraction of shape. The child must be able to grasp the reversed ordering of line action that brings symmetry to his drawing. As Piaget and Inhelder stated:

\[\ldots\text{to discover one's own viewpoint is to relate it to other viewpoints, to distinguish it from and co-ordinate it with them. Now, perception is quite unsuited to this task, for to become conscious of one's own viewpoint is really to liberate oneself from it. To do this requires a system of true mental operations, that is, operations which are reversible and capable of being linked together.}\]

Experiments carried out by Piaget and Inhelder with children aged four to twelve years showed that a comprehensive co-ordination of points of view was not developed until the age of nine or ten years, when the drawings of the children began to show mastery of perspective.

\[5\text{iibid., p. 193.}\]
The ability to estimate the size of objects at a distance probably continues to develop through adolescence (Aeigler and Leibowitz; Cohen, Hershkowitz, and Chodak).

A healthy child of nine or ten years would probably have reached a stage of psychological differentiation that would permit him to make relatively accurate judgments concerning his body and the size of its parts. Apparently non-object size perception in the adult parallels body-part size perception, and it is reasonable to assume that the same may be true of preadolescents.

The drawings made by children have been used in psychological testing situations to measure intellectual development, to determine

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levels of developmental processes, and as diagnostic and therapeutic devices.

Although it has been recognized that culture plays a significant role in determining the content of children's spontaneous drawings, Kellogg's exhaustive analysis of children's paintings from many countries led her to the conclusion that: "... all children everywhere draw the same things in the same way at the same age." Children begin to draw the human figure at about the age of four, but this seems to be more a matter of design elements than of representational intent. Not until the age of five or six does the child's picture begin to tell its own story.

As Eng has pointed out, most children seem to give up spontaneous drawing at about the age of ten, when they begin to see that their drawings are poor imitations of nature. As a general rule, however, children and young people from eight to sixteen still seem to prefer linear and clear pictures.

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Lowenfeld's work seems to support Eng's findings. Lowenfeld establishes a 'stage of dawning realism' in children's drawings that occurs between the ages of nine and eleven years. Careful study of the artwork of children at all ages clearly shows the general interdependence between a child's creative expression and his mental and emotional growth.

It is in the stage of dawning realism that the child, in his drawings, seems to become aware of the meaningfulness of the space between the base lines; trees, houses, and people no longer stand on the edge of the baseline or remain suspended in space. Essentially, the child seems to become graphically aware of anchor points and spatial symmetry.

Lowenfeld, in his writing, has emphasized the importance of conscious visual perception and expression of depth by the child in his creative products. He states: "Children who are misunderstood by their parents feel frustrated and as such have the tendency to withdraw within themselves. In drawings, this withdrawal expresses itself in the inability to establish spatial correlations."\(^1\)

In the ten to eleven year old child the inability to establish spatial correlations could be an indication of his emotional state, for a close relationship apparently exists between an individual's self concept and his creative expressions.


\(^{15}\)Ibid., p. 189.
Many investigators have based their work with children and their drawings on the idea that even in early childhood, the body-image of the child may be inferred from the concepts expressed by his drawings.

As originally developed and subsequently standardized, the Goodenough Draw-A-Man test has placed its major emphasis upon the assessment of developmental levels of conceptual thinking, not upon the measurement of artistic skill. The test has been widely used to test many different hypotheses related to psychological differentiation or functioning, although its major use has been as an indicator of intellectual ability. In the revised scaling of the Draw-A-Man test the subject is asked to draw a man, a woman, and himself.

Schilder felt that Goodenough's work with the figure drawings of children had great importance for the study of the problems of body image in children. He said: "... the way in which children draw human figures really reflects their knowledge and sensory experience of the body image. They express at least the mental picture they have of the human body, and the body-image is mental picture as well as perception."

As Schilder pointed out, in discussing the progressive development of the body-image: "Our bodily self is built up according to the needs of the personality ... . By actions and determinations

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17 Goodenough and Harris, *op. cit.*
we give the final shape to our bodily self. It is a process of con-
tinual active development."  

Machover's work with figure drawings is based on the as-
sumption that certain graphic traits observable in the drawings are
cues to elements of the drawer's personality. Machover came to the
collection that an individual's attitude toward his body had a sig-
nificant influence upon his ability to deal with unstructured spatial
situations.

Bennett studied the figure drawings produced by sixth graders
in public schools. She found significant relationships among all
traits and self-concept Q sort scores. Measurements were obtained
on twenty-seven graphic traits considered to be clues to the per-
sonality of the drawer. Of these, seven variables were found to
account for thirty-five percent of the variance: abnormal placement,
large head, ears absent, buttons absent, heels present, sex (if the
derwer was a male).

On the basis of much of her own and other research, Loevinger postulated a personality trait that she described as the capacity to

19 Ibid., p. 105.
20 Karen Machover, Personality Projection in the Drawing of the
Human Figure (Springfield, Ill.: Charles C. Thomas, Pubs., 1949).
21 Virginia Bennett, "Combinations of Figure Drawing Character-
istics Related to the Drawer's Self Concept," Journal of Projective
22 W. Stephenson, The Study of Behavior: Q-technique and Its
23 Jane Loevinger, "A Theory of Test Response," Proceedings of
1958 Invitational Conference on Testing Problems (Princeton, N. J.: 
Educational Testing Service, 1959), pp. 36-47; see also the work by
J. Loevinger and A. G. Ossorio, "Evaluation of Therapy by Self Report:
conceptualize one's own self, or to assume 'distance' from one's self and one's actions or impulses.

Studies have shown that the ability to form a self concept increases with age, intelligence, education, and socio-economic level. As an individual matures, he progresses toward a differentiated and relatively realistic self concept.

Various testing devices have been developed which purport to measure selected aspects of an individual's self concept. Figure drawings, Q sort techniques, Adjective check lists, and Semantic Differential scales have all been utilized in an attempt to test specific hypotheses related to the 'self', the 'ideal self' or the 'social self' (an individual's estimate of himself as he envisions others evaluate him). These focus on how objects are perceived by the individual, and in this sense, the body is object, as is the self.

Boraks studied body cognition, using undergraduate students. He viewed body image as being organized around and built up out of three internal and hierarchically organized representations of body experience (body perception, body conception, and body phantasy) defined as levels of body cognition. In addition, Boraks suggested a further psychological dimension, a motivational link between body image and self image, which he termed body involvement.

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Boraks utilized a ten-concept rating scale modeled after Osgood's semantic differential techniques, two human figure drawings (of 'self' and of a 'person') and asked his undergraduate subjects to estimate the linear size of seven body parts. He then measured each subject on each of these body parts. The drawings were scored by judges, and the total area on the page covered by the drawing was also measured. Body involvement was evaluated by means of a modified version of the Secord Homonym Test. The findings of the study suggested that a different kind of body image organization existed for each sex, since male subjects had greater differentiation in the conceptual and phantasy aspects of body cognition than did the females.

Gasser studied the body-image concepts of boys aged eight to eleven years, as these were expressed in self-drawings; the drawings were then sorted by judges as to their representations of feelings of inadequacy and inferiority, and then were ranked according to the ethnic group membership of the drawer. Gasser came to the conclusion that while there were no significant differences in the drawings when ranked according to ethnic groupings, that ranking according to socio-economic level might have been more rewarding. However, during these years, boys would in all likelihood just be entering their pre-adolescent growth spurt, and thus not have demonstrated the body concern that would probably have been readily apparent on their drawings, at a later stage in development.

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As Gordon points out, the major change in the child's view of himself comes with adolescence: "... most children accept their bodies but do not single them out for special concern during pre-adolescence. We might hypothesize that those who do are either early or late maturers, or differ significantly in some way (obesity, illness) from their peers."^{29}

The work by Simmel,^{30} Money,^{31} and others^{32} emphasizes the role of past experience in the development of the basic body schemata, and the inclusion of features of the body and its parts in this cognitive structure.

When the Draw-A-Person test has been used with individuals handicapped by physical abnormalities, the figures drawn by these subjects have shown characteristics related to the physical condition manifest in the subject. In studies of dwarfism, for example, it has been shown that children tend to project their statural deficits into their drawings.

Evidence from studies by Witkin et al.,^{33} tends to support the premise that the tendency to experience the body as more articu-

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lated or less articulated is associated with a tendency to experience the self and the environment in the same way. Figure drawings were secured from ten-year-old boys who were asked to draw a person, and then another person of the opposite sex. A five-point scale was designed on which articulation of the body concept could be assessed. The drawings were evaluated as to form level, identity or role and sex differentiation, and level of detail.

Two aspects of body concept seem to be reflected in performance on space orientation tests: (a) extent to which body is experienced as clearly an entity apart from its surrounding field, and (b) degree of inner structure, or 'emptiness of the body container'. In the drawings of children whose performance on spatial orientation tests identified them as field-independent performers, Witkin and his co-workers found the following characteristics: "The body is typically drawn in realistic proportion. The parts of the body are presented in some detail and fairly realistically. There is clear representation of sex and sex differences." 34

Katcher and Levin 35 used schematic representations of body parts to study the ability of nursery school children to make realistic estimates of the sizes of three selected body parts (head, torso, legs). The children were asked to select from a triad of part sizes the one of each which most represented the size of their own body part. Of


all the subgroups (older girls, younger girls, older boys, younger boys) the older girls were most consistent in identifying their own body parts as being smaller than their parents.

Hunt and Weber\(^{36}\) used a variation of the Katcher and Levin technique in their investigation of the visual perception of height, conformation, and proportional dimensions of the body; subjects for this study were young college women. Emphasis in their study, however, was placed on what subjects thought about their body outlines, and no attempt was made to measure the accuracy of perception of size of body parts.

Bender and Keeler\(^{37}\) used figure drawings, verbalizations, and other variables in a study of the self concepts and body images of schizophrenic children. The investigators used behavioral observations, verbalizations, figure drawings and dreams as sources for data concerning the body image. One of their findings was that schizophrenic children had particular difficulty in determining the periphery of their bodies, and seemed preoccupied with the establishment of a body boundary line. In their figure drawings, the body periphery was heavily outlined.

As Fisher and Cleveland stated: "It has been clearly shown at an experimental level that an individual's perception of his body size may be affected by the nature of his attitudes toward himself


and his body." Several studies are cited which tend to support this point of view.

Kurtz, in a study involving male and female undergraduate students, used a Semantic Differential-type scale which elicited responses to thirty body concepts. The Rees-Eysenek Index of body size was used to classify subjects as to body size, while the Rees-Eysenek Index of body build was used to categorize conformation (eurymorph—wide, squat type; mesomorph—medium; leptomorph—thin, narrow). Results of the study indicated that subjects' attitudes toward their bodies varied as a function of sex, size, and body shape.

Bachelis studied relationships between levels of body-perceptual differentiation and creative thinking, in which the perception of the body was seen as object separated from environment. Subjects were male college students, and the body-field perceptual differentiation was assessed by means of five tests: Body Sophistication Scale, Finger Apposition Test, Two-point Tactile Test, Thurstone Hands Test, and the Rorschach body boundary dimension known as the Barrier score. The body-field perception was altered through the use of monocular retinal inverting lenses; however, only the Finger Apposition Test results, and those on the Two-point Tactile Test were related to creative thinking.

Woods explored the developmental relationships between estimated dimensions of body space, performance of motor tasks, and body image boundary dimension (Barrier scoring) in a population of elementary school children. In this study, Woods used a modification of the Popper Height Estimation Test. The children were eight, ten, and twelve-year-old boys and girls, who tended to underestimate their heights, extended heights and span (when these were symbolically represented on paper and pencil tests).

Orbach, Traub, and Olson designed an instrument that purported to measure (objectively) the internalized picture of the physical appearance of the body. A plastic full-length mirror, constructed so that it was of crystal glass quality, was designed so that it could be adjusted to reflect the body of the subject on a distortion continuum that ranged from no distortion to extreme distortion.

At the beginning of each of four problems the subject was presented with an extremely distorted reflection of himself, and asked to watch his reflection change; the subject was asked to indicate when the reflected image looked just as he did himself. Judgments of head and shoulders were most accurate, using this instrument, while those involving the legs and feet were least accurate.

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42 Juliet Popper, "Motivational and Social Factors in Children's Perception of Height." Unpublished Ph.D. dissertation, Stanford University, 1957. Popper suggested that the tendency to overestimate one's height probably reflected some inaccuracy in the perception of one's physical self, and she found that in children the distortions in perceived height were related to feelings of inadequacy and inadequacy.

Cassell used undergraduate students to study the relationships between body image boundary dimensions (Barrier scoring) and speed of perception of internal and external aspects of the body. Men perceived the internal organs (presented photographically) at a significantly greater speed than women students were able to do.

As Cassell pointed out: "An individual's awareness encompasses a fluid field of shifting percepts. An important sector of this field focuses on the space demarcated by the human body. Each individual has an idiosyncratic hierarchial pattern of awareness for the component segments of the body space." To provide Barrier scores and barrier minus body interior awareness scores, Cassell presented Rorschach Inkblots to groups of eight individuals at a time.

Fish constructed a multiple choice variation of the usual Rorschach technique responses to measure Barrier and Penetration scores in boys aged seven, nine, and eleven years. She also obtained estimates of height from these subjects and used figure drawings to obtain predictions of how subjects expected to be when they grew up. Fish found that the Barrier score was not significantly related to self-estimates of height.


Epstein used vibration in an experiment to study the apparent perception of body-part size, using a population of college students. Initially, most subjects underestimated body parts and non-body objects. With initial underestimators there was a significant tendency to increase size estimation on re-measurement, while initial overestimators tended to decrease estimates. Non-body size perception paralleled body part perception by subjects.

Staffieri used silhouettes of extreme body types to study the perception of body type in boys aged six to ten years, and also compared teacher ratings of body types with thirty-nine traits on an objective check list scale. The subjects were grouped according to relative fatness, muscularity and thinness on the basis of Ponderal Index scores.

A selected group of subjects demonstrated reasonable accuracy in the perception of their own body types, but results showed clearly that boys in these age groups have a common concept of behavior-personality traits associated with various body types. Subjects demonstrated a preference for the mesomorphic image.

All of the significant adjectives used to describe mesomorphic body types were favorable ones, while those assigned to endomorphic body types were socially unfavorable, and those assigned to ectomorphic physiques were personally unfavorable.

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Iftikhar \(^{49}\) studied the social stereotyping of body images in elementary school children aged from six to ten years. The Ponderal Index was again used as a measure of body surface area and physique. Results indicated that children whose body types were of the favored physique had more accurate concepts of themselves than the subjects did whose bodies were of the unfavored types, and this was true of both sexes.

Cremer and Hukill \(^{50}\) presented line drawings of tall, medium, and short idealized female figures to undergraduate women, in an attempt to determine the effect of weight-height ratio on perception of body size. In their study, the greater the amount of undesirable weight, in pounds, carried by the subjects, the greater the amount of underestimation of body size demonstrated.

These line drawings represented drawing tasks and as such they elicited measures of conscious awareness of body size and contours; this contrasts with the interpretation of figure drawings done by subjects, and the body dimension scores gained from inkblot presentations, which largely elicit unconscious body percepts.

Many children and adults, when faced with a blank sheet of paper and the request that they draw a person or themselves, will protest that they have no drawing ability. The presentation of a line drawing task avoids eliciting this response by asking the subject to


alter a drawing with which he can identify. While the subject pencils in the alterations which indicate his own opinion of his body size and its contour lines, he does not seem to regard this as 'drawing' in the usual sense of the term. Although the Body Size Estimation Test does purport to objectively measure the perception of body size and contour lines, this is on the phenomenological level. As a theoretical construct, body image is considered by most investigators to be a largely nonphenomenal aspect of the body concept.

The Body Image Boundary Dimensions

In their survey of the body image concept as it appears in the various theoretical systems of psychological thought, Fisher and Cleveland paraphrase the viewpoint of Lotze by saying that "an individual builds up a complicated series of body 'landmarks' which become reference points in interpreting spatial relationships." Lotze's theory, explain Fisher and Cleveland, focused upon the body as a standard reference, a representation of the features of a limited area, one which authoritatively sets a certain type of order upon an individual's experiences. Fisher and Cleveland continued: "Freud conceived of the body image as the original framework for the development of the whole ego structure . . . . Most of the ideas about body image in the current literature stem at least in part from Freud's theorizing about body experiences." The term body image is used to represent a psychological 'map' of the body. According to Fisher and

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52 Ibid., p. 46.
Cleveland, the term body image:

... focuses on the individual's feelings and attitudes toward his own body. It is concerned with the individual's subjective experiences with his body and the manner in which he has organized these experiences. The assumption is that as each individual develops he has the difficult task of meaningfully organizing the sensations from his body—which is one of the most important and complex phenomena in his total perceptual field.  

Schilder described the progressive development of the body image by saying that: "Our bodily self is built up according to the needs of the personality . . . . By actions and determinations we give the final shape to our bodily self. It is a process of continual active development."  

As Wylie points out: "By far the most widely studied body image index is Fisher and Cleveland's Barrier score on the Rorschach." Fisher and Cleveland originally devised the boundary dimension index from responses to Rorschach administrations. When they began their work with the Barrier score, they assumed that it would validly indicate the degree to which individuals "experience their body boundaries as definite and firm versus indefinite and vague." The Barrier score is determined from response content relating to distinctive surfaces, enclosed openings, articles of clothing, containerlike shapes, and the like.

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53 Ibid., p. x.
56 Fisher and Cleveland, op. cit., p. 56.
The Penetration score reflects an individual's feeling that the exterior of his body gives him little protection and could easily be penetrated. Responses that are given in terms of images that involve the intrusion, disruption, or corrosion of the outer surfaces of things, or channels for getting inside things, or fragile surfaces, for example, are scored for Penetration.

These two body-image scores tend to show only a limited relationship with other Rorschach determinants, and show only a chance relationship with intelligence. So long as the response total is controlled the boundary dimension scores are apparently not influenced by whether the Rorschach records from which they are determined were secured individually or on a group basis. 57

The Rorschach is a projective technique which has been extensively used in the diagnostic investigation of the personality. The Holtzman Inkblot Test also makes use of inkblots for psychodiagnosis and personality assessment, but it utilizes an objective scoring technique that has been shown to be highly reliable. While early work with the boundary dimension scores was based on the use of individually administered Rorschach Tests, in much of the later work done by Fisher and Cleveland, the Holtzman Inkblot Test has been used in group settings. A number of test-retest studies involving the use of barrier scoring on the Holtzman Inkblot Test have been completed, and these indicate a range of reliability values from 0.40 to 0.89. 58

57 Ibid., p. 71.
Fisher and Cleveland, in discussing the results of the many studies which have been done using the Barrier score as one of the variables, point out that the score apparently shows little relationship with scores that describe features of the actual structure or condition of the body. Cheatham's work, for example, with somatotype classifications and conventional scoring categories on the Rorschach demonstrated that there were apparently no significant relationships between them; Fisher and Cleveland found only a chance relationship between Barrier scores and somatotype scores.

As Fisher and Cleveland interpret the body image boundary dimension, it seems to correspond in some ways to: "a screen on which is projected the individual's basic feelings about his safety in the world. It is a screen which he interposes between himself and outer situations and which he can carry with him at all times."  

Of the two boundary dimensions, the Barrier score has been the more widely studied, and seems to reflect the most stability. Although the Barrier score seems to have little relationship with the actual physical attributes of an individual's body, it does seem to indicate important qualities of being associated with the body as social object.

Maher studied obese and non-obese subjects, in an attempt to determine whether or not exterior symptoms site, when separated from

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60 Fisher and Cleveland, op. cit., p. 354.
self-steering behavior, would be predictive of a high Barrier score; results of his study indicated that a high Barrier score reflected an alertness for objects which had productive interaction with the environment. He matched his obese and non-obese subjects for age, sex, race, height, and educational program, and placed them in groups differentiated by inter-pair homogeneity and interpair heterogeneity; in neither group did the obese subjects distinguish themselves as high barrier subjects. Maher concluded that the relatedness of barrier score and somatic conditions was founded on the intimate and reciprocal responsiveness of behavior and body to each other.

McFee, in a follow-up of the Woods study, investigated the relationships between Barrier scores, estimations of body space dimensions, and performance of motor tasks; she found that both females and males overestimated their height. Male and female subjects tended to be accurate in representing their width dimensions, but the males were more accurate. There was an inverse relationship between Barrier score and subject's overestimation of the vertical body dimensions in both sexes.

Cleveland et al., in a study of schizophrenic subjects, found that they consistently overestimated body size. Reitman and


Cleveland studied body-image changes in neurotic and schizophrenic patients after a period of sensory isolation. The schizophrenics showed increased tactile sensitivity and decreased concept of body size after isolation, but the non-psychotic patients showed no change in tactile sensitivity and an increased concept of body size.

In discussing theories concerning body image, Fisher and Cleveland suggested that the body scheme may function as a frame of reference that influences perception as well as performance of certain skills. Body image is recognized as a psychological variable which evolves gradually as a result of learning experiences. The Barrier and Penetration techniques for evaluating body image phenomena were seen by these investigators as indicators of the boundary aspects of this unconscious schema.

Wylie, in her discussion of the studies related to these constructs, points out that: "... to establish the discriminant validity of the Barrier scores as indices of unconscious body image boundaries, we need studies in which S ' Barrier scores are compared with their conscious descriptions of body boundaries as such."

Woods, in studying the developmental relationships between boundary dimension scores and estimations of body spatial dimensions by children, attempted to meet Wylie's dictum.

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Kennedy and Lasswell,\textsuperscript{66} and Fish\textsuperscript{67} also studied the body size estimates of school children and related these to body and self image variables. In these studies, as in the Woods study, both boys and girls tended to underestimate actual body size.

Apparently the tendency to underestimate aspects of body size is also a characteristic of healthy adults.\textsuperscript{68} In an unpublished study by Fisher and Gaston,\textsuperscript{69} using normal undergraduate students, results indicated that the tendency to underestimate body size was associated with a normal, well-integrated body image.

Disproportionate gross body size may be associated with disturbances of the body image. The body size may become a symbolic insulating barrier against strong emotions or external stress.

The body boundary concept is an intriguing one and one that has fostered many studies. The Barrier Index seems primarily to reflect persisting attitudes, while the Penetration Index seems to reflect the perception of immediate situational conditions. As Fisher and Cleveland said: "... the individual with well-defined boundaries is one who is achievement and goal oriented and highly motivated toward the mastery of problems; and such traits count heavily in coping adequately with frustration and difficulty."\textsuperscript{70}


\textsuperscript{68} Cremer and Hukill, \textit{op. cit.}

\textsuperscript{69} Cited by Fisher and Cleveland in \textit{The Body Percept}, p. 63.

\textsuperscript{70} Fisher and Cleveland, \textit{Body Image and Personality}, p. 392.
One would expect, then, that the high Barrier individual might demonstrate this mastery in his approach to the solution of his health problems and in the selection of his health practices. If one can assume that there is probably a relationship between body attitudes and measures taken to preserve the body's integrity, assessment of an individual's self-reported practices might provide an indication of his body attitudes.

The concluding portion of this review of the literature deals with the construction of various tests in health education, and the assessment of health attitudes, knowledge, and practices of elementary school children.

Measurement in Health Education

Many studies in health education have been concerned with some aspect of the attitudinal dimension. Three attitudinal components are usually inferred: (a) the cognitive, (b) the affective, and (c) the behavioral. These three dimensions are based on the assumption that attitudes are precursors of behavior. Defined by English and English as: "an enduring, learned predisposition to behave in a consistent way toward a given class of objects; a persistent mental and/or neural state of readiness to react to a certain object -- class of objects, not as they are but as they are conceived to be." In Horace B. English and Ava C. English, A Comprehensive Dictionary of Psychoanalytical Terms (New York: David McKay Co., Inc., 1958), p. 50.


preparatory base of the beliefs and values which promote internal consistency and give meaning to objects and situations in their environment.

The earliest quantitative studies of attitudes and the processes of attitudinal change were done in the late 1920's, following Thurstone's\(^7\) proposal of an objective method of measurement based on the 'law of comparative judgment'.

The law of comparative judgment hinges upon the assumption that when an individual is presented with a stimulus and asked to make a judgment about some aspect of that stimulus, his reaction represents a most frequently aroused action pattern—a modal discriminant process—on a psychological continuum. These reactions are expressed as depths of feelings or levels of concern.

In all psychological scaling methods used for the quantification of subjective data, the individual's place on the attitude continuum is estimated from his responses to the statements on the scale. The statements are usually arranged on the psychological continuum so that they range from least favorable to most favorable.

Utilization of the theoretical rationale implicit in the law of comparative judgment makes it possible to measure, objectively, the many kinds of values, beliefs, subjective experiences or characteristic behaviors that individuals report on paper and pencil tests.

Although few of the studies done in health education are primarily concerned with the measurement of attitudes, many of the survey instruments developed to assess health practices or beliefs

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about disease are based upon some aspect of the law of comparative judgment. Most of the investigations in health education reported in the literature attempt to measure health knowledges and behaviors while purporting to elicit attitudes or assess attitudinal change.

One of the earliest published tests related to health instruction and the planning of a curriculum in health and disease at the elementary classroom level was a self-report instrument devised by E. George Payne. 75

Designed for testing the health knowledges and practices of children in public schools in grades four to eight, the test was to be used (as was the Health Behavior Inventory 76 selected for use in the present study) as a basis for planning and subsequently evaluating the effectiveness of a course of study based on the content covered by the test questions. Students were asked to report on their own health practices in respect to eleven categories of health and safety.

Franzen, in 1929, conducted a study for the American Child Health Association in which the theoretical rationale implicit in the law of comparative judgment was used in test construction to measure the health knowledges and behaviors of fifth and sixth grade children in public schools. A battery of five tests was built in which attempts were made to measure awareness of desirable as well as undesirable health practices.


These tests were research instruments which contained 250 items and they required over 90 minutes for administration. In the original form, the tests were too unwieldy for practical classroom purposes, and in 1933 revised forms of the tests were published.\footnote{Raymond H. Franzen, Mayhew Derryberry, and W. A. McCall, \textit{Health Awareness Test} (New York: Bureau of Publications, Teachers College, Columbia University, 1933).}

The more discriminatory items from the original tests were retained, and the length of time required for test administration was shortened to 30 minutes, increasing the test's classroom usefulness.

The Health Awareness Test was in three sections: one part contained forty true-false items; another contained twenty-one matching items; a third consisted of four short stories. The students were asked to read through the stories and underline everything that would be 'good' for health, and cross out everything that would be 'bad' for health. Then, as now, it would be imprudent for a teacher to assume that knowledge of a desirable health practice would indicate implementation of that knowledge with the desired behavior.

In 1935, Brewer and Schrammel\footnote{John W. Brewer and H. E. Schrammel, \textit{Health Knowledge and Attitude Test} (Emporia, Kansas: Bureau of Educational Measurement, Kansas State Teachers College, 1935).} developed a knowledge and attitude test for use with junior high school students. The development of this test was significant, for it marked an early attempt to compare knowledge of desirable health habits with direct observation of a student's health practices. There were two forms of the test, each containing 100 items. To determine the relationship between...
scores made on the test and actual health habits, the 287 students participating in the study were ranked by their teachers as to their health behaviors, and then were ranked according to their achievement on the health test. Using this procedure, forty-eight percent of the students were placed in the same categorical ranks. The authors, in reporting their study, inferred that test results could be used to determine the correlation between knowledge of correct health information and attitudes but failed to indicate which items were thought to reflect specific attitudinal components.

Boyd investigated attitudes related to desirable nutritional practices, using an opinion questionnaire which he developed (based on the Thurstone equal-appearing intervals technique) and a list of stimulus words.

In developing his list of stimulus words, Boyd used elementary school children as well as college students as subjects, and utilized judges to determine the hierarchy of response levels as to favorable or unfavorableness. However, the two instruments showed only moderate correlation (0.31) with each other, and it is questionable whether or not they measured the same attitudinal components.

In comparison with the number of health knowledge tests constructed during the last thirty years, only a few health attitudes and practices survey instruments have been constructed and standardized. Most of these were designed for use with junior or senior high school or college students.


80 Mayshark and Richardson, op. cit., pp. 79-84.
Veenker discusses the general lack of well-developed evaluation instruments in health education and comments:

Of fundamental importance to research in health education is the availability of suitable devices for appraising the status of the health knowledge, attitudes, and practices of the population under study. Even though an investigation is well designed, the degree of confidence to be placed in its findings is relative to the validity of the instruments used and the treatment methods applied to test results. It appears that recognition of this simple truth has constituted a serious blockage to more extensive study of health instruction.81

During the 1950's a comprehensive evaluation was made of the total school health program in public schools of the Los Angeles area. This extensive project involved separate but concurrent investigations of both city and county schools, and the results of the separate studies were then synthesized and dealt with in a combined report.82

To carry out such a comprehensive study, many appraisal instruments were required. Among these were several inventories of health knowledges, attitudes and practices; these instruments were used to reveal content areas in health instruction which needed increased emphasis. One of the survey instruments employed was a revised version of a Health Practice Inventory developed by Sylvia Yellen for use with children in grades 3, 4, and 5.83

Subsequently, Yellen's inventory of health practices was again revised and used in the student testing phase of the nation-wide survey of school health education in the public schools of the United States carried out during the early 1960's. 84

Results from the School Health Education Study survey provided a challenging view of the health knowledges, misconceptions, and health practices of both elementary and secondary students.

Review of currently available health education tests (suitable for use in elementary schools) reveals that a shortage of valid, useful, appraisal instruments still exists. The Directory of Selected References and Resources for Health Instruction, 85 for example, only lists seven published forms available for use at this level, and two of these are in need of revision.

Only one of the published evaluation instruments listed for use with elementary school children in the aforementioned Directory was designed to assess self-reported health practices, and this published test represents the second revision of the Health Behavior Inventory 86 devised by Yellen. In its present form, it is suitable for use in grades 3 to 6, and was used to survey health practices at the sixth grade level during the School Health Education Study testing phase.


86 Sylvia Yellen, Health Behavior Inventory: Elementary (Monterey, Calif.: California Test Bureau, 1962).
Because the Yellen inventory has been widely used, and is apparently a valid and reliable indication of the health practices of elementary school children, it was selected for use in the present study, in spite of certain limitations apparent in its use.

Inherent in the problem of health attitude-behavior measurement is the implication that behavior does reflect attitudes, although attitudes operate at both conscious and unconscious levels. Students at the fifth and sixth grade levels are probably mature enough, also, to have become aware of the socially 'desirable' response to the items.

Yellen's Health Behavior Inventory uses a graded response technique, and from the content areas covered some attitudinal set toward body care and safety might be implied.

The survey instrument contains forty situation-type questions and line drawings that illustrate various health practices—not all of them desirable. These questions reflect a sampling of some of the attitudes, knowledges and behaviors in content areas such as nutrition, personal cleanliness, safety, dental care, disease prevention, and personal relationships (mental health).

The vocabulary is simple; the questions direct. The student is directed to underline the response which best describes his customary behavior in regard to each health practice. Three response choices are offered: (1) Most of the time I do; (2) Sometimes I do; and (3) No, I never do. One of the less desirable features of this test involves the scoring procedures, for in scoring the test, the preferred item response for 37 of the 40 questions is the first one.
There may be a tendency for uncertain students to choose the first response as a matter of course, and give more 'desirable' answers than appropriate ones.

Since one of the purposes of the present study was to examine the relationships between body 'attitude' and health practices, the test was considered from the 'body response' point of view. Eighteen of the item-questions were found to have some 'body' connotation. Four situations have to do with washing the hands; four refer to brushing the teeth; three are concerned with the skin; and six allude in some way to body orifices; two deal with clothing the body for protection against the elements. Two of the forty questions seem to focus upon the child's ability to take the role of the 'other' person.

In selecting a response choice characterizing his customary health practices, the fifth grade boy or girl may be choosing between the response he feels: (a) is accepted practice among own age-mates, and subsequently identifies him with his own age and sex peers; (b) is the practice recommended by authoritative adults, and is thus socially a desirable one; or (c) that which is peculiarly his own--the 'this is what I do' approach. It is likely that the unsophisti-
cated prepubescent youngster in the early part of his fifth year in school, in a non-competitive, unhurried situation, will tend to select the 'this is what I do' response, although this may be less likely at a later time in the year, when he might be more responsive to peer pressures.

When a child is asked to make a perceptual judgment about himself, his body, or his actions, frequently the assumption is made
that because the individual has reached a specified chronological age level, he has reached the stage of psychological differentiation which enables him to carry out the assigned tasks, and in doing so, is able to identify the statuses and role expectancies common to the age or sex groupings of his culture.

On the basis of prior administrations of the Health Behavior Inventory, it is reasonable to assume that the test is appropriate for the grade levels for which it was designed.

Two published tests were used in the conduct of this study. To assess health practices, the self-report instrument devised by Sylvia Yellen was selected, since it contains eighteen items that may be related in some way to body care and safety. To gain insight into unconscious aspects of the body image—the body boundary dimensions—the Barrier and Penetration scoring of the Holtzman Inkblot Test was chosen.

The adaptation of the Body Size Estimation Test purports to assess conscious recognition of the size and proportional relationships of the body. As a measure of body surface area, the Ponderal Index has frequently been used, and it was considered adequate for this purpose in the present study. As a criterion standard against which variables of the various test instruments might be measured, each child's height and weight were assessed.

In the discussion of the Body Size Estimation Test technique which follows, certain studies (relevant to the development of the line drawings constructed for use with preadolescent students) were consulted, and these are noted in the next chapter.
A major purpose of this study was to construct and try out drawing-task test instruments designed to measure and objectively score the accuracy of perception of body size and contours of pre-adolescent boys and girls.

As such, the technique purports to measure one of the cognitive aspects of body image, namely, the awareness of body size and proportional dimensions. It is assumed that there is a curvilinear relationship between perception and delineation of body boundary lines and conceptualization of the body as a 'tool' and that it is probable that this relationship is revealed in the adoption or rejection of desirable health practices.

Since the method of scoring the drawing-task instrument performance permits the assessment of accuracy in estimation, and also reveals underestimation or overestimation of the size of the body parts (numerical comparisons between the perceived and the real), it is further assumed that the perception of the body's spatial dimensions is expressed on a psychological continuum that may vary from marked overestimation to marked underestimation of body size. It is suggested that the individual's expression of his position on that continuum probably reflects his sense of security in his world; accuracy of estimations of body size (as subtle expressions of knowledge of body-
space versus environmental-space relationships) would probably be reflected by the body image boundary dimension scores.

The Body Size Estimation Test technique was first developed for and used with undergraduate women. Scaled front-facing and side-view line drawings were constructed and utilized as drawing-task instruments to obtain objective scores representing body size estimations. These scores were then compared with others obtained from breadth measurements of body photographs of the subjects. Accuracy of estimations from young women that were overweight, underweight, and of desirable weight-height relationships were then compared. Accuracy of estimations of height were also determined. In this earlier study it was found that the greater the deviation in weight from that considered desirable in terms of height of the individual, the greater the amount of underestimation found in estimations of body size.

Although the basic method of the Body Size Estimation technique was unchanged for the present study, new drawings were prepared. In the creation of line drawings appropriate for use with preadolescent children many sources were consulted.

Young children, aged from ten to twelve years, were photographed in their bathing suits; the children were asked to stand as they would if they were looking in a long mirror to see 'how big' they were. It was noted that boys tended to stand with their arms down at the sides, 1Cremer and Hukill, op. cit., pp. 34-35.
shoulders straight, thorax extended. Girls tended to stand with their arms lifted, so that as they looked at themselves from the side view, they could see the waist and hipline. These were the poses adopted for the drawings.

Studies of growth status were reviewed. Bayer and Bayley have conducted extensive investigations of the normal variations in build and speed of growth in children of all ages. These studies have contributed a great deal to our understanding of the physical and mental growth of children from birth to maturity. As these investigators point out: "Children are very sensitive about their size and shape, especially during adolescence when even the most normal boy and girl experiences some anxiety about the outcome of the puberal metamorphosis."³

Bayer and Bayley emphasize that body proportions change with age in characteristic ways, and that at the beginning of the pre-puberal period of rapid growth many children become quite plump. The body proportions associated with growth changes have been illustrated in Growth Diagnosis with back view line drawings, and the line drawings for this study were compared with them to check proportional dimensions.

A cautionary note was sounded by Bayer and Bayley, with the statement that: "Diagnosis of over- or underweight can be made erroneously in children over 9 or 10 years of age if their relative

²Leona M. Bayer and Nancy Bayley, Growth Diagnosis. Selected Methods for Interpreting and Predicting Physical Development from One Year to Maturity (Chicago, Ill.: University of Chicago Press, 1959).
³Ibid., p. 7.
⁴Ibid., pp. 24-25.
maturity, and therefore their body proportions, do not match the averages from which the tables were constructed."

Height and weight are frequently used as criterion standards in the assessment of physical status and progress. Status is calculated by comparing a child's stature with that of other children of his own age, sex, race, or country of origin. Studies concerned with the determination of weight-height relationships of children at various ages have produced normative tables from which growth status as well as growth progress may be inferred. Healthy children, it is recognized, tend to maintain their position in a respective growth channel except during periods of rapid growth or when illness or malnutrition inhibits growth progress.

5 Bayer and Bayley, op. cit., p. 25.
6 J. M. Tanner, Growth at Adolescence (Springfield, Ill.: Charles C. Thomas, Pub., 1962). As Tanner points out, the use of more recent norms of age-graded heights and weight is desirable, because children of today are taller and heavier than were those of the twenties and thirties.
Maresh considered the study of proportions, or relative lengths, of parts of the body to be a necessary part of a description of body build, and pointed out that while it did not seem unreasonable to think of a body form that would be of 'average linear proportions', study of the relationships of relative bone lengths to height did not in fact bear this out.  

Martin prepared a handbook for use by school officials, architects and others in planning school buildings, furniture and equipment. In preparing the handbook, Martin synthesized the data from published reports of eleven studies of child growth and development and also incorporated unpublished material from growth studies currently in progress. Fifty basic body measures were reported, with the means, standard deviations, and range for each measurement as synthesized from these several studies. Included are line drawing illustrations for each measurement, to illustrate the body landmarks from which measurements were derived.

From these basic source materials a composite picture of the body proportions most characteristic of ten to eleven-year-old boys and girls emerged. A professional artist prepared twelve line drawings. Three front-facing and three side view profiles were drawn for each sex. The figures were shown in bathing suits, standing on a baseline.

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11 See Appendix B.
No detailed facial features were portrayed on the front profiles because it was discovered that these tend to give the drawings an identity of their own.

On the left side of each of the 8½ x 11-inch sheets, a vertical line was drawn. This line represented a six-foot standard, and the six dimensions were indicated by circled numbers. Although the heights of the drawn figures varied (tall, medium, short) basically the body contours for each sex were the same.

When the test is administered, the drawings are arranged in three piles of paired sets, so that the front-facing figure of each set is uppermost. The subject chooses the set that he thinks looks 'most like' him.

With a well-sharpened soft-lead (an HB) pencil, the subject alters the body lines of the figures so that his own body dimensions are portrayed. (Many students also alter the length of the arms, the width of the shoulders, or the hairstyle). The student also indicates his height. The subject is not permitted to seek counsel from others as to his own dimensions but is reminded, when necessary, that it is what he thinks about himself that is important.

On that same day, the subject is weighed, measured, and photographed. In adults, knowledge of weight loss or gain of a few pounds is known to influence the delineation of body proportions, so it is considered advisable to complete test procedures on the same day.

Barefoot subjects are photographed in one piece non-elasticized bathing suits. The subject assumes the standing positions shown in the line drawings, and his attention is drawn to the positioning of his hands, so that the rest of the body is not rigidly held in position. Front and side views are obtained. In boys, it is important that the posterior line of the elbow does not obscure the line of the back, and in a child with poor posture the arm may need to be raised and extended so that the waistline is visible.

A backdrop was prepared from a 36 x 72-inch cream-colored screen. On it was painted a black open grid pattern of three-inch squares. The backdrop was fastened to a portable standard, and attached at the top and bottom so that the screen hung without a ripple.

The subject stands on a raised platform placed six inches in front of the backdrop (so that no part of the body touches the grid screen). The camera (a Contaflex 35 mm. with electronic flash equipment) is positioned on a tripod exactly 16 feet from the vertical and horizontal center of the extended backdrop. Additional lighting is placed on either side of the photographer.

Prints (4 x 5) are made from each negative. This size facilitates the calculation of the cross-dimensional grid measurements. The number of grid squares in width of each one of the selected body measurements is calculated and recorded from the photographs. The total number of grid square units across the chest at the nipple line, the waist at the narrowest portion, the hips at their widest, and the upper third of the thighs at their widest diameter are calculated.
These same dimensions are also calculated on the altered line drawings.

The photographic negatives are placed on the carrier of an enlarger. Each corresponding line drawing is then placed on the flat bed of the enlarger and the photographic image is superimposed over the drawing so that the height of the image matches that of the line drawing.

The outline of the projected image is then inked in upon the altered line drawing to give an indication of the amount of the discrepancy which exists between the real and the perceived body dimensions.  

By comparing the two scores obtained for each of the selected body dimensions an index of discrepancy for each dimension is determined. In most cases the discrepancy is either a plus or minus value, but in some instances subjects estimate the size of a body part dimension with such skill that there is no apparent difference between the real and the perceived breadth of the body part. Plus or minus values are not considered when the sum of the single dimension differences is calculated for each view. Single dimension scores, then, may indicate over- or under-estimation as well as apparent accuracy (no difference) of estimation.

The total score for the front view (Total Front Discrepancy Index score) represents the total amount of difference between the

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13 In a subsequent refinement of this technique, the grid backdrop was photographed alone, beside a six-foot standard. From the photographic image of the negative, Mr. Gregg prepared a plastic grid screen which, when placed over the drawing, eliminates the need for the projected image to be superimposed on the drawing, yet permits measurement of the altered line drawing dimensions.
perceived outline and the real outline of the body as determined from the comparison of the selected dimensions on the altered line drawing and the photographic image of the subject. Five diameter estimation differences are combined to calculate the Total Front Discrepancy Index (TFDI) score; these are the chestline, waistline, hipline, right thighline and left thighline. Four are combined to obtain the Total Side Discrepancy Index (TSDI) score; these are the chestline, waistline, hipline, and thighline.

Since each grid unit on the flat plane of the drawing (and on the photograph) represents three inches in the breadth of the body dimension being measured, the difference between the perceived and the real breadth of the body part gives an estimate of the number of inches in width on that dimension which has not been acknowledged by the subject.
CHAPTER IV

METHODS AND PROCEDURES

The purpose of this study was twofold: (1) to create and test an evaluative technique designed to measure the ability of fifth grade boys and girls to estimate own body size and proportional dimensions; and (2) to compare scores representing body boundary dimensions, body size estimates, real body dimensions, and self-reported health practices in order to determine whether significant relationships existed between these variables.

Three types of test instruments were used to provide data for the study. These were the: (1) Body Size Estimation Test drawing-tasks, (2) the Holtzman Inkblot Test, and (3) the Health Behavior Inventory. Supplementing scores obtained through the administration of these tests were those obtained from measurements of height and weight and through assessment of individual photographs.

Selection of Subjects

The subjects for this study were 103 fifth grade boys and girls enrolled in three elementary schools in the Catholic Diocese of the City of Columbus, Ohio. There were 40 boys and 63 girls in the population sample, ranging in age from 108 to 141 months. Health records were examined to determine whether or not the children had any uncorrected handicapping conditions (physical or mental). All subjects
were apparently pre-pubescent, free from observable physical impairment, with no uncorrected visual or hearing problems, and of sufficient intellectual capacity to participate in routine classroom activities.¹

Since the subjects were elementary school children, and the test procedures involved photographing them in their bathing suits, it was considered desirable to obtain parental consent for the children to participate in the study.

The experimenter visited each school, and after consultation with each principal, a form letter was devised² and subsequently mailed to the parents of each child in the fifth grade classrooms of the participating schools. The consent forms were signed by the parents, and then returned to the school by the students.

At each school, a time was arranged so that the investigator and the principal could meet with any parents wishing to discuss the project. The experimenter also discussed various aspects of the proposed study with the teachers whose classes were to be used.

**Administration of Tests**

The order of administration of the three test instruments selected for use was arranged so that participating children would become increasingly aware that it was the reporting of their own ideas, their own estimations, their own evaluations, that were considered desirable and important.

¹Children with handicapping conditions were tested and measured, but their scores were not used in the study.
²See Appendix A.
The sequence was planned as it was because it has been recognized by other investigators\(^3\) that when dealing with self-report devices, order of presentation may condition response.

In an effort to encourage children to focus upon the 'me'—'not me' response throughout the testing period, the Health Behavior Inventory was used as the initial test in all groups. Administration of this test forced the children to examine their own health practices; to elicit the 'this is what I do' response, rather than the 'this is what I should say I do' answer, for example, the children were frequently reminded that the investigator really wanted to know what they usually did.

The Body Size Estimation Test was the second to be administered. The drawing-task instruments impel the child toward a consideration of his body's size and its proportional relationships. Selection of the short or tall set carries with it the inference that the child thinks that he is taller or shorter than the average child in his classroom; as a general rule it is the child whose stature falls in the middle range (for height) that takes the longest to make his selection of a paired set of drawings.

The Holtzman Inkblot Test was the third instrument to be presented to the children. In giving this test, one assumes that the responses of the children are indicative of their usual perceptive responses, and that personality traits influence perception; it is thus important that the responses written on the protocols are the

\(^3\)Allan D. Simmons, "A Test of the Body Image Hypothesis in Human Figure Drawings," unpublished Ph.D. dissertation, The University of Texas, 1966.
child's own. In practice runs it was observed that children experi­
encing some difficulty with a particular inkblot had a tendency to
seek outside assistance. By building up to the 'this is what I think'
response set, it was hoped that children would refrain from this
practice.

The test administrations and measurement procedures began
during the third week of October, 1968, and were completed in all
schools during the second week of November. Insofar as possible the
tests were administered at the same time of day in each school, were
in the same sequence in all schools, and were conducted in the same
manner in all schools. Paper and pencil tests were given during the
morning hours, and the photographing and measuring of subjects was
accomplished during the afternoon.

Health Behavior Inventory

The Health Behavior Inventory was used to begin the testing
program in all schools. When the booklets and pencils had been dis­
tributed in the classroom, the experimenter explained that the children
would be taking part in a survey designed to discover just what fifth
graders thought and did about their health. It was explained that the
tests that they would be working with were not going to be 'graded'
because they were not that sort of test.

Throughout the testing phase of the study it was repeatedly
emphasized that it was each child's own opinions, his own practices,
his own ideas that the investigators were interested in, and the
children were most cooperative.
The general directions were read aloud, while the children read silently, and worked through the practice response. Questions were answered, and the children were instructed to be careful to respond to all of the test questions. They were asked to read each question carefully, to look at the picture illustrating it, and then to decide what they usually did. The children were asked to underline the response that would tell what they thought they really did about a particular health practice. The test was untimed, but in all classrooms children completed the test within a thirty-minute period.

**The Body Size Estimation Test**

The second test situation involved the use of line drawings prepared for the Body Size Estimation Test. Three paired sets of line drawings (tall, medium, short figures) were arranged according to sex; the girls were on one side of the room, and the boys on the other as they selected their drawings. From each group of three sex-appropriate sets, each child chose the one set that he decided looked 'most like him' and then returned to his seat. Children wishing to change their selections were given an opportunity to do so. The children were not hurried through this procedure because the examiner considered it important that each child be satisfied with his selection.

Well-sharpened soft-lead (HB grade) pencils and erasers were distributed. The investigator then said:

Now, using these pictures, I would like you to tell me how big you think you are. Look at the pictures you have chosen. Do you think that your body is different from the one in the drawing? How is it different? Is it larger in some places? Is it smaller in some places? Is it just about the same?
Think about it for a minute. Now, take your pencils and make any changes that you think should be made in order to show me how you really look.

First, work on the top drawing, and then turn the page and work on the second drawing. The second drawing shows how you would look from the side. Are you thicker, or thinner, or just about the same? Try to make the pictures look just like you!

Do you think that you are taller than the boy or girl in your pictures? Are you shorter than that, or are you just about the same? Place a line on the picture that will show me just how tall you really are. You may add anything you wish to the pictures so long as it makes the picture look more like you.

During the course of this testing phase, sometimes a child would exclaim: "This picture looks just like me; I am just this big!" These children were instructed to write this statement on their pictures.

When it was necessary, a child would be reminded that it was his own opinion that we wanted him to express. When the children had finished, they were instructed to write their names on their pictures and hand them in. The investigator then said:

After lunch, we will be taking your photographs in some bathing suits that we have with us. We will be measuring you so that we may see just how much you weigh and how tall you are. Do you remember how you were standing in the pictures? That is the way that you will be standing while we are taking your photographs. We will give each of you your own number to carry, and when we take your picture we will put your number up on the screen behind you. Then we will know who you are when we develop the pictures.

The Holtzman Inkblot Test

Following the administration of the Body Size Estimation Test, (and after a recess) the body image boundary dimensions were assessed through administration of the first twenty-five inkblots from the
Form B set of the Holtzman Inkblot Test materials. It will be recalled that the Body Size Estimation Test purports to measure the conscious perception of body boundary lines, while the Barrier and Penetration scores apparently reflect unconscious perceptions of the parameters of body space.

The subjects were assembled in small groups of six or eight in a separate room. The children were seated around a table, with the experimenter sitting at one end. The children were seated so that all had a clear view of the inkblots. Protocol forms and pencils were distributed. The investigator then said:

I have some inkblots here that I would like to show you. They were made by spilling ink on paper and then folding it. I'd like you to look at each card and write down what it looks like to you. Now, if you don't know how to spell what the picture or a part of it reminds you of, try to spell it the way the word would sound if you said it out loud.

Since these are only inkblots, they were not made to look like anything and there are no right or wrong answers. You might each think of a different thing when you see a particular inkblot. Just write down one thing that you see for each card. Now, let's look at the first one, and practice with it.

Any questions asked by the subjects were answered nondirec-tively—for example: "If that is what you think you see, then write it down." A few students said: "Oh, I know what these are for, I've seen these at the Clinic." To these students, the experimenter replied, casually: "Oh, yes, I know that sometimes they are used like .


5 Following directions suggested by Holtzman et al., in Inkblot Perception and Personality, p. 30.
that in clinics, but that isn't the way we're using them. We just want to see how imaginative you are. You know, you can use inkblots in many ways. Haven't you made these in your art classes, sometimes?"

And, reassured, the children would settle back in their seats.

This is picture X. Can you find this on your picture page? It is the very first one. Now, write down what you see in this first picture in the space beside picture X. Remember that it is what you see that matters. You each will look at the picture in your own way, and it is your way that you should write down. Please circle the part of the picture that you have written about. Now, let's look at the next picture.

The children were allowed a maximum of three minutes to look at each inkblot, although with succeeding inkblots this length of time was not usually necessary. If a child had difficulty responding to an inkblot in the upright position, it was reversed. He reversed his protocol form when he wrote his response, indicating the position the card was in when he responded to it.

To control for examiner effects, the administration of the inkblots was conducted by the investigator. The protocols obtained from the administration of the inkblots were masked, identified by number only, and subsequently mailed to Dr. Seymour Fisher, who blind scored the protocols for Barrier and Penetration responses. Those protocols identified by Dr. Fisher as producing an insufficient number of total responses were then discarded, and the data obtained from the testing of these children were not used in the study.

**Measurement of Height and Weight**

Height and weight measures were determined on all students by two registered nurses. The nurses used upright, beam-balanced scales with an attached height bar. Students were measured in their bathing
suits, and without shoes. Height was recorded to the nearest half inch, and weight was recorded to the nearest half pound.

Students were assembled in groups of three or four to be weighed and measured. All students of one sex were measured at a time. Provision was made through the use of folding screens or individual change booths for as much privacy as possible when children were changing their clothes.

Following measurement of height and weight, the students were given a large identifying number to carry, and then were photographed standing in front of the grid screen. Students assumed the standing positions depicted by the line drawings. Following the photographic session, each child was thanked for his participation in the study, and the nurses answered any questions the child asked about the study or his growth status.

Statistical Treatment of the Data

All of the tests and measurements obtained in the study were objective scores. In comparing these scores, the means, standard deviations, and range of scores were calculated for each test or measurement utilized. These scores were then segregated as to age, sex, race, and school to determine whether or not there were significant differences between the various groups. Analysis of variance techniques were used in this portion of the analysis.

To determine the measure of internal consistency for the Body Size Estimation Test, the two drawing tasks were treated as two halves of the same test, and the relationships between comparable scores examined. The total front discrepancy score was compared with the total
side discrepancy score. The total amount overestimated on the front facing view was compared with the total amount overestimated on the side view. The total amount underestimated on the front view was compared with that underestimated on the side view. In addition, comparisons were made between single dimensions of the front-facing and side views; for example, the estimated front chestline score was compared with that of the estimated side view chestline. Estimated heights were compared with other estimated and real scores. Further, since the criterion standard for the line drawing portion of the test was considered to be the photographic image of the subject, the relationships were determined between single dimensions of the line drawings and those obtained through inspection and calculation of photographic dimensions. In other words, the criterion standard for each body part line dimension was considered to be the breadth of that body part dimension on the corresponding photographic image of the student. Correlational matrices were constructed which demonstrated the relationships between real body height, estimated body height, accuracy of estimation of body height, real body part dimension breadth, estimated body part dimension breadth, accuracy of estimation of body part dimension breadth, the Ponderal Index as a measure of body surface area, and body boundary dimension scores.

The multivariate analysis procedure was used to test for the acceptance or rejection of the null hypothesis related to groups divided as to sex or racial composition.

For both inter- and intragroup comparisons, 't' tests were applied. Use of the 't' test was based upon the assumption that there
was a normal distribution of scores in the population sample, although insofar as age was concerned, the subjects were treated as a homogeneous group.

The chi-square technique was used to test for the significance of differences between population and performance variables within the three participating school populations. Age, sex, height, weight, and Ponderal Index were used as independent variables, while the following were used as both independent and dependent variables in further analysis of the data: Barrier score, Penetration score, Total Front Discrepancy Index score, Total Side Discrepancy Index score, Health Behavior Inventory score, and the part scores made on the Health Behavior Inventory. The raw scores representing part score content on the Health Behavior Inventory were converted to percentile scores for statistical analysis.
CHAPTER V

ANALYSIS AND INTERPRETATION OF DATA

The data for the study were programmed and processed by the Statistics Laboratory and Data Processing Center of The Ohio State University. The data have been organized for presentation in this chapter according to the sequence followed in the statement of the problem, and as the hypotheses were expressed.

There is an initial paragraph concerning the structure of the population, and the grouping of the subjects insofar as the population variables were concerned.

The Population Sample

It will be recalled that the data from students with incomplete test performances or uncorrected medical impairments were not retained in the analysis of data. Since these students had received parental permission to participate in the study, they were encouraged to participate in the testing and measurement phase of the project, and were photographed, but their data were not utilized.

There were 103 students in the population sample retained for study. These were from three schools which were selected as being representative of the parochial elementary school population. Each school contained students from lower and middle class socio-economic levels.
Of these 103 students, 63 were girls and 40 were boys. Two boys were nine years of age, 36 were ten, and four were 11 years old. Five of the girls were nine years of age, 52 were ten, and six were 11 years old. In months, the ages ranged from 108 months (1, a girl) to 141 (1, a boy). Mean age for the total group was 122.45 months. For statistical analysis all ages were recorded to the nearest month.

School No. 1, with the lowest total enrollment, had 13 boys and 6 girls in the study sample; School No. 2, with 32 subjects, had 25 girls and 7 boys in the population sample; and School No. 3, with 52 students participating, provided data from 32 girls and 20 boys. When scores from the three schools were compared, it was found that there were no significant differences between them.¹

Analysis of Performance Scores

Since the primary purpose of the study was the construction and initial testing of the drawing task instruments, it was essential to determine the measure of internal consistency between the two drawing-tasks; these were considered equal parts of the Body Size Estimation Test and were administered in sequence and at the same time.

It was necessary then, to discover whether: (a) performance of the two tasks was significantly related; (b) performance on the single dimensions of one view was reflected on these same dimensions on the other view; (c) overestimations on the front views were reflected on these side view dimensions; (d) underestimations on the front views were also reflected on these same dimensions on the side dimensions.

¹See Appendix C.
views; (e) preadolescents can, through alterations on the line drawings, realistically estimate their body size and its proportional dimensions.

1. A significant correlation was found to exist between accuracy of estimations made on the front-facing drawing task instrument and those made on the side views. The correlation of coefficient between the TFDI and TSDI scores was 0.61. The child who overestimated the dimensions of his body on the front-facing drawing also tended to overestimate these same dimensions on the side view. The correlation between total amounts overestimated on the front-facing and side views was 0.72. The correlation of coefficient between underestimations on the front-facing and side views was, however, lower (0.52).

To further study the two drawing-task instruments, comparisons were made between single dimension scores. The relationships between real (as determined by photographic analysis) and estimated (as determined by line drawing analysis) body dimensions, between height as estimated and as measured, and the interrelationships between these variables are shown in the following tables.

Table 1 portrays the relationships between the estimated (perceived) and the real (photographically determined) body dimensions on the front-facing views.

Table 2 illustrates the relationships between the real and the estimated side view dimensions.

Table 3 demonstrates the correlations found between estimations of single dimensions on the front view, and those on the side views. However, since the real breadths of the body when viewed from the side are different from those seen from the front, the basic differences in
<table>
<thead>
<tr>
<th>Lt. Thighline</th>
<th>Real Front</th>
<th>Real Front</th>
<th>Real Front</th>
<th>Real Front</th>
<th>Chestline</th>
<th>Lt. Thighline</th>
<th>Real Front</th>
<th>Real Front</th>
<th>Real Front</th>
<th>Real Front</th>
<th>Chestline</th>
<th>Real Front</th>
<th>Estimated Front</th>
<th>Real Front</th>
<th>Estimated Front</th>
<th>Estimated Front</th>
<th>Estimated Front</th>
<th>Estimated Front</th>
<th>Estimated Front</th>
<th>Chestline</th>
</tr>
</thead>
</table>
the two breadths of the same line dimensions should be recognized when interpreting student estimations of body breadths.

TABLE 2
RELATIONSHIPS BETWEEN REAL AND ESTIMATED SIDE VIEW DIMENSIONS

(103 subjects)

<table>
<thead>
<tr>
<th>SIDE DIMENSIONS (Real)</th>
<th>Real Side Chestline</th>
<th>Real Side Waistline</th>
<th>Real Side Hipline</th>
<th>Real Side Thighline</th>
<th>Estimated Side Chestline</th>
<th>Estimated Side Waistline</th>
<th>Estimated Side Hipline</th>
<th>Estimated Side Thighline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chestline</td>
<td>0.72</td>
<td>0.78</td>
<td>0.66</td>
<td>0.35</td>
<td>0.34</td>
<td>0.30</td>
<td>0.43</td>
<td></td>
</tr>
<tr>
<td>Waistline</td>
<td>0.80</td>
<td>0.70</td>
<td>0.36</td>
<td>0.38</td>
<td>0.37</td>
<td>0.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hipline</td>
<td>0.80</td>
<td>0.38</td>
<td>0.42</td>
<td>0.41</td>
<td>0.48</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thighline</td>
<td>0.34</td>
<td>0.41</td>
<td>0.40</td>
<td>0.47</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

SIDE DIMENSIONS (Estimated)

| Chestline                 | 0.85                | 0.81                | 0.70             |                          |                          |                          |                         |                          |
| Waistline                 |                     | 0.82                | 0.50             |                          |                          |                          |                         |                          |
| Hipline                   |                     |                     | 0.72             |                          |                          |                          |                         |                          |
| Thighline                 |                     |                     |                  |                          |                          |                          |                         |                          |

These student estimations may be contrasted with the correlations found between their real body breadths on the front-facing views and those on the side views, as shown in Table 4.
### TABLE 3
RELATIONSHIPS BETWEEN FRONT AND SIDE VIEW
SINGLE LINE DIMENSION ESTIMATES

<table>
<thead>
<tr>
<th>SIDE DIMENSION ESTIMATES</th>
<th>Estimated Front Chestline</th>
<th>Estimated Front Waistline</th>
<th>Estimated Front HipLine</th>
<th>Estimated Front Right Thighline</th>
<th>Estimated Front Left Thighline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chestline</td>
<td>.65</td>
<td>.62</td>
<td>.63</td>
<td>.63</td>
<td>.61</td>
</tr>
<tr>
<td>Waistline</td>
<td>.69</td>
<td>.70</td>
<td>.70</td>
<td>.65</td>
<td>.65</td>
</tr>
<tr>
<td>Hipline</td>
<td>.68</td>
<td>.61</td>
<td>.69</td>
<td>.63</td>
<td>.60</td>
</tr>
<tr>
<td>Thighline</td>
<td>.56</td>
<td>.53</td>
<td>.61</td>
<td>.74</td>
<td>.70</td>
</tr>
</tbody>
</table>

### TABLE 4
RELATIONSHIPS BETWEEN FRONT AND SIDE VIEW REAL (PHOTOGRAPHIC) SINGLE BODY DIMENSIONS

<table>
<thead>
<tr>
<th>SIDE DIMENSIONS (Real)</th>
<th>Real Front Chestline</th>
<th>Real Front Waistline</th>
<th>Real Front HipLine</th>
<th>Real Front Right Thighline</th>
<th>Real Front Left Thighline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chestline</td>
<td>.65</td>
<td>.70</td>
<td>.65</td>
<td>.49</td>
<td>.46</td>
</tr>
<tr>
<td>Waistline</td>
<td>.67</td>
<td>.76</td>
<td>.69</td>
<td>.53</td>
<td>.52</td>
</tr>
<tr>
<td>Hipline</td>
<td>.72</td>
<td>.78</td>
<td>.79</td>
<td>.63</td>
<td>.65</td>
</tr>
<tr>
<td>Thighline</td>
<td>.70</td>
<td>.75</td>
<td>.78</td>
<td>.76</td>
<td>.75</td>
</tr>
</tbody>
</table>
2. Significant relationships (to the .05 level of confidence) were found to exist between scores representing self estimates of body dimension size and those indicating actual size of the body and its parts (as determined by photographic assessment and measurement of stature). These relationships may be seen in Tables 5 and 6.

### TABLE 5
RELATIONSHIPS BETWEEN REAL AND ESTIMATED BODY DIMENSION SCORES, MEANS, AND STANDARD DEVIATIONS (Front) (103 Students)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>rho*</th>
<th>Real</th>
<th>Est.</th>
<th>Mean Difference</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front Chestline</td>
<td>0.40</td>
<td>3.66</td>
<td>2.94</td>
<td>0.72</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>Front Waistline</td>
<td>0.40</td>
<td>3.27</td>
<td>2.63</td>
<td>0.64</td>
<td>0.30</td>
<td>0.37</td>
</tr>
<tr>
<td>Front Hipline</td>
<td>0.44</td>
<td>3.89</td>
<td>3.43</td>
<td>0.46</td>
<td>0.37</td>
<td>0.36</td>
</tr>
<tr>
<td>Front Rt. Thighline</td>
<td>0.26</td>
<td>1.88</td>
<td>1.65</td>
<td>0.23</td>
<td>0.21</td>
<td>0.25</td>
</tr>
<tr>
<td>Front Lt. Thighline</td>
<td>0.21</td>
<td>1.86</td>
<td>1.68</td>
<td>0.18</td>
<td>0.22</td>
<td>0.26</td>
</tr>
</tbody>
</table>

* (101 df) P .05 level of confidence = .195.

### TABLE 6
RELATIONSHIPS BETWEEN REAL AND ESTIMATED BODY DIMENSION SCORES, MEANS, AND STANDARD DEVIATIONS (Side) (103 Students)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>rho*</th>
<th>Real</th>
<th>Est.</th>
<th>Mean Difference</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Side Chestline</td>
<td>0.35</td>
<td>2.71</td>
<td>2.40</td>
<td>0.31</td>
<td>0.27</td>
<td>0.30</td>
</tr>
<tr>
<td>Side Waistline</td>
<td>0.38</td>
<td>2.59</td>
<td>2.19</td>
<td>0.40</td>
<td>0.29</td>
<td>0.32</td>
</tr>
<tr>
<td>Side Hipline</td>
<td>0.41</td>
<td>3.00</td>
<td>2.49</td>
<td>0.51</td>
<td>0.33</td>
<td>0.32</td>
</tr>
<tr>
<td>Side Thighline</td>
<td>0.47</td>
<td>2.11</td>
<td>1.80</td>
<td>0.69</td>
<td>0.26</td>
<td>0.33</td>
</tr>
</tbody>
</table>

* (101 df) P = .05 level of confidence = .195.
One of the indicators of body size used as an independent and dependent variable in the study was the Ponderal Index. Sheldon's formula\(^2\) (P. I. equals height divided by the cubed weight) was used as an indication of body volume or surface area.

In the analysis of variance and covariance, the Ponderal Index was found to be of little influence on height, but negatively correlated with weight (-0.59), as would be expected. There was an inverse relationship with the TFDI scores (-0.21) and a more marked inverse relationship with the TSDI scores (-0.33), which would indicate that smaller children were apparently a little more accurate in estimating the size of their body dimensions than larger children.

The mean weight for girls (63) in the total sample was 80.24 pounds, with a range of 55 to 115 pounds. The mean height for girls was 54.93 inches, with a range of from 49 to 62 inches.

The mean weight for boys (40) was 69.36 pounds, with an overall range of 54 to 122 pounds. The mean height for boys was 55.24 inches, with a range of from 50 to 61 inches. As a part of the general picture of the total group, children tended to underestimate their heights, although girls were slightly more accurate than boys of the same age.

Table 7 illustrates the relationships that were found between real and estimated body dimension scores and stature. For the total group, there was only a chance correlation between real height and estimated height (0.12), and between accuracy in estimating height and

---

stature (-0.01). An inverse relationship was found between accuracy in estimating height and the TSDI scores (-0.20). Perhaps children learn the size of body breadths as a function of developing right-left spatial relationships, while awareness of length of the vertical dimension increases as a result of the onset of puberty and resultant anxiety over the question of adult stature.

TABLE 7
RELATIONSHIPS BETWEEN ESTIMATIONS OF HEIGHT, ACCURACY OF HEIGHT ESTIMATIONS, REAL AND ESTIMATED BODY DIMENSIONS

<table>
<thead>
<tr>
<th>Dimensions (103 Subjects)</th>
<th>Real Height rho</th>
<th>Estimated Height rho</th>
<th>Height Discrepancy rho</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real Front Chestline</td>
<td>0.15</td>
<td>0.19</td>
<td>0.001</td>
</tr>
<tr>
<td>Real Front Waistline</td>
<td>0.15</td>
<td>0.18</td>
<td>-0.05</td>
</tr>
<tr>
<td>Real Front Hipline</td>
<td>0.19</td>
<td>0.23*</td>
<td>-0.001</td>
</tr>
<tr>
<td>Real Front Right Thighline</td>
<td>0.09</td>
<td>0.13</td>
<td>0.05</td>
</tr>
<tr>
<td>Real Front Left Thighline</td>
<td>0.10</td>
<td>0.18</td>
<td>0.13</td>
</tr>
<tr>
<td>Estimated Front Chestline</td>
<td>0.15</td>
<td>0.23*</td>
<td>0.12</td>
</tr>
<tr>
<td>Estimated Front Waistline</td>
<td>0.22</td>
<td>0.20*</td>
<td>0.13</td>
</tr>
<tr>
<td>Estimated Front Hipline</td>
<td>-0.17</td>
<td>0.32*</td>
<td>0.16</td>
</tr>
<tr>
<td>Estimated Front Right Thighline</td>
<td>0.13</td>
<td>0.31*</td>
<td>0.19</td>
</tr>
<tr>
<td>Estimated Front Left Thighline</td>
<td>0.22</td>
<td>0.32*</td>
<td>0.30*</td>
</tr>
<tr>
<td>Real Side Chestline</td>
<td>0.09</td>
<td>0.32*</td>
<td>0.02</td>
</tr>
<tr>
<td>Real Side Waistline</td>
<td>0.11</td>
<td>0.15</td>
<td>-0.09</td>
</tr>
<tr>
<td>Real Side Hipline</td>
<td>0.16</td>
<td>0.14</td>
<td>-0.05</td>
</tr>
<tr>
<td>Real Side Thighline</td>
<td>0.04</td>
<td>0.19</td>
<td>0.17</td>
</tr>
<tr>
<td>Estimated Side Chestline</td>
<td>0.13</td>
<td>0.29*</td>
<td>0.29*</td>
</tr>
<tr>
<td>Estimated Side Waistline</td>
<td>0.17</td>
<td>0.22*</td>
<td>0.20*</td>
</tr>
<tr>
<td>Estimated Side Hipline</td>
<td>0.13</td>
<td>0.21*</td>
<td>0.17</td>
</tr>
<tr>
<td>Estimated Side Thighline</td>
<td>0.15</td>
<td>0.29*</td>
<td>0.25*</td>
</tr>
</tbody>
</table>

*P .05 (101 df) = .195.

Inaccuracy in the estimation of stature was also inversely correlated with one of the body boundary dimension scores. There was a -0.20 correlation between height discrepancy and Penetration score.
3. No significant relationships were found to exist between scores representing accuracy of body size estimations and the Barrier and Penetration scores.

It was earlier suggested that the body image boundary dimensions were apparently a reflection of unconscious aspects of body image, namely, the unconscious delimitation of 'me' from 'not me' in body space terms. The Body Size Estimation Test technique, on the contrary, purports to measure the conscious differentiation of 'me' from 'not me'. Table 8 illustrates the relationships that were found between stature and these variables.

**TABLE 8**

RELATIONSHIPS BETWEEN ESTIMATION OF HEIGHT, ACCURACY OF HEIGHT ESTIMATIONS, BARRIER, PENETRATION, TFDI AND TSDI SCORES

<table>
<thead>
<tr>
<th>Scores (103 Subjects)</th>
<th>Real Height</th>
<th>Estimated Height</th>
<th>Height Discrepancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>TFDI Scores</td>
<td>-0.06</td>
<td>-0.11</td>
<td>-0.17</td>
</tr>
<tr>
<td>TSDI Scores</td>
<td>-0.08</td>
<td>-0.02</td>
<td>-0.20</td>
</tr>
<tr>
<td>Barrier Scores</td>
<td>0.10</td>
<td>-0.11</td>
<td>-0.07</td>
</tr>
<tr>
<td>Penetration Scores</td>
<td>-0.04</td>
<td>-0.02</td>
<td>-0.20</td>
</tr>
</tbody>
</table>

Table 9 illustrates the relationships found between Barrier and Penetration scores, accuracy of body size estimation scores, over-estimation of body size scores, and underestimation of body size scores.
TABLE 9
RELATIONSHIPS BETWEEN BARRIER, PENETRATION, TFDI, TFDIO, TFDIU, TSDI, TSDIO, AND TSDIU SCORES

<table>
<thead>
<tr>
<th>Scores (103 S)</th>
<th>TFDI</th>
<th>TFDIO</th>
<th>TFDIU</th>
<th>TSDI</th>
<th>TSDIO</th>
<th>TSDIU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barrier Index</td>
<td>-0.02</td>
<td>-0.20</td>
<td>0.14</td>
<td>-0.11</td>
<td>-0.07</td>
<td>-0.11</td>
</tr>
<tr>
<td>Penetration Score</td>
<td>0.12</td>
<td>-0.11</td>
<td>0.10</td>
<td>0.19</td>
<td>-0.24</td>
<td>-0.003</td>
</tr>
</tbody>
</table>

4. One of the major hypotheses of this study was based on the assumption that an individual's attitudes toward his body and his 'self' are probably reflected in his life style (Barrier and Penetration scores) and in the choices he makes insofar as his health practices are concerned. It was suggested that a crucial period for the crystallization of these attitudes, and for the adoption of desirable health practices, was during preadolescence. It was postulated that a significant relationship would be found between scores representing self estimates of body size and those obtained through the self-reported health practices described in the Health Behavior Inventory.

Table 10 illustrates the relationships that were found between scores representing accuracy of estimates of body size, body boundary dimension scores, and total and part scores made on the Health Behavior Inventory. There were no significant correlations between TFDI, TSDI, Barrier, Penetration, and Health Behavior Inventory scores. There is 0.26 correlation between the part score on the Inventory that relates to Nutrition and the TSDI score. Since the relationship is a positive one, this would tend to indicate that the greater the accuracy of
<table>
<thead>
<tr>
<th></th>
<th>Barrier Score</th>
<th>Penetration Score</th>
<th>Total Front Discrepancy Index Score</th>
<th>Total Side Discrepancy Index Score</th>
<th>Total Health Behaviour Inventory Score</th>
<th>Personal Health Score</th>
<th>Personal Cleanliness Score</th>
<th>Nutrition Score</th>
<th>Safety Score</th>
<th>Community Health Score</th>
<th>Infectious Diseases Score</th>
<th>Mental Health Score</th>
<th>Dental Health Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barrier score</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penetration score</td>
<td>0.11</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total front discrepancy index score (TFDI)</td>
<td>-0.01</td>
<td>0.12</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total side discrepancy index score (TSDI)</td>
<td>-0.11</td>
<td>0.19</td>
<td>0.61</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total health behaviour inventory score</td>
<td>0.07</td>
<td>-0.13</td>
<td>0.13</td>
<td>0.14</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal health score</td>
<td>0.03</td>
<td>-0.09</td>
<td>0.08</td>
<td>0.10</td>
<td>0.57</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal cleanliness score</td>
<td>0.09</td>
<td>-0.20</td>
<td>0.00</td>
<td>0.08</td>
<td>0.62</td>
<td>0.65</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nutrition score</td>
<td>0.02</td>
<td>-0.04</td>
<td>0.17</td>
<td>0.26</td>
<td>0.54</td>
<td>0.06</td>
<td>0.21</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety score</td>
<td>0.08</td>
<td>-0.08</td>
<td>-0.01</td>
<td>0.07</td>
<td>0.43</td>
<td>0.55</td>
<td>0.30</td>
<td>0.15</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community health score</td>
<td>0.02</td>
<td>-0.11</td>
<td>0.10</td>
<td>0.14</td>
<td>0.59</td>
<td>0.35</td>
<td>0.31</td>
<td>0.29</td>
<td>0.44</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infectious diseases score</td>
<td>0.09</td>
<td>-0.15</td>
<td>0.04</td>
<td>0.14</td>
<td>0.71</td>
<td>0.50</td>
<td>0.43</td>
<td>0.29</td>
<td>0.50</td>
<td>0.76</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental health score</td>
<td>-0.07</td>
<td>-0.17</td>
<td>0.09</td>
<td>0.11</td>
<td>0.42</td>
<td>0.10</td>
<td>0.18</td>
<td>0.09</td>
<td>0.17</td>
<td>0.31</td>
<td>0.38</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Dental health score</td>
<td>-0.19</td>
<td>-0.04</td>
<td>-0.16</td>
<td>-0.11</td>
<td>0.28</td>
<td>0.14</td>
<td>0.36</td>
<td>0.07</td>
<td>0.14</td>
<td>0.05</td>
<td>0.05</td>
<td>0.16</td>
<td>1.00</td>
</tr>
</tbody>
</table>
estimation of body size on the side view profile, the higher the Nutrition score. There were seven questions relating to nutrition on the inventory.

5. No significant relationships were found to exist between the body boundary dimension scores and the Health Behavior Inventory scores. The highest correlation is that of an inverse relationship (-0.20) between the Penetration score and the Personal Cleanliness part score. The Personal Cleanliness score was made up of seven items, six of which had to do with washing some part of the body.

The final three hypotheses dealt with comparisons between scores made by boys and those made by girls on the three test instruments. Using sex as the independent variable, the analysis of variance technique was used to discover significant mean differences between scores made by the two groups.

6. As illustrated by Table 11, no significant mean difference was found between scores made by boys and those made by girls on side view profiles, but there were significant differences on front facing size estimations, where boys were more accurate in their body size estimations.

7. No significant differences were found between body boundary dimension scores made by boys and those made by girls, although the range of scores on the two dimensions differs to a surprising extent, as illustrated in Table 12.

8. The final hypothesis was concerned with the Health Behavior Inventory scores. No significant differences were found between scores made by boys and those made by girls on the total test. There was a
significant mean difference, however, on the part score related to mental health. There were four items in this part score; three referred to being friendly, while one asked: Do you hide your feelings when you are unhappy? Table 13 presents these relationships.

### TABLE 11

**INFLUENCE OF SEX OF SUBJECTS ON TFDI AND TSDI SCORES**

<table>
<thead>
<tr>
<th>Sex</th>
<th>TFDI</th>
<th>TSDI</th>
<th>'t'</th>
<th>TFDI</th>
<th>TSDI</th>
<th>'t'</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.D.</td>
<td></td>
<td>Mean</td>
<td>S.D.</td>
<td></td>
</tr>
<tr>
<td>Total Group (103)</td>
<td>2.10</td>
<td>1.04</td>
<td>-2.34</td>
<td>1.77</td>
<td>0.81</td>
<td>-0.53</td>
</tr>
<tr>
<td>Boys (40)</td>
<td>2.61*</td>
<td>1.14</td>
<td></td>
<td>1.74</td>
<td>0.82</td>
<td></td>
</tr>
<tr>
<td>Girls (63)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* 't' is significant at .05 level of confidence if > 2.20 (101 df).

### TABLE 12

**MEANS, STANDARD DEVIATIONS, SCORE RANGES: BARRIER AND PENETRATION SCORES**

<table>
<thead>
<tr>
<th></th>
<th>Barrier</th>
<th>Penetration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.D.</td>
</tr>
<tr>
<td>Total Sample (103)</td>
<td>3.87</td>
<td>2.26</td>
</tr>
<tr>
<td>Boys (40)</td>
<td>4.22</td>
<td>2.09</td>
</tr>
<tr>
<td>Girls (63)</td>
<td>3.65</td>
<td>2.35</td>
</tr>
</tbody>
</table>
TABLE 13
MEANS, STANDARD DEVIATIONS, SCORE RANGES ON HEALTH BEHAVIOR INVENTORY SCORES

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>S.D.</th>
<th>Mean</th>
<th>S.D.</th>
<th>Range</th>
<th>Mean</th>
<th>S.D.</th>
<th>Range</th>
<th>'t'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total score</td>
<td>24.11</td>
<td>6.28</td>
<td>23.68</td>
<td>5.64</td>
<td>12-38</td>
<td>24.38</td>
<td>6.68</td>
<td>11-36</td>
<td>0.55</td>
</tr>
<tr>
<td>Personal health</td>
<td>0.68</td>
<td>0.16</td>
<td>0.68</td>
<td>0.16</td>
<td>1.0-0.27</td>
<td>0.68</td>
<td>0.16</td>
<td>1.0-0.27</td>
<td>0.18</td>
</tr>
<tr>
<td>Personal Cleanliness</td>
<td>0.61</td>
<td>0.25</td>
<td>0.57</td>
<td>0.24</td>
<td>1.0-0.29</td>
<td>0.64</td>
<td>0.25</td>
<td>1.0-0.0</td>
<td>-1.39</td>
</tr>
<tr>
<td>Nutrition</td>
<td>0.66</td>
<td>0.22</td>
<td>0.67</td>
<td>0.21</td>
<td>1.0-0.14</td>
<td>0.66</td>
<td>0.24</td>
<td>1.0-0.0</td>
<td>0.32</td>
</tr>
<tr>
<td>Safety</td>
<td>0.63</td>
<td>0.22</td>
<td>0.62</td>
<td>0.21</td>
<td>1.0-0.20</td>
<td>0.64</td>
<td>0.23</td>
<td>1.0-0.2</td>
<td>-0.35</td>
</tr>
<tr>
<td>Community health</td>
<td>0.53</td>
<td>0.27</td>
<td>0.51</td>
<td>0.23</td>
<td>1.0-0.0</td>
<td>0.55</td>
<td>0.30</td>
<td>1.0-0.0</td>
<td>-0.66</td>
</tr>
<tr>
<td>Infection &amp; Disease</td>
<td>0.61</td>
<td>0.21</td>
<td>0.58</td>
<td>0.19</td>
<td>1.0-0.18</td>
<td>0.64</td>
<td>0.22</td>
<td>1.0-0.09</td>
<td>-1.37</td>
</tr>
<tr>
<td>Mental health</td>
<td>0.61</td>
<td>0.26</td>
<td>0.54</td>
<td>0.25</td>
<td>1.0-0.0</td>
<td>0.65</td>
<td>0.25</td>
<td>1.0-0.0</td>
<td>-2.15*</td>
</tr>
<tr>
<td>Dental health</td>
<td>0.38</td>
<td>0.41</td>
<td>0.35</td>
<td>0.27</td>
<td>1.0-0.0</td>
<td>0.40</td>
<td>0.48</td>
<td>1.0-0.3</td>
<td>-0.56</td>
</tr>
</tbody>
</table>

*The result is significant at .05 level of confidence if 't' is greater than 2.02 (101 df).
A Further Look at the Data

One of the functions of the research reported in this document was the study of relationships between body surface area (the Ponderal Index), weight-height ratios, body boundary dimensions, and accuracy of estimations of body size. The assumption was that in fifth graders, before the onset of puberty, the weight-height ratio would probably not be an influential factor in estimation of body size.

Charts or graphs which plot height and weight against chronological age are limited in their usefulness, even with adult populations. Such graphs or charts are most useful in the pre-adult years when they are used to indicate growth inhibition or change over time, or utilized in conjunction with indices of developmental age, as when used to predict adult stature.

In studying the ability of undergraduate women to estimate body size and contours, Cremer and Hukill used tables of desirable weight/height ratios to indicate the various ranges of desirable weight-for-height balance. Cremer and Hukill found, as stated earlier, that the greater the number of pounds carried over the desirable range, the greater the amount of underestimation there was, in the subject's estimation of her body size.

In making use of the same general principle, the investigator consulted the Meredith Growth charts to determine the percentile height-weight standards by age and sex against which each child could

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3 Textbook of Pediatrics, edited by Waldo E. Nelson, V. C. Vaughn, and R. J. McKay, p. 44. The measurements for this table are from studies by Howard V. Meredith, Iowa Child Welfare Research Station, The State University of Iowa.
be positioned on a percentile continuum. In doing so, it was found that 57 girls and 39 boys had weight-height ratios which could be placed along the percentile continuum at one of the following points: the third, tenth, twenty-fifth, fiftieth, seventy-fifth, ninetieth, and the ninety-seventh.

Table 14 was constructed to illustrate the distribution of performance scores as these were found with various patterns of weight-height relationship among girls and boys in this selected sample of subjects. No attempt was made to compare groups because of the wide variation in numbers at each percentile range.

As may be seen in Table 14, girls at the 25th, 50th, and 75th percentiles were relatively accurate in their side view estimates of body part dimensions. It will be recalled that a TSDI of 0.9 (the mean score for girls at the 75th percentile of height and weight) reveals that no more than three inches of grid distance difference was found between the body size estimation combined scores on the side view line drawing and that obtained from the combined difference scores resulting from photographic assessment.

On all but the 75th percentile, boys tended to be more accurate than girls in estimating their front-facing dimensions. On the TSDI scores, boys were more accurate than girls in assessing body size at the 25th, 10th, and 3rd percentiles, but less accurate as their weights increased relative to height. (This may be because in many respects the added weight is a distinct advantage on the playing field in preadolescence.)
<table>
<thead>
<tr>
<th>Percentile Height/Weight</th>
<th>Subjects Sex &amp; No.</th>
<th>Age Range</th>
<th>TFDI Mean</th>
<th>TFDI Range</th>
<th>TSDI Mean</th>
<th>TSDI Range</th>
<th>Barrier Mean</th>
<th>Barrier Range</th>
<th>Penetration Mean</th>
<th>Penetration Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>97%</td>
<td>Girls (4)</td>
<td>118-128</td>
<td>2.75</td>
<td>1.8-3.1</td>
<td>2.25</td>
<td>1.8-2.9</td>
<td>3.0</td>
<td>1-5</td>
<td>1.0</td>
<td>0-2</td>
</tr>
<tr>
<td></td>
<td>Boys (1)</td>
<td>130</td>
<td>2.3</td>
<td></td>
<td>2.8</td>
<td></td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90%</td>
<td>Girls (8)</td>
<td>108-133</td>
<td>2.75</td>
<td>1.3-4.4</td>
<td>0.5</td>
<td>1.1-2.1</td>
<td>5.88</td>
<td>3-10</td>
<td>0.625</td>
<td>0-3</td>
</tr>
<tr>
<td></td>
<td>Boys (3)</td>
<td>118-133</td>
<td>2.5</td>
<td>1.4-3.7</td>
<td>2.0</td>
<td>0.8-3.5</td>
<td>5.66</td>
<td>4-7</td>
<td>1.0</td>
<td>0-2</td>
</tr>
<tr>
<td>75%</td>
<td>Girls (10)</td>
<td>118-128</td>
<td>2.4</td>
<td>0.5-3.9</td>
<td>0.9</td>
<td>0.5-3.9</td>
<td>7.4</td>
<td>1-12</td>
<td>1.00</td>
<td>0-2</td>
</tr>
<tr>
<td></td>
<td>Boys (6)</td>
<td>120-134</td>
<td>2.83</td>
<td>2.2-3.7</td>
<td>3.6</td>
<td>2.0-3.7</td>
<td>3.66</td>
<td>2-5</td>
<td>1.83</td>
<td>0-4</td>
</tr>
<tr>
<td>50%</td>
<td>Girls (12)</td>
<td>118-131</td>
<td>3.0</td>
<td>0.7-5.6</td>
<td>1.58</td>
<td>0.1-3.3</td>
<td>2.83</td>
<td>1-4</td>
<td>1.25</td>
<td>0-4</td>
</tr>
<tr>
<td></td>
<td>Boys (14)</td>
<td>122-131</td>
<td>1.86</td>
<td>0.9-3.7</td>
<td>1.79</td>
<td>0.4-3.0</td>
<td>4.14</td>
<td>1-7</td>
<td>1.5</td>
<td>0-4</td>
</tr>
<tr>
<td>25%</td>
<td>Girls (12)</td>
<td>119-140</td>
<td>2.58</td>
<td>0.7-4.1</td>
<td>1.75</td>
<td>0.2-3.3</td>
<td>3.5</td>
<td>1-8</td>
<td>0.92</td>
<td>0-3</td>
</tr>
<tr>
<td></td>
<td>Boys (8)</td>
<td>122-132</td>
<td>1.88</td>
<td>1.1-3.4</td>
<td>1.62</td>
<td>0.6-2.9</td>
<td>5.12</td>
<td>2-9</td>
<td>1.62</td>
<td>0-6</td>
</tr>
<tr>
<td>10%</td>
<td>Girls (6)</td>
<td>120-133</td>
<td>2.83</td>
<td>1.7-5.3</td>
<td>2.33</td>
<td>1.0-3.5</td>
<td>6.33</td>
<td>1-9</td>
<td>1.16</td>
<td>0-2</td>
</tr>
<tr>
<td></td>
<td>Boys (3)</td>
<td>122-126</td>
<td>1.67</td>
<td>0.6-3.2</td>
<td>1.33</td>
<td>1.3-1.9</td>
<td>3.33</td>
<td>1-5</td>
<td>0.34</td>
<td>0-1</td>
</tr>
<tr>
<td>3%</td>
<td>Girls (5)</td>
<td>126-139</td>
<td>2.4</td>
<td>1.2-3.3</td>
<td>1.8</td>
<td>1.1-2.5</td>
<td>3.6</td>
<td>2-6</td>
<td>0.6</td>
<td>0-1</td>
</tr>
<tr>
<td></td>
<td>Boys (4)</td>
<td>124-141</td>
<td>2.25</td>
<td>1.0-3.3</td>
<td>1.5</td>
<td>1.0-2.1</td>
<td>5.0</td>
<td>1-8</td>
<td>1.75</td>
<td>0-3</td>
</tr>
</tbody>
</table>
Barrier scores, in general, were lower at the 50th percentile, and the Barrier score for girls is lower at the 50th percentile than for other groups.

The Penetration mean score is lowest for girls at the 50th percentile, although a fairly steady increase in the Penetration mean score is seen from the third through the 75th percentile.

When Fisher and Cleveland began their work with the body image boundary dimensions, they speculated that one significant dimension of the body image might be the manner in which individuals perceived their body peripheries. The individual's body, they surmised, "encompassed his private domain," and was recognized as the "cumulative site for all his past experiences." Thus, they speculated, one might expect to find that the sort of boundaries the individual attributed to his body would reveal much about his over-all life style.

As their work continued, and as studies by other investigators were pursued, it became apparent that the Barrier score as such showed little relationship with measures that described the actual structure of the body. No correlation was found, for example, between the Barrier score and Sheldon's body-type classifications.

Since the Barrier score seems the more stable index of life style, it may well be that threat to the body is perceived within a situational context that varies from time to time and situation to situation. When an obese person, for example, attaches blame for the disappointing relationships in his life to the gross size of his body,

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4Fisher and Cleveland, Body Image and Personality, p. 56.
5Ibid., p. 354.
this may find reflection in the shifting Penetration score rather than the Barrier Index. The Barrier score may tap a deeper level of the unconscious, and be less amenable to change as a reflection of perceived threat.

Most of the research studies that have been done have concentrated their research interest on the Barrier Index. Unless an investigator is counselling students, or is working with his subjects over a period of time, he may not establish enough rapport with them to become aware of the threatening life situations that might be associated with changes in body boundary scores or in body size estimation scores.
A primary purpose of this study was the development and initial testing of drawing-task instruments that would produce objective scores indicating levels of accuracy in estimating body size and proportional relationships.

With this purpose in mind, twelve fine line drawings were constructed, using body dimensional proportions determined from published studies of the growth and development of healthy preadolescent children aged 10½ to 11 years. The drawing-task instruments were then used to test the ability of fifth grade boys and girls in selected parochial schools to estimate their heights (as a vertical dimension) and their body part breadths (as horizontal dimensions).

Performance on these drawing-task instruments was accepted as indication of awareness of body spatial relationships and proportional dimensions, a developmental task that would theoretically be in process during these formative years.

Accuracy of perception and delineation (expressed as estimations) of body size and contour lines was measured by: (1) weighing and measuring the height of each student by means of balance beam scales with attached height bar; (2) obtaining individual photographs of students in their bathing suits as they posed against a grid screen.
backdrop which facilitated measurement of the breadth of selected body dimensions.

Photographic and line drawing dimensions were then compared for each student, and dimensions objectively scored as to (a) no difference, (b) over-estimation, or (c) under-estimation. Awareness of body height was scored in the same manner.

Accuracy of body size estimation, over-estimations, under-estimations, Ponderal Index scores and single dimension scores were then compared for the total group, for the groups divided by schools, and for same sex groups.

To obtain an index of the unconscious aspects of body image, the first 25 inkblots from the Holtzman Inkblot Test, Form B, were administered; the protocols were masked and mailed to Dr. Seymour Fisher, who graciously blind scored them. Scores from this administration were then compared with other performance and population variables used in the study.

To survey the health practices of participating students, the self report instrument known as the Health Behavior Inventory: Elementary, devised by Sylvia Yellen was used. Eighteen of the forty items on this inventory were felt to contain some 'body' connotations from which attitudes toward body care and safety might be inferred. Total and part scores on the inventory were correlated with each other and with other variables in the study, using analysis of variance and covariance techniques.

To further explore the possible relationships between indicators of body size and performance variables, the Ponderal Indices,
and the percentile weight-height positions of selected students were calculated. The relationships between body boundary dimensions, body size estimation total scores, age and sex variables were then considered from the standpoint of the position on the weight-height percentile continuum.

Conclusions

On the basis of comparisons between the two portions of the drawing tasks, and the single body dimension estimates made on each view, it was concluded that the Body Size Estimation Test demonstrated an adequate measure of internal consistency, and is in fact suitable for use with preadolescent boys and girls.

It was demonstrated that there was significant correlation between dimensions of the body as shown by photographic assessment and estimations made of the size of these dimensions by the population group. The conclusion is that sufficient accuracy in the delineation of body spatial relationships was produced to warrant extension of the study, with suitably calibrated drawings, to other age groups.

However, few more than chance correlations were found between body boundary dimension scores, accuracy of size perception scores, and Health Behavior Inventory scores. Exceptions were found, but the relationships were of a low order—less than 0.26 in most cases.

No significant differences were found to exist between sex-linked groups, with the exception of two instances. Boys made significantly lower scores on the front view profile drawings than girls, indicating that boys were more accurate in their assessments of the
front view dimensions. Girls, however, made significantly higher scores on the Health Behavior Inventory part score concerned with mental health practices.

Basic to the hypotheses of the study were two major assumptions: (1) that the body image, the features of the physical body, and the individual's external representations of his body are in isomorphic relation; and (2) that the body attitudes revealed in self-report instruments are reflected in self-reported health practices. On the basis of the instruments used in this study, the findings do not support either assumption. However, the boys and girls in this study were preadolescents; it is possible that different results may have been obtained with pubescent subjects.

Recommendations

Results from the study seem provocative enough to warrant an extension of the study to other age groups in the public and parochial school populations. It would be interesting to learn how healthy active children describe their body and its size, in comparison with those demonstrating: (a) perceptual-motor impairment; (b) chronic disease symptoms; (c) marked hearing loss; (d) marked visual inefficiency; (e) frequent accidental injuries; (f) obesity or malnutritional states; (g) impairment of psychological functioning.

In future studies, alterations made on the line drawings should be compared with scores obtained from figure drawings made by subjects directed to draw themselves or another person. Results may suggest that there are categories of developmental 'shape' age-awareness. A psychological continuum of the range of estimations
(over and under) characteristic of each developmental phase of growth might then be constructed, and used as a basis for comparing individual scores.

Chronological age may prove to be the least influential factor on body size estimations, when comparisons are made between the child's estimations of his body's size and contours, and those his parents make as to his size and contours, using the Body Size Estimation Test technique.

Further, it is recommended that other instruments (focusing on health attitudes and practices) be devised for use with the Body Size Estimation Test. A Semantic Differential type scale, suitable for use with elementary school children and concerned with aspects of healthful body functioning and healthy growth and development, would seem less global in its approach to body and health attitudes than the Health Behavior Inventory seems to be.

There were only eleven students in the study group that were not of Caucasian extraction, and race did not prove to be a significant factor insofar as performance scores were concerned. It is recommended that a study be made with matched groups based on ethnic, racial, or socio-economic factors, to determine the influence of culture on the estimation of body size and proportions.

It is recommended that the Body Size Estimation Test technique be used in a school setting, in health education, physical education, and family life education classes, to test the efficiency of the instrument when used as a teaching aid to help preadolescent students gain increased understanding of the growth and developmental processes,
and to encourage tolerance for individual differences in physique and articulation.

As a research tool, it is recommended that the Body Size Estimation Test be used in conjunction with tests of non-body object size estimations, to determine the efficiency of the instruments when used in health counselling the markedly overweight or obese youngster.

In conclusion, it is recommended that an additional line drawing be added to each set of the drawing task instruments: a back view needs to be developed which can be used in conjunction with the side and front-facing drawings.
APPENDIX A

Form Letter to Parents
Dear Parent:

C_______ C_______ Grade School, with the approval and permission of the Superintendent's Office of the Diocese of Columbus, is participating this year in a study of the normal growth and development of school children.

As a part of this study, the children will be weighed, measured, and photographed wearing bathing suits. Each child's parents may receive one copy of the photograph taken of his child if this is desired.

I will be at the school on Friday, ______________, at 9:00 a.m., to answer any questions about the study.

We feel confident that you will be interested in this project and will wish your child to be included in the study group. We would appreciate your cooperation in helping us to carry out the study requirements. Please sign and complete the following form and return it promptly to Sister ________________.

Sincerely,

Mrs. Gordon D. Cremer

I, ____________________________, give my consent for (Name of Parent or Guardian) (Name of Child) to participate in the above mentioned study.

Signature: ______________________

Date: _________________________
APPENDIX B

Line Drawings Used in Study
APPENDIX C

Comparison of Performance Scores from the
Three Elementary Schools
<table>
<thead>
<tr>
<th>Variables</th>
<th>School No. 1 (19 Subjects) (13 boys) (6 girls)</th>
<th>School No. 2 (32 Subjects) (7 boys) (25 girls)</th>
<th>School No. 3 (52 Subjects) (20 boys) (32 girls)</th>
<th>Univariate* F Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.D.</td>
<td>Mean</td>
<td>S.D.</td>
</tr>
<tr>
<td>Barrier score</td>
<td>3.95</td>
<td>2.37</td>
<td>3.66</td>
<td>2.67</td>
</tr>
<tr>
<td>Penetration score</td>
<td>1.16</td>
<td>1.54</td>
<td>1.16</td>
<td>1.11</td>
</tr>
<tr>
<td>Total front discrepancy index</td>
<td>2.54</td>
<td>1.19</td>
<td>2.72</td>
<td>1.22</td>
</tr>
<tr>
<td>Total side discrepancy index</td>
<td>1.85</td>
<td>0.88</td>
<td>1.78</td>
<td>0.77</td>
</tr>
<tr>
<td>Health Behavior Inventory</td>
<td>23.21</td>
<td>8.30</td>
<td>23.78</td>
<td>6.61</td>
</tr>
<tr>
<td>Pers. Health</td>
<td>0.69</td>
<td>0.14</td>
<td>0.66</td>
<td>0.17</td>
</tr>
<tr>
<td>Pers. Cleanl.</td>
<td>0.65</td>
<td>0.23</td>
<td>0.57</td>
<td>0.26</td>
</tr>
<tr>
<td>Nutrition</td>
<td>0.70</td>
<td>0.18</td>
<td>0.66</td>
<td>0.20</td>
</tr>
<tr>
<td>Safety</td>
<td>0.60</td>
<td>0.24</td>
<td>0.64</td>
<td>0.21</td>
</tr>
<tr>
<td>Commun. Health</td>
<td>0.51</td>
<td>0.24</td>
<td>0.52</td>
<td>0.32</td>
</tr>
<tr>
<td>Infect. &amp; Dis.</td>
<td>0.65</td>
<td>0.21</td>
<td>0.58</td>
<td>0.26</td>
</tr>
<tr>
<td>Mental Health</td>
<td>0.59</td>
<td>0.22</td>
<td>0.61</td>
<td>0.30</td>
</tr>
<tr>
<td>Dental Health</td>
<td>0.30</td>
<td>0.25</td>
<td>0.32</td>
<td>0.32</td>
</tr>
</tbody>
</table>

*If F(2,100) is greater than 3.12, there is a significant difference at the 0.05 level of confidence.
SELECTED BIBLIOGRAPHY

Books


Periodicals


________. "Size and body build of adolescents in relation to rate of skeletal maturing." Child Development XIV (1943), 47-90.


Elkind, D. "Quantity conceptions in junior and senior high school students." Child Development, XXXII (1961), 551-60.


Gates, Arthur I. "The nature and educational significance of physical status and of mental, physiological, social and emotional maturity." Journal of Educational Psychology, XV (1924), 6-10.


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Likert, R. "A technique for the measurement of attitudes." *Archives of Psychology*, XXII (1932), 5-43.


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Mussen, Paul H., and Jones, Mary C. "Self-conceptions and interpersonal attitudes of late and early maturing boys." Child Development, XVIII (1957), 243-56.


Orbach, J.; Traub, A. C.; Olson, R. "Psychophysical studies of body image." Archives General Psychiatry, XIV (1966), 41.

Rice, C. "The orientation of plane figures as a factor in their perception by children." Child Development, I (1930), 111-143.


________. "The body percept in physical medicine and rehabilitation." *Journal of Health and Social Behavior*, VIII (1967), 60-64.


Zion, Leila C. "Body concept as it relates to self-concept." *The Research Quarterly*, XXXVI (1965), 490-95.

**Published Tests**


Franzen, Raymond H.; Derryberry, Mayhew; McCall, W. A. *Health Awareness Test*. New York: Bureau of Publications, Teachers College, Columbia University, 1933.


Theses and Dissertations


Simmons, Allan D. "A Test of the Body Image Hypothesis in Human Figure Drawings." Unpublished Ph.D. dissertation, The University of Texas, 1966.


Miscellaneous