

To the Graduate Council:

I am submitting a dissertation written by Deborah Ann Stevens entitled "A Valid and Reliable Instrument for the Measurement of Perceived Body Size in Children." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Education, with a major in Physical Education.

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A VALID AND RELIABLE INSTRUMENT
FOR THE DIRECT MEASURE OF
PERCEIVED BODY SIZE
IN CHILDREN

A Dissertation Presented for the
Doctor of Education Degree
The University of Tennessee, Knoxville

Deborah Ann Stevens

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To my Parents

Calvin and Dove Stevens

whose prayers, support, and
encouragement are never ending.

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ABSTRACT

Body size estimation is one means which can be used to assess the development of the concept of body-image by children. An instrument for building a model to represent the body-image of an individual child was used in this study, i.e., the Stevens' Block Figure Model (SBFM). The purposes of this study were: (a) to determine the best method of performing the task and scoring the SBFM, (b) to test the reliability of the SBFM as a direct measure of perceived body size for children, and (c) to determine the degree of validity based on the relationship of body-image measured by the SBFM with/for the theoretical constructs of age, sex, IQ, and physical activity experiences inside and outside of school.

Subjects for the study included 60, 7-, 8-, and 9-year-old children in the Tennessee area. The SBFM was the basic instrument used to assess the body size estimations of the following: (a) total height, (b) leg length, (c) trunk length, and (d) hip width. The assessment of these body segments provided the information from which to determine whether or not children could symbolically represent vertical and horizontal dimensions of their body space. To ascertain the correspondence between actual and perceived measures of body size estimation, testing occurred in two different sessions approximately seven days apart. The

first test session involved making introductions and taking actual body measurements. Test session two was concerned with using the SBFM to derive the children's ascending estimations of their perceived body size.

The analyses of the data were conducted specific to the nature of eight individual subproblems. Data analyses were accomplished using correlation, regression, and multivariate techniques. Results indicated that body size perception is a complex multidimensional phenomena that acts in conjunction with other variables for 7- to 9-year-old children. The constructs of age, sex, IQ, and physical activity experience were all contributing factors to the child's ability to perceive their body size. The overall results indicate that the SBFM: (a) has high reliability (total height, $r = .96$; leg length, $r = .91$; trunk length, $r = .85$; hip width, $r = .97$), and (b) has construct validity as a measure of perceived body size in 7- to 9-year-old children.

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CHAPTER I

INTRODUCTION

Self-concept is a broad term that encompasses a variety of components relating to the attitudes and feelings that an individual has about his/her identity, life role, and appearance (Fisher & Cleveland, 1965). Jersild (1952) defines self-concept in terms of three components: (a) a perceptual component involving the way one perceives the self, his/her appearance, and the impression one makes on others; (b) a conceptual component, the concept one has about individual abilities, characteristics, assets, and limitations; and (c) an attitudinal component that involves the feelings a person has about the self. Basically the term implies an individual's awareness of self in its totality, including abilities, limits, and feelings (Jersild, 1952). The development of self-concept is viewed as beginning early in life and becoming more stable over the years, while always remaining open to change (Tanner, 1969).

An individual's perception of body-image is considered to be an integral part of their overall self-concept. Body-image and self-image overlap somewhat since they are both constructs that describe perception of self. However body-image deals with the very specific perception of the physical body. Body attitudes and body experiences, that may have societal and environmental origins, combine to influence the

development of an individual's body-image (Fisher & Cleveland, 1965). Witkin (1965) has defined body concept as the cognitive and affective, conscious and unconscious impression an individual has of the body that develops as the individual matures. Frostig and Maslow (1970) have expressed a similar view in defining body image as the totality of all life experiences, thought processes, feelings, and emotions that the individual uses to recognize self and relate to the world. Every aspect of a child's development may influence the body-image concept; i.e., sensory motor functions, communication abilities, perception, intelligence, emotional development, and social adjustment (Frostig & Maslow, 1970).

The importance of the development of a positive self-concept is reflected by most motor development and psychology experts (Shontz, 1965; Cratty, 1964; Harrow, 1972) as being basic to the development of autonomy and self-actualization. The inherent development of the body-image within the overall scheme of the self-concept is important in the child's overall development. During development, the body-image construct will change in a positive or negative manner in relation to changes in the child's self-concept. Witkin (1965) reported that the study of the body concept can help us understand a great deal about individual development and functioning. As a child grows and develops, bodily sensations received from the self

and from outside objects are integrated into the perception of the body, or body-image, for future use. This perception will enable the child to gain knowledge of: (a) the relationships between self and the world, and (b) the contribution and influence each has on the other (Stiles, 1975).

The body-image appears to be the foundation necessary for the performance and development of certain judgments and skills (Teitelbaum, 1941). "An individual's attitude toward his body has a significant influence upon his ability to deal with unstructured spatial situations" (Fisher & Cleveland, 1958, p. 34). The ability to accurately interpret certain spatial relationships is affected by feelings one has toward the body-image. Overall, the body-image can serve as a frame of reference which can influence some of the individual's perceptual strategies and that person's ability to perform certain skills (Fisher & Cleveland, 1958).

The earliest conceptualization of the term body-image was referenced in the fields of neurology, psychiatry, and psychology. The British neurologist, Head, was the first to establish an elaborate theory on body-image. Head (1920) postulated that the functioning of the body may be perceived as an instrument that can be used to develop accurate spatial locations and to measure movement. He proposed that people develop a model of the self which may serve as a standard against which all body movements are judged. Head (1920) established the role of body-concept as the mediator

of human movement, since the body-image is developed and maintained through movement experiences. Movement is viewed as altering the perceptions regarding the body-image and the feelings one has toward movement itself (Head, 1920).

Schilder (1950) alluded to mechanisms in the central nervous system (CNS) as important in individuals constructing a spatial image of their body. His work emphasized the importance of motility in the development of body-image and contends that changes in movement influence the structure of the body-image. Schilder (1950) was convinced that both motility and sport concepts are judged by comparisons with the standards of each individual's body concept. Both Schilder (1950) and Head (1920) laid the foundation for the theoretical framework of the body-image construct, and theorized the nature of the relationship which exists between body concept and motor development.

The importance of body-image awareness is essential to the development of motor skills and movement and vice versa. Thus, it is important that children have an accurate understanding of their body and it's relevant position in space. The body serves as a reference point for perception of people, objects, and orientation in space (Kephart, 1971). Schilder (1950) stated "... the body-image and especially it's optic parts are necessary for the beginning of a movement" (p. 23). Witkin (1965) contended that the body-

image "... serves as an organizing principle for perception especially when stimulus conditions for perception of the body are not entirely definite and clear cut" (p. 28). The child has fewer resources available, in terms of developed perceptual abilities, than the adult. Therefore, these limitations cause children to use existing abilities associated with movement to meet their needs. Movement becomes a large factor in determining how the child perceives and evaluates his/her own body-image (Woods, 1966). Schilder (1950) stated,

It is remarkable... that movement leads to a better orientation in relation to our own body. We do not know very much about our body unless we move it. Movement is a great uniting factor between the different parts of our body. By movement we come into a definite relationship to the outside world and objects, and only in contact with this outside world are we able to correlate the diverse impressions concerning our own body. The knowledge of our own body is to a great extent dependent upon our own action. (pp. 112-113)

Kephart (1971) concluded that "only through a reliable and consistent body-image can the child develop a reliable and consistent point of origin for either perception or motor responses" (pp. 52-53).

The approach to teaching elementary physical education has changed in the past 20 years. Many experts (Nichols, 1986; Siedentop, Herkowitz, & Rink, 1984; Graham, Holt/Hale, & Parker, 1987) have agreed that the traditional approach of

games, dance, and gymnastics teaching units does not appear to be meeting all the developmental needs of the young child. A newer approach, known as movement education, is viewed as a more holistic, child-centered approach, designed to help children understand conceptually more about themselves and fundamental movement patterns (Nichols, 1986). The question of potential differences in effects on learning/performance between traditional physical education programs and movement education programs has been researched since the inception of the movement education program in the U.S.A. in the early 1950's. Movement education has been viewed as providing a variety of fundamental movement experiences for children that enable them to establish a foundation for all types and forms of movement (Graham et al., 1987). This variety of movement experiences is considered to enhance perceptual and visual abilities, which in turn, may have a greater influence on the child's overall self-concept (Tanner, 1969).

Educators are beginning to realize that increased body awareness and the resulting efficiency of movement may be influenced greatly by the individual's perceptual development. Schilder (1950) suggested that perceptions will only generate meaning when they are the basis for actions. A postural knowledge about the body model, knowledge of the limbs and their relationship to each other, is necessary to begin every movement. Woods (1966) contended that the

movement behavior of children represents a level of performance that involves the interaction of their perceptions of self or body-image in conjunction with their perceptions of the environment. Woods further contended that "the significance of perception lies in relation to the manner in which the child achieves mastery of himself for greater manipulation of the environment" (p. 7). Most experts have agreed that efficiently functioning perceptual abilities are essential if development of the learner is to occur in all domains; i.e., cognitive, affective, and psychomotor. Enriched movement experiences will occur for the child, due to perceptual efficiency in relation to the environment (Harrow, 1972). Perceptual development plays a vital and integral part in the development of the concept of body-image. An aspect which must be considered in the growth and development of a child is that perception also implies the possibility of misperception. In order for normal growth and motor patterns to develop and function successfully, correct perceptions must occur more frequently than misperceptions (Woods, 1966). Schilder (1950) concluded that when misperceptions prevail, disturbances in body-image are evident, and learning difficulties result.

Some individuals develop definite and clearly defined body-image boundaries and can differentiate those boundaries from the surrounding environment. Others have difficulty as

body-image boundaries are vague and indistinguishable (Fisher and Cleveland, 1958). Schilder (1950) stated, "When the knowledge of our own body is incomplete and faulty, all actions for which this particular knowledge is necessary will be faulty too" (p.45). Disturbances in body-image and faulty movement patterns appear to spread into all aspects of the child's educational experience. The close relationship that exists between perceptual activities and motor activities is very important. Schilder (1950) indicated that a large body of research exists that shows individuals with psychological disturbances in personality, also consistently demonstrate disturbances in body-imaging.

Body size estimation is one aspect of measuring body-image which is being utilized to measure accuracy of self-perception. Shontz (1969) viewed body size estimation, with inherent individual differences, as a tool from which to reference movement. He suggested that the degree of accuracy of body-imaging, as measured by estimation of body size, will determine: (a) one's performance of movement skills, or (b) one's ability to learn new movement skills. In the area of research, most of the instruments which have been used to estimate body size have involved some projective techniques or paper-and-pencil type tests. Measures of body-image frequently encountered in the literature include: (a) the Barrier score (Fisher & Cleveland, 1958), (b) rod and frame tests (Wapner & Werner, 1965), (c) draw-a-person

test (Machover, 1949), (d) schematic representations of body parts test (Katcher & Levin, 1955), and (e) estimation of body part size (Fuhrer & Cowan, 1967; Shontz, 1965; McFee, 1968; Woods, 1966). The most sophisticated technique, used to date, was devised by Dillon (1962); i.e., an instrument similar in concept to a sliding door in which the sides were moved in and the top down, in order to "fit" an individual's perceived estimation of body size.

Horowitz, Duff, and Stratton (1964) suggested that a "body buffer zone" or body boundary exists which incorporates a measure of space surrounding the body and may perhaps be personalized by the individual. They suggest that through play and movement, children can develop an inner awareness of this boundary and of their own body-image that allows them to indirectly estimate the body size they perceive. Previous research (Dillon, 1962; Hart, 1971) has sought to measure the outer limits of the body boundary, mainly through instruments which surround the individual's estimate of that zone. A more specific measure of an individual's estimated size can be obtained by having each child build a block figure representing an estimate of his/her perceived height and width. An apparatus for building a model to represent the body-image of an individual child has been developed and pilot tested. The instrument is called the Stevens' Block Figure Model, hereafter referred to as the SBFM.

Statement of the Problem

The purposes of this study were: (a) to determine the best method of performing the task and scoring the estimations of perceived and actual body measures, (b) to test the reliability of the SBFM as a direct measure of perceived body size for 7- to 9-year-old children, and (c) to determine the degree of validity based on the relationship of body-image measured by the SBFM with/for the theoretical constructs of age, sex, IQ, and physical activity/movement experiences inside and outside of school. If the constructs/relationships/differences support the theoretical framework, then there is further support for construct validity of the instrument. Thus, the following subproblems will be addressed:

Determination of Best Scoring:

1- Are there significant differences between the ascending scores from the SBFM instrument and the respective actual body measure? This measure was utilized to determine if ascending estimates were significantly related to the actual measurements.

2- Do patterns of representation in the estimates of the dimensions of body size emerge as either consistent overestimation or underestimation?

Reliability:

3- Are the SBFM scores reliable utilizing the test-retest method for 7-, 8-, and 9-year-old children?

Further Validation Relative to Theoretical Constructs:

4-Are the instrument scores of perceived body size related to age across 7-, 8-, and 9-years? A positive relationship supports the theoretical notion of age/body-image development.

5- Are there significant relationships between IQ and the difference between SBFM scores of actual and perceived estimates? A positive relationship would support the theoretical notion of IQ/body-image development.

6- Are there significant differences between actual measures of body size and perceived estimates of body size on the SBFM instrument for each age level? If older children's scores are significantly closer in estimation of body size to actual size, than younger children's scores in some or all measures of body-image, then there is support for the theoretical perspective.

7- Are there significant differences between actual estimates of body size and perceived estimates on the SBFM instrument for each sex? Society suggests that boys have more movement opportunities than girls. Research also tends to suggest that greater movement opportunity is associated with more accurate body-image representations, however, sex

differences often do not show up at this young age level, but remains an important construct to consider.

8- Are there significant differences between children's body size estimations in relation to: (a) the activity experience issue in schools, i.e., type of physical education program, and/or (b) other physical activity experiences outside of school.

Definition of Terms

The following terms are defined theoretically and where appropriate operationally as they are used in this study.

Accuracy of body size estimation: The difference between actual and estimated body size measures.

Actual body size: Physical magnitude, extent or bulk, relative or proportional dimensions (Flexner, 1987).

(a) Actual height (stature): The measured height, while the subject was standing with heels and back against the wall, from the base of the heel to the top of the head. In this study, actual height was recorded by measuring the child using an anthropometer to compute the child's actual height to the top of the head.

(b) Head height: The measured distance from the top of the head to the acromian process. In this study, actual height minus total height was used to determine head height.

(c) Hip width (Biiliac Breadth): The measured width with the greater trochanter being the landmark site on

each side of the hips. In this study, this measurement was taken using an anthropometer from the back of the subject, such that the blades of the anthropometer were in contact with the iliac crests (Lohman, Roche, & Martorell, 1988).

(d) Leg length (subischial height): The measured distance between the hip joint and the floor when the subject stands erect. In this study, leg length was defined as the difference between actual height and sitting height (Lohman et al., 1988).

(e) Sitting height: This measurement was derived using an anthropometer. The subject sits erect on a table in which the legs hang freely and the hands were in the lap. The anthropometer was positioned vertically at the midline, behind the subject (Lohman et al., 1988).

(f) Total height: The height of the subject relative to the model the child builds. In this study, total height was measured using an anthropometer to measure the height of the child to the top of the shoulder. Total height equaled actual height minus head height.

(g) Trunk length: The measured height from the greater trochanter to the acromian process. In this study, the difference between sitting height and head height determined trunk length.

Age: An individual's development measured in terms of years (Lohman et al., 1988). In this study, the chronological

age of children 7-, 8-, and 9-years was used to the nearest month.

Ascending measure: Moving upward, growing or directed upward from the base (Flexner, 1987). In this study, ascending estimates only were derived on the SBFM instrument in which blocks were increased in size from zero to the child's estimated perception of the vertical dimensions.

Body-image boundary: The outer layers of the human body which are most intimately in contact with the environment, i.e., the skin and musculature (Woods, 1969).

Body-image or concept: The impression an individual has of one's body, a mental representation of one's body in space, the totality of experiences through which the individual recognizes the self (Witkin, 1965; Frostig & Maslow, 1970). In this study, a difference score between estimated measures on the SBFM and actual measures were used to evaluate body-imaging of the perceived body size estimates of total height, leg length, hip width, and trunk length.

Construct validity: The degree to which a test measures abstract attributes or qualities that cannot be directly measured (Safrit, 1986). In this study, construct validity involved the degree to which the SBFM measures supported the related theoretical concepts in the expected direction (pp. 10-12).

Dimensions of body space: The amount of space one's body consumes in the horizontal and vertical planes (Woods, 1969). In this study, the horizontal (total height, leg length, and trunk length) and vertical (hip width) estimates made in conjunction with the SBFM were used to assess dimensions of body space.

IQ: A number used to express the apparent relative intelligence of a person (Lohman et al., 1988). In this study, the achievement test score which was recorded in the child's school records was used; i.e., Stanford Achievement Test.

Perceived body size: The subject's estimate of the size of a body part in conjunction with perceptual efficiency of the environment (Harrow, 1972). In this study, the child's estimate of the body dimensions of total height, leg length, hip width, and trunk length, utilizing the SBFM were used to assess perceived body size. Ascending estimates only were derived in relation to estimates of total height, leg length, and trunk length.

Physical activity/movement experience: The amount of extracurricular and curricular activities in which the child participates. In this study, the activity experience inside of the school was determined by the type of physical education program content; i.e., traditional physical education or movement education. The activity experience

outside of school was determined by the amount of activities, recreation, or sports of which the child chose to be a part of as determined by parent responses to a questionnaire (Appendix G).

(a) No outside activities: This is defined as a child who does not participate in any games/sports/activities outside of school.

(b) Some outside activities: This is defined as the child who participates in 1, 2, or 3 games/sports/activities outside of school at least once a week.

Physical education programs: The part of the educational process that contributes to the physical, emotional, social, and mental development of each child through the medium of physical activity (Kirchner, 1966).

(a) Movement education program: A child centered approach to learning designed to help children develop greater understanding of themselves as movers, the space in which to move, and the factors affecting efficient movement (Nichols, 1986).

(b) Traditional physical education program: An activity-centered curriculum composed of units of instruction in games, dance, and individual activities (Nichols, 1986).

Physical education specialist: A teacher specially trained and certified to teach physical education (Nichols, 1986).

Reliability: The consistency of an individual's performance on a test (Safrit, 1986). In this study, reliability was measured by the test-retest method using one-half of the sample with stratification for age, sex, IQ, and physical activity/movement experience. This portion of the data collection occurred approximately one week following the initial testing.

Assumptions

It is assumed that:

- 1- Everyone has a body concept and various degrees of body articulateness exist.
- 2- Children age seven and above have some degree of conceptualization of their body parts.
- 3- Children's understanding of body boundaries develops in conjunction with their understanding of self and non-self.
- 4- During testing, the children understood the instructions given in relation to the SBFM.
- 5- Children are able to discriminate changes in perceived size estimates for ascending measures when using the SBFM.

Limitations

Limitations regarding this study:

- 1- This paper is limited to 7-, 8-, and 9-year-old children enrolled in two elementary schools in the state of Tennessee.

2- This paper is limited to children who do not fall into extreme deviations of excessive height and width, due to the limits in size of the SBFM.

3- The findings in this paper may be generalized only to the population sampled.

4- The measurements and estimations are limited to four dimensions of body size: (a) total height, (b) hip width, (c) leg length, and (d) trunk length.

Significance of the Study

Much of the research in the area of body-image definitiveness has involved projective techniques or psychological paper-and-pencil tests (Fisher & Cleveland, 1958; Wapner & Werner, 1965; Machover, 1949; Katcher & Levin, 1955). Studies involving the direct measure of perceived body size are rare, but do exist (Dillon, 1962; Werner, Wapner, & Comalli, 1957). Researchers in this area of body awareness contend that the definitiveness with which the body-image is measured is influenced by the child's self-concept (Witkin, 1965). The way in which a child feels about the self is a measure of how articulate one might be in assessing body-imaging.

Conceptualization of the perceptual abilities to assess body part size develops as a result of efficient movement (Schilder, 1950). Each construct is seen as reinforcing the

other, such that movement is essential to the development of a concrete body-image and a concrete body-image is essential to develop efficient movement (Robinson, 1981). Knowledge of the body model, its limbs, and their relation to each other is necessary to elicit movement and the development of motor skills (Schilder, 1950).

Body size estimation is one measure which can be used to assess perceptual ability in children. The accuracy of body-imaging defines one's performance of movement skills and one's ability to learn new movement skills (Shontz, 1969). Attributes which can be derived from estimating body size is very important in the total scheme of childhood growth and development. It is important that an instrument for the direct measure of perceived body size be developed so that projections and theories can be accurately tested. A valid and reliable measuring device would facilitate the accurate assessment of the developmental rate of body awareness and the relationship of this construct to other developmental phenomena.

CHAPTER II

REVIEW OF LITERATURE

Body size estimation is one aspect of measuring self perception of an individual's body-image. Body size estimation can be used as a tool to define one's ability to learn or perform movement skills (Fisher & Cleveland, 1965). The process of defining the degree or direction of this perceptual ability lies in the development of an instrument for valid and reliable assessment. A limited amount of research has been done in the area of body size estimation in the past, and what has been done primarily involved the utilization of projective techniques or paper-and-pencil assessments (Dillon, 1962; Wapner & Werner, 1965; Woods, 1966). This review of literature examines information regarding the theoretical basis and measurement techniques of perceived body-image in the following categories: (a) definition of the body concept, (b) development of the body-image, (c) evaluation of body concept, and (d) movement and body-image concept.

Definition of Body Concept

The body-image phenomena is a construct that embraces a variety of ideas in several areas of research including psychology, education and philosophy. According to Blom et al, (1970), "the body concept is not an etiologically-based

function but rather is a functionally-based one. It contains a number of elements or subconcepts when it is broken down for the purpose of understanding..." (p. 32). Generic definitions of the term body-image have been suggested by several authors. Smythies (1953) and Witkin (1965) both proposed a more all-encompassing definition by viewing body-image as a combination of cognitive, affective, and psychomotor elements. Shontz (1969) expanded on the above by describing the body-image as a construct which connects perception and language to give meaning to the self.

Terms that have been used to refer to the body-image phenomena include body-schema, body awareness, body percept, and body concept. Often the term body-image refers to the individual's conscious and verbalized concept of the body or to the individual's subjective experiences (Tanner, 1969). Each term varies in usage according to the different research orientations, experiences, or settings.

Schilder (1950) examined the influence of the personality on the perceptual process and suggested that perceptions remain the same for the perceiver's self and outside objects. Schilder suggested that representation of outside objects occurs in the same manner that the individual represents the self. The body-image can be viewed here as the "germ" for initiating movement. Schilder defined the body-image as the picture of our body which is

formed in our mind. Schilder's (1950) definition incorporates the relationship of self and object as necessary for initiating movement. This capacity to move is influenced by past experiences and the images formed from those experiences.

Fisher and Cleveland (1958) have done a vast amount of the early research in the area of body image and many view their definition of the term as the most inclusive of all meanings.

The body-image is a term which refers to the body as a psychological experience and focuses on the individual's feelings and attitudes towards his own body. It is concerned with the individual's subjective experiences with his body and the manner in which he organizes them. 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. It is a phenomena relatively more complex and difficult to organize perceptually than other phenomena 'out there' because of its unique simultaneous role as a participant in the perceptual process and also as the object of this same perceptual process (Fisher & Cleveland, 1958, p. x).

Frostig and Maslow (1970) defined the term body-image from a socialization perspective. They defined body-image as "... the totality of the life experiences and thought processes through which the world is recognized and through which the individual recognizes himself..." (p.44). In this sense, every aspect of a child's development would influence the body-image concept, i.e., motor functions, communication,

perception, intelligence, emotional development, and socialization (Frostig & Maslow, 1970). In contrast, Robinson (1981) suggested different components, i.e., individual aspects of perception of body size and shape, judgments concerning the performance abilities of the body and its parts, overall subjective feelings, and penetrability of body boundaries become important in formulating the overall construct.

The term body-image has been defined differently by various researcher's in several fields of study. Despite the variations, all theorists/researchers have expressed the belief that the development of the body-image is of fundamental importance to the child establishing a sense of self-identity. This identity helps children to cope better with the environment and to interact with the world in general.

Development of the Body-Image

Development of the body-image proceeds in much the same way as other growth and development characteristics. The child progresses through stages from a global analogy of the environment to a defined and developed focus on specifics in the environment. Although divergent theories exist as to the nature of this process, most experts agree that body-image development involves a dynamic combination of forces

that influence children and their subsequent maturation (Werner et al., 1957; Fisher & Cleveland, 1958). A variety of research based opinions exist in relation to the development of the body-image. Different educational and scientific fields interpret the construct from independent viewpoints, but each emphasizes that a relationship does exist between an individual's body concept and his/her behavior.

Fisher and Cleveland (1958) have identified body-image as a component of self-concept. Contrary to the developmentalist viewpoint, Fisher and Cleveland suggested that the body-image concept focuses on the individual's feelings and attitudes toward his/her own body. "...such attitudes and experiences grow out of one's socially determined role and identities" (Fisher and Cleveland, 1958, p.111). In this context, the body-image functions in conjunction with the individual's basic social relations, especially those involving the identity of self as good or bad. As individuals develop, organization of the sensations from the body influence the positive or negative development of the body-image. The developmental principle of differentiation has been applied in research by the French psychologist, Paul Schilder (1950). Schilder has postulated that in the early stages of development the body is visualized as having a lack of differentiation of the separate body parts and the global entity becomes

differentiated only through contact in and with the environment and, later in development, through movement experiences.

Merleau-Ponty (1962), a philosopher, has theorized that the body percept is developed through a series of three different stages. The first stage involves little more than a collection of visual, tactile, and kinesthetic associations. Stage two introduces the formulations of patterned form, similar in awareness with Gestalt psychology, in which mutual relations between parts of the body develop. The final stage involves organization of essential centers with peripheral elements in the environment. Merleau-Ponty views the conceptualization of body-image as an ever changing entity which parallels changes in the environment.

Witkin (1965) shares Schilder's view regarding the differentiation principle and has stated that, "The child's conception of his body develops through an interplay of forces which go into shaping him as a person" (Witkin, 1965, p.26). According to Witkin, at first the body appears to the child as an undifferentiated whole, but the child soon becomes actively involved in the awareness of body parts and their interrelated functions. What began as a global body concept combines with experiences in the environment to develop a precise body-boundary. Once this latter

development occurs, then feelings about the self and self-image become important (Witkin, 1965). Witkin (1965) summarizes, "...we consider the progress toward differentiation of the self entails a growing awareness of needs, feelings, and attitudes recognized as one's own and the identification of these as distinct from those of others" (p. 39).

Some researchers view differentiation and the development of the body-image occurring concurrently (Wapner & Werner, 1957). Individuals need to develop the ability to differentiate between the perception of self and the perception of objects because interpretations of experiences may be dependent upon one's current perceptual state (Wapner & Werner, 1957). According to this view, the interaction of the self, environment and the stimulus object is important because of the differing perceptual abilities involved. The individual is the observer, as well as the observed. Therefore, external objects and self are different perceptual phenomena. The development of the body concept occurs in conjunction with the differentiation of the personality structure (Stiles, 1975).

The majority of researchers (Fisher & Cleveland, 1958; Witkin, 1965; Schilder, 1950; Wapner & Werner, 1957) have viewed the development of body-image as reflective of the child's individual self-concept. As they see it, the development of the body-image generally proceeds from a

global perspective to one of differentiation. As children's perceptual abilities develop, they become more aware of the possibilities for moving the body, along with gaining an enhanced understanding of that movement. The world which surrounds the child can provide an environment that allows for the development of certain feelings and, eventually, opinions about the body itself (Fisher & Cleveland, 1958).

Evaluation of Body Concept

Many techniques have been employed by researchers investigating the degree and direction of body-image development. Projective, objective, verbal, manipulative, and cognitive techniques have all been utilized to assess the various interpretations of body-image.

Body size estimation is one measure of body-image that has been utilized to determine the accuracy of self perception. The ability to estimate body size can be an important factor in an individual's ability to learn and perform movement skills (Shontz, 1969). Body size and the child's image of personal size are of significance during early social interactions. Katchner and Levin (1955) stated that one of the earliest concepts the child learns to verbalize is that of size. Research in this area has revealed that the ability to discriminate large differences in size appears to be well established by the age of three

(Hicks & Stewart, 1930; Thrum, 1935; Terman & Merrill, 1937). Children receive numerous reinforcing examples relative to size and status during the early developmental years that enable them to have sufficient exposure to size distinctions (Katchner et al., 1955).

Research has provided evidence that children are capable of making differentiations in size and of providing estimates of their perceived body size. The assumption becomes one of knowing that some conceptualization of body parts is evident within every child. The degree or direction of developed differentiation of this perception is unknown, but some conceptualization of size does exist (Hicks and Stewart, 1930).

Many of the above considerations have led researchers to study the concept of body-image. Many techniques have evolved which try to determine the degree to which body-imaging can be accurately assessed. Most of the instruments which have been used to estimate body-image fall into one of three categories: (a) projective techniques, (b) objective tests, and (c) non-projective techniques. The following portion of this review will examine the research in these areas.

Projective Techniques

Projective techniques have been utilized primarily in the psychological literature and have been defined as a

process whereby a subject responds to a particular stimulus with the interpretation of the response left to the subjective analysis of the psychologist (Stiles, 1975). The most common projective techniques include the Draw-A-Person Test by Goodenough (1926) and the Rorschach Ink Blot Test, with protocols for body-image boundary and barrier score assessment (Fisher & Cleveland, 1958).

The Draw-A-Person Test (Goodenough, 1926) examines the child's knowledge regarding body-articulateness and requires that the child sketch a person. This tool has been used with children in the assessment of IQ, personality, psychological problems, and body-image. The test allows the analysis of body drawings according to shape, size, consistency, relationship between parts and the whole, symmetry, and detail (Blom et al., 1970). Since the inception of the Draw-A-Person Test in 1926, many problems with the technique have arisen (Machover, 1949). Limiting factors include the child's ability to draw, to control fine motor movements, and to understand directions. Kellogg (1969) found that one-third of the children drew entirely different pictures of humans on different days and that the IQ quotients of a single child may differ by 50% from one drawing to the next. From Kellogg's (1969) work, it was determined that a large number of drawings must be made by the child in order to derive adequate emotional and intellectual assessments. Other tests similar to

Goodenough's (1926) include: (a) Trait and Askars' (1955) Inside-of-the-Body Test which examines developmental concepts and distortions, and (b) Ilg and Ames' (1965) Incomplete Man Drawing.

Another popular projective technique used primarily by psychologists is the Rorschach Inkblot Technique (Beck, 1944). Fisher and Fisher (1964) suggested that individual differences exist in the way in which one articulates the boundary regions of the body. Fisher and Fisher stated, "...some individuals perceive their body boundaries as definite and clearly demarcating them from their environs; whereas others experience their boundaries as vague and only hazily distinguishing them from non-self objects" (p.255).

In studying boundary phenomena, Fisher and Cleveland (1958) have devised an index of body-image boundary definitiveness, known as the Barrier Score. It totals the number of responses elicited by the Rorschach Inkblots and derives a score that indicates the degree of concern individual's have about their body limits, i.e., protective, containing, decorative, or covering functions of the periphery (Fisher & Fisher, 1964). Boundary definitiveness was equated with the number of Barrier responses produced (Fisher & Fisher, 1964).

Fisher and Fisher (1964) have determined that the more definitive an individual's boundaries are, the greater will

be their degree of autonomy, achievement motivation, and communication. "Overall, a picture has emerged of the individual with definite boundaries as more active, independent, communicative, and also more likely to channel excitation to the exterior layers of the body than the individual with indefinite boundaries" (p. 255). The Barrier Score has been interpreted as not only an abstract index of how inkblots are perceived, but also as being closely associated with the individual's actual body experience (Fisher & Fisher, 1964).

Two other projective measures from which information about the body can be obtained include the Arthur Mannequin Assembly Test (1958) and the Imitation of Gestures Test (Berges & Lezine, 1963). The Arthur Mannequin Assembly Test requires that the child select body parts that are appropriate for various individuals from a variety of different size puzzle parts. The Imitation of Gestures Test challenges the accuracy with which the child can imitate hand and limb gestures initiated by the examiner. Berges and Lezine (1963) used this test in a non-verbal mode to test the body awareness of the child. There are other tests or parts of tests for measuring body-image that are classified as projective techniques.

Objective Tests

Another approach is to put direct questions to the child and allow him/her to respond verbally or on paper. Existent objective tests are mainly paper-and-pencil tests and are rarely suitable for use with young children. The language barrier becomes difficult because children often cannot derive the meaning of the words used in the directions. Most objective tests use some type of Lickert Scale (Lickert, 1932) to record the feelings the subject has regarding the body. Examples of these tests include "My Body As It Really Is" and "The Body Attitude Scale" devised by Kurtz (1968). Each of these tests require the subject to state their true feelings and/or satisfaction in regard to their body.

Another type of objective test that has received a great deal of attention is a measure of body concept through the use of a body cathexis scale. The use of the term cathexis is defined as the concentration of psychic energy upon the self (Flexner, 1987). The most widely used cathexis scale is one devised by Secord and Jourard (1953). The subjects included 70 college age males and 56 college age females. The subjects were asked to express their degree of satisfaction or dissatisfaction with various body parts and body functions. Secord and Jourard had previously conducted a large amount of research in the area of self concept. The authors found that the body-cathexis scale

correlated significantly with their self-cathexis scale, thereby supporting their hypothesized relationship between body-image and self-concept (Tanner, 1969).

Researchers from a wide variety of disciplines have utilized the body-cathexis scale in their studies. Several researcher's (Leahy, 1966; Vincent & Dorsey, 1968) have studied the relationship between body-image and motor performance.

Leahy (1966) correlated body-cathexis with a single measure of motor performance on the stabilometer. A body cathexis test and body rating scale were administered to 79 college men. A body-image score was obtained and scores were derived from the stabilometer. The test reliabilities were high, but no significant correlation with the motor performance measure was evident.

Vincent and Dorsey (1968) conducted a similar test to investigate the relationships between three measures of body-image and two measures of physiological performance on 50 male undergraduates. The Barrier Score Index was correlated with body cathexis and produced a similar lack of relationship. No significant relationships were evident when considering the use of body cathexis in conjunction with body-image measures. Vincent and Dorsey (1968) determined that a general relationship between body-image and physiological performance did not appear to exist.

Blom et al., (1970) examined the various instruments available for assessing body-image concept, but felt that researchers often selected measurement instruments to assess body-image and overlooked the most valuable assessment instrument, behavioral observation. Blom et al. (1970) documented a case study regarding a 10-year-old boy to illustrate the complexity of problems associated with body-image. The child demonstrated an unusual skewness in his performance in various developmental areas. Although the child's language and math skills were adequate, he was extremely awkward in movement and motor coordination. Blom stated that "a child under static or standardized test conditions may seemingly display a great deal of body-awareness, yet in motion may indicate many confusions and uncertainties and instability" (p.443). Blom and colleagues reemphasized the importance of behavioral observations as one of the most salient and feasible methods available today to examine body concept.

The Group Embedded Figures Test (Witkin, Oltman, Raskin, and Karp, 1971) is another paper-and-pencil test designed to examine individual perceptual ability. Swinnen (1983) used this test with 194 college males to determine if differences in perception existed between field-dependent and field-independent subjects. Previous studies have suggested that the field-independent person often performs better in relation to movement situations. Subjects in this study had

to describe eight complex, gross motor, gymnastics skills from a videotape. The field-independent persons provided more details and appeared to have a greater ability for analyzing and structuring the perceptual field (as measured by the Group Embedded Figures Test), than the field-dependent subjects. Swinnen reported a significant difference between the two groups for five of the eight movements and suggested that the field-independent person may be in a more favorable position to learn new skills. The Group Embedded Figures Test was viewed as an adequate instrument for measuring visual-perceptual cognitive ability.

A variety of paper-and-pencil tests have been used throughout the context of the psychological literature. These tests sought to determine various attributes of perceptual ability which can be present in individuals. A vast variety of these tests are available, but few are viewed as suitable for accurate assessment of children.

Non-Projective Techniques

The use of non-projective techniques were developed from an interest to design a more direct and accurate assessment of how an individual perceives the body as an object. The largest category and most recent research has involved examination of the body-image in conjunction with perception in and of the environment. The body-environment

relations vary as the individual grows and as spatial relationships with the environment change (Tanner, 1969). Early in a child's development, perception of self is viewed as a blending with the environmental surroundings. As differentiation occurs, perception of self is viewed as independent of the environment. Knowledge regarding the individual's perception of body size has grown in part due to the increase in non-projective assessment techniques. The various assessment tools and their contributions to the body-image literature are discussed in the following section.

Early research in the area of body size estimation often examined one's ability to perceive one bodily property alone. Werner et al., (1957) attempted to verify previous findings that estimates of head size were often overestimated in relation to actual head size. Werner and colleagues tested 12 adult subjects in an effort to determine if differences in estimations would occur under two experimental conditions: (a) lightly touching the subjects' temples, and (b) no touching. The results have indicated that head size may be overestimated under both conditions. However, overestimation of head size tends to decrease under conditions of touch. Wapner (1957) suggested that this decrease may occur because touching initiates a degree of separation in the figure-ground environment, and

thus a reduction in estimated size.

Several devices have been utilized over the years to allow an individual to perceive the self as an object, separate from the environment. Schneiderman (1956) was recognized as one of the first to utilize a calibrated, flexible mirror. The mirror is used to determine if subject's can estimate features involving their own face, that of others, and of objects. Schneiderman's investigation involved 21 male and female undergraduates. His results indicate that men may be less accurate in recognizing their own face, as compared with recognizing that of another. When these results were correlated with the Rorschach findings, no significant relationships were found. Schneiderman (1956) concluded that the ability to recognize one's own face is affected by self-attitudes and values that do not attach to other person's or objects.

During the 1960's, several researcher's (Shontz, 1963; Fuhrer & Cowan, 1967) began to experiment with examination of the body-image construct by using a rod-and-frame apparatus. This tool is made up of rods mounted horizontally above the floor on a frame which is suspended at eye level to the subject. The rods are movable from one side such that estimated dimensions of body parts or objects can be made. Shontz (1963) used this apparatus to test the ability of 22 male and 22 female undergraduates' ability to estimate ten body parts and three non-body object stimuli.

Women were found to overestimate body part sizes, while men's estimates were more realistic. Shontz (1963) suggested that, in addition to these sex differences, one's estimation of body dimensions may also be influenced by the presence or absence of visual stimuli and the postural conditions under which the estimations are made, i.e., whether the subject is sitting or standing.

Because measurement conditions were believed to have played a vital role in the original investigation, Shontz expanded his research to test this assumption. In this study (Shontz, 1965), 48 undergrads were asked to estimate the size of 9 body part objects and 6 non-body part objects in conjunction with ascending and descending estimations. Body part estimates were proven to be very sensitive to starting position effects. Ascending estimates produced underestimation and descending estimates produced overestimation of size. Position effects (ascending versus descending judgments) were more extreme when ascending judgments were made first. All size estimates were found to be sensitive to variations in response and visual conditions. Shontz (1965) surmised that underestimation was associated with active use of the body, while overestimation was associated with disuse of the body.

Furher and Cowan (1967) also utilized the rod and frame apparatus under conditions of active movement, room

illumination, and sex on the estimation of body part size with 40 adults age 18-29. A major concern of this study was if active movement of a joint increased the accuracy with which it was judged. Results indicated that active movement of a limb reduced underestimation. Females underestimated body parts substantially more than males in both movement and non-movement situations. Differences among estimates of different body parts were for the most part unaffected by measurement conditions or sex of the subject.

In conjunction with many assessment tools being devised, several researcher's (Katchner & Levin, 1955; Adams & Caldwell, 1963) have tried to develop an objective technique that permits variations in response, but requires a more specific and simple response. Such instruments are needed to assess the body-image concepts of young children. The schematic representation of body parts has become an appropriate tool to assess the body-image of young children. Katchner and Levin (1955) have used this approach by asking 69 children to select body parts that seemed appropriate from a variety of sizes presented. The selection of these parts formed a manikin-like human figure. The sample included children from 2.9- to 5.4-years. The children were asked to select individual body parts that corresponded with the child's perception of mom, dad, someone of the opposite sex, and themselves. Results indicated that size concepts of the self were most reliable. As a group, perceptions of

both parents were perceived realistically.

Adams and Caldwell (1963) used a similar technique with 35 normal, 13 moderately disturbed, and 10 retarded males, ranging in age from 7- to 14-years. The major objective of this study was to establish a relative measure of an individual's conception of the body in terms of gross anatomy, i.e., length of legs, arms, and head. The apparatus consisted of ten wooden figures with removable heads, arms, and legs. Each child was asked to choose the figure most like himself, the figure he would most like to be like, and then to build that choice with various body parts. The major findings indicated that 80% of all groups chose smaller body parts when building the desired image. Overall, this technique of measuring body-image is appropriate for young children and normal or sub-normal children.

Several researcher's (Fisher & Cleveland, 1958; Schilder, 1950) have suggested possible theories regarding the dual role an individual must deal with in terms of perception. The individual is often viewed as the observer in estimating body perception or as the object of the perception. Arnhoff and Damianopoulos (1962) suggested that the best way to examine this construct is to use the individual's actual body as stimulus base for the assessment of self-perception. The study posed the task for the

subject (21 male college students) to recognize his own body, devoid of clothing, facial, or situational identifications, from a series of photographs. The photographs ranged in similarity from most similar to least similar photos of the subject. Based on previous research, the study presents the hypothesis that at least some subject's would fail to recognize themselves, however, the entire group of 21 correctly identified their own pictures. The Arnhoff and Damianopoulos (1962) study established base-rate performance for normal males at this age level.

Gellert, Girgus, and Cohen (1971) have utilized a similar technique with 166 children ranging in age from 5.4- to 12.8-years. The major difference from other research (Arnhoff & Damianopoulos, 1962) was that subjects were clothed in the same attire, but all other distinguishable markings were eliminated. The focus of this study involved the child's level of awareness of the characteristics of body shape, proportion, and symmetry. The children viewed a series of photographs of themselves from the front, rear and side perspectives. The findings indicated that when the entire figure was visible, self-perception was perfect from the anterior and nearly so for the side view. Results of the back view indicated recognition was found to improve with age. Self recognition improved significantly with age, and no significant sex differences were found. At the age of 10.8-years and below, correlations between IQ and self

selection accuracy were positive and significant for some age groups. The results provide significant implications for the development of body-image in children.

Horowitz et al., (1970) has examined the measurement of personal space as perceived by the individual in interpersonal relations. They proposed that certain reproducible distances are imposed between one person and another or one person and an object. This distance which appears to surround every individual may be regarded as the body-buffer zone. This zone can be personalized by the individual and an enhanced awareness of this zone develops through play and movement. As an inner awareness of the body-buffer zone develops, the child's own body-image is enhanced such that perception and body size estimation improve (Horowitz et al., 1970).

Shaffer (1964) has developed and sought to validate another method for measuring estimated height. A type of paper-and-pencil test was used in conjunction with this non-projective technique. The sample included 235 children in fifth through eighth grades. The children were told the experimenter was interested in knowing how well they could guess the heights of the following: themselves, their mother, their father, the school principal, their teacher, their teacher the previous year, and the experimenter. A stick (65.5" high) was set up vertically on a stand in front

of the class. Each child had a booklet that had a horizontal and vertical line drawn on each page that corresponded with the model in the front of the classroom. The child was told simply that if they were standing next to the stick in the front of the room, to mark a place where the top of their head would come on the stick. Similar directions were given for the other body parts. The experimenter scored each student's response and compared it with actual measurements. The variables of sex and IQ were also correlated with the results. Results demonstrated that children significantly underestimated their own heights in relation to their estimates of height for adults. Sex differences were evident, as girls underestimated their own height more than boys. For boys, significant positive correlations were evident with IQ and estimations of self-height. The age appropriateness of the subjects showed that although all subjects underestimated height, this underestimation decreased slightly as the child increased in age. This was the major accountable reason for the evident sex and IQ differences.

A similar technique for estimating dimensions of body space was used by Woods (1966). Woods used 143 male and female subjects age 8-, 10-, and 12-years. In examining the body-image research, Woods sought to test the construct in three major areas: (a) body-image boundary definitiveness, (b) performance of gross motor skills, and (c) estimates of

selected dimensions of body space. The Barrier Score was utilized to determine the degree of body-image boundary definitiveness. Motor performance was assessed via videotape in conjunction with the other variables of body-image definitiveness and estimates of selected dimensions of body space. The Popper Height Test (Popper, 1957) was used to establish estimates of body dimensions.

The Popper Height Test was similar to the model used in Shaffer's (1964) study, except that the visual model in the front of the room consisted of an eight foot vertical and horizontal line constructed of two inch cash register tape. The task for the child was the same except the length of certain body parts (shoulder span, hip width) and standing and extended height were obtained.

Woods' (1966) results showed an increase in Barrier scores across age groups. Analysis of estimates of body space revealed females underestimated vertical dimensions and shoulder span estimates. Analysis of shoulder width and hip width showed tendencies toward overestimation. The children demonstrated a greater capacity for functioning at each age level. Woods (1966) suggested that the tendency to underestimate was related to a well defined and intact body image. This conflicts with others (Tanner, 1969; Robertson, 1974) who feel overestimation is related to feelings of adequacy and greater control over the environment, and

underestimation is related to feelings of inadequacy and threatening feelings from the environment.

McFee (1968) extended Woods' (1966) study by utilizing adolescent subjects. McFee hoped to discover information relative to the developmental process when comparing her research with the previous study conducted by Woods in 1966. McFee's subject's included nine males and ten females age 18 and eleven males and eight females age 20. McFee used the same variables as above, except for a modification of the Popper Height Test. The modification of the test came in estimating vertical and horizontal dimensions separately and in the manner in which the test was scored. The modified test was called the McFee Grid and was devised by McFee to eliminate possible subject errors in the symbolization process of the Popper Test. Results indicated that the McFee Grid was more accurately represented and more frequently significantly related to the other variables of motor performance and body size estimation in the study. Horizontal dimensions of body space were more accurately represented than vertical dimensions. Males were more accurate than females in estimating body dimensions, and their Barrier Scores were higher. The results of this study combined with that of Woods (1966) showed several maturational trends: (a) Barrier scores increased with age, (b) motor skills of both sexes increased with age, (c) estimates of body dimensions tend to be overestimated in

adults and underestimated in children, and (d) an increased accuracy of estimating body dimensions develops with age (McFee, 1968).

A recent non-projective device utilized for estimation of body dimensions was devised by Dillon (1962). The concept of a sliding door was designed to enable a subject to estimate height, width, and depth. The pilot investigation by Dillon utilized 20 normal and 21 psychiatric adults age 21 to 50. Ascending and descending estimates and sex were the major variables. Results indicated descending estimates were significantly greater than ascending estimates in all three dimensions. Overall estimates of height were significantly greater than actual physical measures. The descending estimates were significantly different from the true dimensions of height and depth, while the ascending estimates were not. The average of ascending and descending estimates were also significantly different from actual measurements of height. The instrument devised by Dillon produced sufficient reliability coefficients to promote the use of the instrument as a valid measuring device of body-image.

Dillon's instrument was utilized by Hart in 1971 to determine if 27, 7-year-old boys estimated their shoulder width differently under static and dynamic conditions using the ascending dimension only. Estimates made in the dynamic

situation were not significantly different from estimates made in the static mode. However, there was a significant difference between dynamic estimates versus measured shoulder width. The size of dynamic estimates were significantly larger than actual shoulder width. Overestimation of the shoulder width dimension was evident in both situations. Hart (1971) postulated that the "real" body image corresponds to the image reported in the dynamic situation because the body incorporates a greater amount of space while moving and is usually viewed in most sport realms in a dynamic context.

A relatively new technique for specifically measuring body size estimation was developed by Doering (1974). The subjects 6.10- to 12.9-years viewed a life-size image of their body projected onto a screen. Ascending and descending estimates were utilized by increasing and decreasing the size of the image with a zoom lens. The child indicated when the image was larger or smaller than his/her self-image. A significant finding showed that the oldest boys (10.10-12.9 years) overestimated their heights, while girls were very accurate in their estimates.

In an overview of this area of research involving non-projective techniques, it is evident that a variety of methods for assessing the body-image have been utilized. Many interesting and well-established findings are apparent, but the variety of instruments utilized makes it difficult to

establish a pattern of relationships between the various measures that might influence body-image awareness.

Some inconsistency seems to exist in regard to factors which produce body size overestimation and underestimation. These differences in the direction of error of body size estimation may well be the result of the variety of instruments which have been used to test the construct. Despite the inconsistencies, the tendencies which appear to be occurring are that adult males estimate size more accurately than adult females (Vincent & Dorsey, 1968; Shontz, 1963; Shontz, 1965) and that children tend to underestimate the size of the majority of body parts (Shontz, 1963; Shontz, 1965; Woods, 1966). The early trends in measuring the body-image concept have included subjective interpretations with paper-and-pencil tests, projective measures, and objective evaluation of the body itself. More recent trends include the use of equipment apparatus to film techniques. Each device and technique allows researchers to enhance the understanding of the body-image concept and its influence upon development.

Movement and Body-Image Concept

The body-image concept is often viewed as a difficult area of research because of the large number of variables which can influence its development. Age, sex, IQ, and

movement experience (past and present) have all been examined by researchers in various studies. Results are spurious in most areas because the variety of devices used to measure body-image make it difficult to generalize results across a population. However, results regarding the influence of movement on the development of self-concept have been positively maintained by many researchers. Stiles (1975) has suggested that,

The body-image is developed and maintained through movement experiences. The continual interaction of the bodily self as object and with object world forms the mental images, knowledge about one's capacities, and the 'germ' for the plan of movement. The bodily sensations received from the self and outside objects by movement are perceived and channeled into the body-image for future participation. The individual gains the knowledge of the relationships between self and world as being separate but united entities, each in the end defined by what it has contributed to the other (p. 17).

If movement does alter the perceptions one has regarding the body-image, then the question becomes one of discovering how this change occurs.

Schilder (1950) has viewed movement as enhancing the body perception. He indicates that we do not learn much about our body when it is at rest, but that movement increases the sensations that occur when we come in contact with objects that are a part of reality. Schilder views movement as enhancement of the image and not as enlargement

of the body-image itself.

Holden (1960) used the Draw-A-Person test (Goodenough, 1926) with 113 handicapped children attending a two week summer camp in order to assess the children's degree of body-image definitiveness. Holden found significant improvement in the children's drawings and hypothesized that in some way the vigorous activity utilized in the camp clarified the children's image of themselves.

A more clinically oriented test of the body-image construct was conducted by Elbaum (1964) with 30, 6- and 7-year-old children. He examined the relationship between the Lincoln-Oseretsky Motor Development Test (Sloan, 1955) and Goodenough's (1926) Draw-A-Person Test. Correlations of .89 indicated a high relationship between motor development and body-image at this stage.

Elbaum (1964) and Holden's (1960) studies provide "... empirical support for the concept that knowledge of the body as a perceptual component of self is dependent upon movement, or at least that the development of each one is vitally linked with the other" (Tanner, 1966, p.11-12).

Hart (1971) has utilized Dillon's (1962) sliding door instrument to determine if estimations of shoulder width differ under static and dynamic conditions. Differences were not significant, however static and dynamic conditions were significantly different from actual shoulder width measures. Hart postulates that moving parts might be

clearer in perception because of greater contact with the environment. The "real" body-image is felt to be that projected in the dynamic situation especially when referring to the sports context.

Robertson (1974) has studied 7- and 8-year-old children (n=79) in a traditional versus a movement education approach to teaching physical education. The Draw-A-Person test and a kinesthesia test were used to measure body-image. Results indicated that children with the movement education classes had significantly greater scores ($p = .05$) on body-image than children in the traditional physical education classes. The author hypothesized that the greater variety of movement experiences in the movement education program enhanced the child's body awareness and resulting body-image.

Robinson (1981) has used a battery of cognitive, psychomotor, and affective tests in conjunction with qualitative motor skill performance to derive the body concept development that is present in preschoolers. Robinson's primary hypothesis is that "...motility is the most outstanding factor in the development of the body-concept" (p. 3). Subjects included 54 children age 3-, 4-, and 5-years. Results showed a strong relationship exists between motor development and body concept. Robinson (1981) suggests that there appears to be a reciprocity between the effects of movement on the body concept and the effects of

the body concept on movement.

The individual's body-image is a mental representation of self-development over time and through a variety of experiences. Interaction with the environment allows the individual to move from experiencing the self as a part of the environment to experiencing the self as separate from the environment. Every new movement experience enhances the body-image and allows the individual to develop greater perceptions of self through movement in and of the environment.

A consistent finding that has continued to appear in the literature involves the correlation between motor performance and body size estimation (Furher & Cowan, 1967; McFee, 1968). These results support several researchers (Stiles, 1975; Schilder, 1950; Hart, 1971) theory of interdependence of movement activity and body-image awareness during the developmental years.

Summary

The study of the complex concept of body-image involves an attempt to unify many diverse variables of development and to consider contributions from a variety of professional disciplines. The conceptualization of the term 'body-image' has advanced through many stages since the inception of the term by Head in 1920. It began by viewing body-image as a global entity, then in terms of relationships between the

body-image and the environment. At present, body-image is considered to be a dynamic construct interdependent with the type and amount of interaction with characteristics inherent in the environment. This review sought to examine the techniques and methods used to assess body-image as the construct has been investigated over the years. The trend of assessment measures over time have moved from indirect to more direct measures. This trend, as in any research area, is a necessary process in order to enhance the understanding of the body-image construct.

CHAPTER III

PROCEDURES

The purposes of this study were: (a) to determine the best method of performing the task and scoring perceived and actual measures, (b) to test the reliability of the Stevens' Block Figure Model, and (c) to test validity by determining if significant theoretically based relationships exist between SBFM scores and age, sex, IQ, and physical activity/movement experiences inside and outside of school. This chapter includes the description of the construction of the instrument, steps to informed consent, selection of the subjects, methods, reliability assessment, and further validation of the instrument.

Construction of the Instrument

The basis for the need of the SBFM instrument is related to the previous research conducted in the area of body size estimation (Chapter II). The majority of instruments which have been used involved projective techniques. The review of literature revealed only one device (Dillon, 1962) which was developed involving a direct measure of the child's perception of body size. Dillon (1962) challenged the child to use the instrument to surround the body boundary, in order to "fit" the child's estimation of body size and width.

The SBFM instrument has incorporated Dillon's measurement perspective and allows for the following additional points: (a) size estimation of four body parts, i.e., total height to shoulders, leg length, hip width, and trunk length, (b) the perception of the outer body boundary and an inward conception of the independent segments, and (c) a more realistic visualization of the actual body dimensions.

The SBFM instrument (Appendix A) consists of individual building blocks which stack together to simulate various heights and widths. The instrument is composed of five individual segments (Appendix B): (a) a baseboard, (b) leg blocks, (c) trunk blocks, (d) arm pieces, and (e) a head piece. The baseboard is a flat platform on which to build/support the model and rests $1 \frac{9}{16}$ th of an inch (3.81 cm) off the floor. The baseboard contains four sets of holes that correspond to the four adjustable widths of 6, 8, 10, and 12 inches (15.24 cm, 20.32 cm, 25.40 cm, and 30.48 cm). The arm pieces and head (a decorated balloon) are the only parts of the instrument which are not alterable. These two portions are included simply for visual purposes to make the model appear more like a real person. The legs are composed of 24 blocks for each leg and a total possible height of 35.81 inches (90.96 cm).

Estimates for trunk width variations were derived by recording hip width measurements on approximately 30 second

grade children in the winter of 1986. From this examination, four sets of blocks were made that correspond with hip width measurements of 6, 8, 10, and 12 inches. Each set of trunk blocks contains 18 blocks with a total possible height of 26.69 inches (67.79 cm).

When completely assembled, the SBFM reaches a total possible height of 62.5 inches (158.75 cm) without the head attachment. The assessment of head height was not considered in this study due to: (a) the limitations of the instrumentation, and (b) research in this area that has revealed the difficulty children have in accurately evaluating head size. Variations in children's height and width make it possible for the SBFM to be easily adapted to varying sizes and ages of children.

A pilot study investigation was conducted in the fall of 1987 to: (a) test the feasibility of using the instrument with second grade children, (b) check and modify directions to the children, and (c) initially check validity. The subjects included 10 second grade children from the Knoxville, Tennessee area. Four body size variables were used in the pilot study i.e., total height, trunk length, hip width, and leg length. Results of ascending scores indicated consistent underestimates and demonstrated tendencies toward significant correlations between actual estimations and perceived estimates of body size on three of the four variables: (a) leg length showed

the highest correlation coefficient of $\underline{r} = .870$, with $\underline{p} = .001$, (b) total height provided a correlation coefficient of $\underline{r} = .556$, with $\underline{p} = .095$, and (c) trunk length provided a correlation coefficient of $\underline{r} = .588$, with $\underline{p} = .0735$. The fourth variable of hip width demonstrated erratic estimates with very low correlations. There was no repeated testing of the sample, therefore, reliability assessment was not possible.

Following the pilot study, several revisions were made in procedure and test instrumentation. The method for assessing actual student measures of total height, leg length, hip width, and trunk height were changed to elicit more accurate body segment length measures. An anthropometer was used for actual measures on the students and perceived measures on the SBFM. Measures of height were changed such that two measures were assessed: (a) actual height involving measurement to the top of the head, and (b) total height involving measurement to the top of the shoulder (excluding the head). These changes were necessary in order to make similar measurement comparisons with the SBFM.

Steps to Informed Consent

The directors of research studies for the two schools involved were contacted and informed by letter (Appendix C) of the intended direction of the study. A copy of the

doctoral committee approved research proposal was forwarded for review to the school system personnel. The research director provided the initial information for selection of the specific schools to the director of research based on the established school criteria for compatibility (Appendix D), and the director of research responded with appropriate schools to be used. Once approval was granted, contact was made with the principals of the prospective schools to be used in the study. The principal of each school affirmed the aforementioned criteria for participation and discussion of the details of the study were given. A meeting time was established by the principal in order to inform participating classroom teachers and the physical education specialist of the intent of the study. The classroom instructors were given an envelope that contained a letter to parents including details of the study (Appendix E), a parental consent form (Appendix F), and a parental checksheet for student selection (Appendix G) to determine which students would meet the criteria necessary for the sample.

Dates for beginning the study and available facilities within the school were established. Envelopes were distributed to the classroom teachers and sent home to students within each respective classroom. A letter of support for the study from the principal (Appendix H) was included in the envelope. Those students meeting the

criteria for selection were tested and the procedures were repeated one week later using one-half of the sample to establish reliability.

Selection of Subjects

The subjects included in the study were from individual second and third grade classrooms at each of two schools. Parental consent forms (Appendix F) were sent to the parents of every student in both classes. The consent forms that were returned and met the student criteria for selection (Appendix G) were used to make the sample selection. A random selection of subjects from students in classes who had parental consent were used to choose 60, 7-, 8-, and 9-year-old children with stratification for age, sex, IQ, and physical activity/movement experience in and out of school.

Methods

The SBFM was the basic instrument used to assess the body size estimations of the following: (a) total height, (b) leg length, (c) hip width, and (d) trunk length. The assessment of these body segments provided the information from which to determine whether or not children could symbolically represent the dimensions of vertical height (leg length, total height, and trunk length), as well as a horizontal aspect (hip width) of their body space.

A basic assumption of this paper was that children have some degree of conceptualization of their body size and/or body parts at the ages of 7-, 8-, and 9-years. This image may or may not correspond to actual measurements. However, the direction of the correspondence may prove to be important in dealing with the overall construct of body awareness. It is conceivable that the degree or direction of correspondence which the child has developed may influence the child's ability to deal successfully with movement in the environment.

To ascertain the correspondence between actual and perceived measures of body size estimation on the SBFM, testing occurred in two different sessions approximately 7 days apart. All testing occurred in the schools on a carefully scheduled basis within six to eight weeks. Each session was conducted in the same room of each school. The room was free from distracting stimuli and environmental cues that might interfere with the child's visual perception in utilizing the SBFM. Approximately one hour (20 minutes for test session 1, 30-40 minutes for test session 2) was required to test each student. A combination of alternating time periods on a carefully scheduled basis was used in testing at the different schools. Once the parental consent forms were returned by the child, the sample was chosen and testing began.

An important part of this research was to determine the

best method of scoring the estimations of perceived and actual measures on the SBFM. In determining this, ascending and descending scores on the SBFM were to be conducted to determine if any differences existed. Preliminary to the actual data collection, problems with the instrumentation (stability of the blocks) made it impossible to obtain the descending scores using the model. As was previously agreed, if the model structure made descending estimates difficult, then only ascending scores would be used in the actual study.

Test Session I:

The first test session involved making introductions, taking the actual body measurements, and discussing the events that would occur in the next test session (Appendix I). Actual measures of total height, leg length, hip width, trunk length, and head height were recorded on individual subject score sheets (Appendix J). All measurements were taken in the same order and all children were tested by one investigator. Actual height was recorded by measuring the child using an anthropometer to compute the child's actual height to the top of the head. Actual height in centimeters was recorded for each child. The recommended procedure for determining leg length (subischial height) involved computing the difference between actual height and sitting height (Lohman et al., 1988). Sitting height

(Appendix K) was measured with the child sitting erect on a flat table, with the legs hanging freely and the hands on the lap. An anthropometer was used to measure the distance from the top of the head to the surface of the table. Hip width (biiliac breadth) was assessed with the child standing using an anthropometer with adjustable rods (Appendix L). Measurement occurred from the back of the subject such that the blades of the anthropometer were in contact with the iliac crests on each side of the hip. Head height was derived by computing the difference between actual height and total height. Trunk length was derived by computing the difference between sitting height and head height. At the end of the first test session, students were introduced to the SBFM instrument. A standing model was shown to the child, and each was told that they would be building a similar model in relation to themselves in test session II. The meaning of the terms trunk, height, and width were discussed and the child was asked to think about those terms prior to test session II. Following this first session the child's actual height was calculated by subtracting head height from total height.

Test Session II:

Test session II was concerned with utilizing the SBFM to derive the children's perceptions of their body size (Appendix M). This test session included the building of

the block model from the ascending mode. Following the building of the model, the investigator recorded the appropriate perceived estimated scores from the SBFM (Appendix J).

Reliability Assessment

Reliability is defined as the consistency of an individual's performance on a test (Safrit, 1986). Reliability of the SBFM instrument was assessed using test-retest method for one-half of the sample, i.e., 30. The method of obtaining test-retest scores was accomplished on a carefully scheduled basis that included stratified sampling across all the control variables: (a) age, (b) sex, (c) IQ, and (d) physical activity/movement experience, in and out of school.

Further Validation of the Instrument

Safrit (1986) stated that construct validity involves the degree to which a test measures abstract attributes or qualities that cannot be directly measured. Specifically in this study, validity refers to the degree to which:

(a) perceived estimates using the SBFM correlate with the respective actual measures, and (b) the degree to which the SBFM scores follow the theoretical projections for body-image development in relation to age, sex, IQ and previous movement experience.

CHAPTER IV

RESULTS

The purposes of this study were: (a) to determine the relationship between the measures of actual and perceived estimates of body size and the best method of scoring, (b) to test the reliability of the SBFM as a direct measurement of perceived body size for 7- to 9-year-old children, and (c) to determine if the SBFM is a valid measure of body image by evaluating the degree of relationship to the theoretical patterns with/for the constructs of age, sex, IQ, and physical activity/movement experience inside and outside of school. Eight specific subproblems (Chapter 1, pp. 10-12) were utilized to evaluate the constructs stated above.

Data from 60 children were collected from two schools in Tennessee. The subjects included 31 males and 29 females, age 7- to 9-years (Table 1). The findings have been organized into three categories: (a) determination of the relationship between the two measures, (b) reliability assessment, and (c) further validation of the instrument.

A correlated t-test was used to determine the relationship among the four actual measurements taken on the child and the four estimated measurements from the SBFM. Reliability coefficients were calculated using an intraclass correlation technique (Safrit, 1986) with $n=30$. Stepwise

Table 1 Breakdown of Subjects Used in the Study

School	7		8		9	
	Male	Female	Male	Female	Male	Female
Movement Education Program:						
A	6	4	5	5	5	5
Traditional Physical Education Program:						
B	3	7	5	5	7	3

multivariate analyses of age with the body-image scores and of IQ with the body-image scores were calculated with $n = 60$. Three, two-way MANOVA's, age by sex, age by school experience, and age by external experience were calculated using age, sex, physical education program type, and external experience as the dependent variables.

Determination of the Relationship Between the Two Measures and the Best Method of Scoring

The first subproblem of the study (Chapter 1, p. 10) was set forth to determine if there were significant differences between the ascending scores from the SBFM instrument and the respective actual body measures. A correlated t -test for each pair of measures (actual and estimated total height, leg length, hip width, trunk length) was calculated for all body parts. There were significant differences for three of the ascending scores (total height, leg length, and hip width) between the estimated length using the SBFM instrument and the respective actual body measures (Table 2). The greatest significant t -value difference (Table 2) was associated with the actual hip width and estimated hip width ($t = -12.828$, $p = .0001$). The analysis of actual leg length with estimated leg length and actual total height with estimated total height were also significant ($t = 11.967$, $t = 10.638$, respectively; $p = .0001$) and close to each other in demonstrating

Table 2 Mean, Standard Deviation, and Correlation Coefficients
for Actual and Estimated Scores on the SBFM

	N	Actual Score	Estimated Score	<u>r</u>	<u>p</u>	<u>t</u>	<u>p</u>
Total Height	60	107.75 (6.99)	98.26 (9.56)	.614	.0001	10.64	.0001
Leg Length	60	62.97 (5.23)	54.74 (6.68)	.449	.0003	11.97	.0001
Trunk Length	60	44.85 (2.68)	43.49 (5.90)	.389	.0021	1.89	.0643
Hip Width	60	21.76 (1.67)	26.54 (2.81)	.226	.0397	-12.83	.0001

similarities. Trunk length was the one variable that did not elicit a significant difference ($t = 1.885$, $p = .0643$) between actual and estimated scores (Table 2). This measure demonstrated the lowest relationship between actual versus each respective estimated measure of the variables tested (Table 2). The results elicited partial affirmative response to the subproblem.

The second subproblem of this study (Chapter 1, p. 10) asked if patterns emerged in the data as either consistent overestimation or underestimation of body parts (Table 3). This pattern was determined by examining the means of the actual minus the estimated scores. Underestimation of the dimensions occurred in three of the four variables (total height, leg length, trunk length). A t -test and p value were calculated on the difference scores of actual minus estimated to determine the degree to which the group mean was different from zero. The rank order from greatest to least of significant underestimation of body size was leg length, and total height (Table 3). Although trunk length was underestimated by 7- to 9-year-olds, the difference from zero was not significant ($p > .05$). In contrast, the hip width variable demonstrated a significant overestimation and showed the lowest variability of the four variables measured (Table 3).

Table 3 Mean, Standard Deviation, Correlation Coefficient, and
t-values of Actual Minus Estimated SBFM Scores

	<u>Mean</u>	<u>SD</u>	<u>SE</u>	<u>t</u>	<u>p</u>
Total Height	9.53	6.94	.90	10.64	.0001
Leg Length	8.31	5.38	.69	11.97	.0001
Trunk Length	1.33	5.44	.70	1.89	.0643
Hip Width	-4.77	2.88	.37	-12.83	.0001

Reliability Assessment

The purpose of subproblem three (Chapter 1, p. 11) was to determine if the SBFM scores were reliable utilizing the test-retest method for 7-, 8-, and 9-year-old children (Safrit, 1986). Fifteen children from each of the two schools were tested on two occasions, seven to ten days apart. An intraclass correlation technique (Safrit, 1986) was used with $N = 30$ and

$$R = \frac{\text{MS}_{\text{trials}} - \text{MS}_{\text{within}}}{\text{MS}_{\text{trials}}}$$

The correlation technique revealed that all four variables were highly reliable using the test-retest method (Table 4). All the variables within this subproblem produced significant test-retest relationships (Table 4) and acceptable to excellent reliability (Barrow & McGee, 1979), therefore, this subproblem was affirmatively answered for 7- to 9-year-old children.

Further Validation of the Instrument

Safrit (1986) stated that construct validity involves the degree to which a test measures abstract attributes or qualities that cannot be directly measured. In this study construct validity involved the degree to which the SBFM measures supported the related theoretical concepts for

Table 4 Reliability Coefficients

<u>Variable</u>	<u>R Coefficients</u>	<u>Reliability*</u>
Hip Width	.971	excellent (.95-.99)
Total Height	.960	excellent
Leg Length	.905	very good (.90-.94)
Trunk Length	.847	acceptable (.80-.89)

*Barrow & McGee, (1979), p. 38

body-image development in relation to age, sex, IQ, and previous movement experiences.

The multidimensional nature of the SBFM allowed for both vertical and horizontal aspects of body-image development to be examined. Three vertical dimensions of total height, leg length, and trunk length and one horizontal dimension of hip width were used. The three vertical measures are interrelated, as one measure, total height, is actually a composite of the other two, i.e., leg length and trunk length. Thus, the vertical dimension of the two dimensional model was evaluated regarding:

- (a) examination of total vertical body-image, or
- (b) examination of two segments of the body-image. Thus, the four components (total height, leg length, trunk length, and hip width) enabled the examination and evaluation of the child's ability to perceive the multidimensional nature of body-image as components of: (a) total height and hip width, or (b) leg length, trunk length, and hip width.

Subproblem 4: The Relationship Between Perceived Body Size and Age

The fourth subproblem (Chapter 1, p. 11) sought to determine if the SBFM actual, estimated, and difference scores of perceived body size were related to chronological age across 7-, 8-, and 9-years and to determine which components of the body were most important for the 7- to 9-year-old age range. Two stepwise regressions of chronological

age with SBFM scores of estimated total height and estimated hip width and chronological age to the nearest .1 year with estimated trunk length, estimated leg length, and estimated hip width were used with $n = 60$. For each of the three dependent variables (actual, estimated, and difference), two multidimensional stepwise regressions were calculated for chronological age to the nearest .1 year with: (a) SBFM scores of total height and hip width, (b) SBFM scores of trunk length, leg length, and hip width. The Max- $\underline{R}$ technique (Joyner, 1985) was utilized in order to determine the variables which would produce the "best fit" for the model.

Estimated Scores

The first stepwise regression of chronological age with the SBFM scores of estimated trunk length ($\underline{r} = .263$, $p = .04$), estimated leg length ($\underline{r} = .488$, $p = .0001$), and estimated hip width ($\underline{r} = .060$, $p = .648$) showed significant relationships. The best one variable model involved the SBFM score of leg length where the stepwise regression produced a multivariate $\underline{R} = .490$ and $p = .0001$. The best two variable model involved the variables of estimated leg length and estimated trunk length with a multivariate $\underline{R} = .530$ and $p = .0001$. The best model overall was the three variable model involving the three variables of leg length, trunk length, and hip width ($\underline{R} = .540$, $p = .0002$).

The second stepwise regression of age with the SBFM scores of estimated total height ($\underline{r} = .507$, $p = .0001$) and estimated hip width ($\underline{r} = .060$, $p = .648$) also showed significant relationships with each model. The best one variable model involved estimated total height where the stepwise produced a multivariate $\underline{R} = .510$ and $p = .0001$. The two variable model of estimated total height and estimated hip width produced a multivariate $\underline{R} = .510$ and $p = .0001$.

Difference Scores

The first multidimensional stepwise regression of chronological age with the difference scores was based on pairwise correlations of age with the SBFM score for trunk length ($\underline{r} = .072$, $p = .59$), leg length ($\underline{r} = .193$, $p = .14$), and hip width ($\underline{r} = .131$, $p = .32$). Neither of the two multidimensional models were significantly related to age. The best one-variable model involved the SBFM difference score of leg length where the stepwise analysis produced $\underline{R} = .192$ and $p = .136$. The best two variable model involved the variables of leg length and hip width with a multivariate $\underline{R} = .237$ and $p = .194$. The best three variable model involved the constructs of leg length, trunk length, and hip width and produced a multivariate $\underline{R} = .255$ and $p = .284$.

The second multidimensional stepwise regression of age

with the SBFM difference scores of total height ($\underline{r} = .203$, $p = .12$) and hip width ($\underline{r} = .131$, $p = .32$) also showed no significant relationships with either model. The best one-variable model involved total height where the stepwise produced $\underline{R} = .203$ and $p = .119$. The two-variable model of total height and hip width produced a multivariate $\underline{R} = .237$ and $p = .192$.

Summary

The stepwise regressions of age with actual measures and estimated measures using the SBFM revealed significant relationships with each model. The model which produced the highest multivariate $\underline{R}$ for each measure (actual, estimated, and difference score) was the rank ordered three variable model of leg length, trunk length, and hip width. Although the three segment models were both significant for the actual and estimated measures, there were no significant relationships from either of the multivariate models of age with difference scores ($p > .05$).

Because both actual and estimated measures produced multivariate relationships to age, it follows that body size and body size estimation are following projected theoretical trends in the 7- to 9-year-old age range. However, the body-image scores, i.e., difference scores, and thus the development of the concept of body-image, was not clearly explained by a direct relationship with age. Thus,

subproblem 4 was only partially supported.

Subproblem 5: The Relationship Between Difference Scores and IQ

The fifth subproblem (Chapter 1, p. 11) was set forth to determine if there were significant positive relationships between IQ and the difference scores representing body image. The following four multidimensional stepwise regressions of IQ with the body-image scores were calculated (Joyner, 1985): (a) math IQ with the difference scores of trunk length, leg length, and hip width, (b) reading IQ with the difference scores of trunk length, leg length, and hip width, (c) math IQ with the difference scores of total height and hip width, and (d) reading IQ with the difference scores of total height and hip width.

Three Segment Models With IQ Measures

The Max $\underline{R}$ technique was utilized in order to determine the "best fit" for the model (Joyner, 1985). The first regression analysis utilized math IQ in relation to the difference scores on the SBFM. The pairwise correlations of math IQ with the difference scores of leg length ($\underline{r} = .290$, $p = .066$), trunk length ($\underline{r} = .457$, $p = .003$), and hip width ($\underline{r} = .322$, $p = .04$) produced significant relationships ($p < .05$). The best one variable stepwise model involved the difference score of trunk length and produced $\underline{R} = .460$

and $p = .0027$. The best fit for the two variable model used difference scores of trunk length and hip width where the stepwise produced a multivariate $R = .600$ and $p = .0002$. The three variable model used difference scores involving trunk length, hip width, and leg length and produced a multivariate $R = .670$ and $p = .0001$. Therefore the three variable model was the best model.

The second stepwise regression of reading IQ with the difference scores of leg length ($r = .045$, $p = .782$), trunk length ($r = .500$, $p = .0009$), and hip width ($r = .143$, $p = .374$) revealed significant relationships with all three components. The best one variable model involved trunk length where the stepwise produced $R = .499$ and $p = .0009$. The best fit for the two variable model used the difference scores involving trunk length and hip width where the stepwise regression produced a multivariate $R = .541$ and $p = .0014$. The three variable model produced the highest multivariate $R = .549$ and $p = .0037$ using the variables of trunk length, hip width, and leg length.

Two Segment Models With IQ

The third stepwise regression of math IQ with the difference scores of total height ($r = .591$, $p = .0001$) and hip width ($r = .322$, $p = .04$), produced significant relationships with each component. The best one variable model found total height producing a multivariate $R = .591$

and $p = .0001$. The two variable model with total height and hip width produced a multivariate $R = .669$ and $p = .0001$ and thus was the better model.

The final stepwise regression involved the difference scores of total height ($r = .437$, $p = .004$) and hip width ($r = .143$, $p = .374$) with reading IQ. The best one variable model involved total height with a multivariate $R = .437$ and $p = .0043$. The best model involved the variables of total height and hip width which produced a multivariate $R = .458$ and $p = .0113$.

Summary

The analysis of the four multidimensional stepwise regressions indicated that there were significant relationships with all variables in conjunction with intelligence. The order of the variables in the best model was the body image score for trunk length, hip width, and leg length. The degree and accuracy of conceptualization of body-image and intelligence of subproblem five were affirmatively answered.

Subproblem 6 and 7: Age by Sex Evaluation of Difference Scores

Multivariate Analyses of Difference Scores

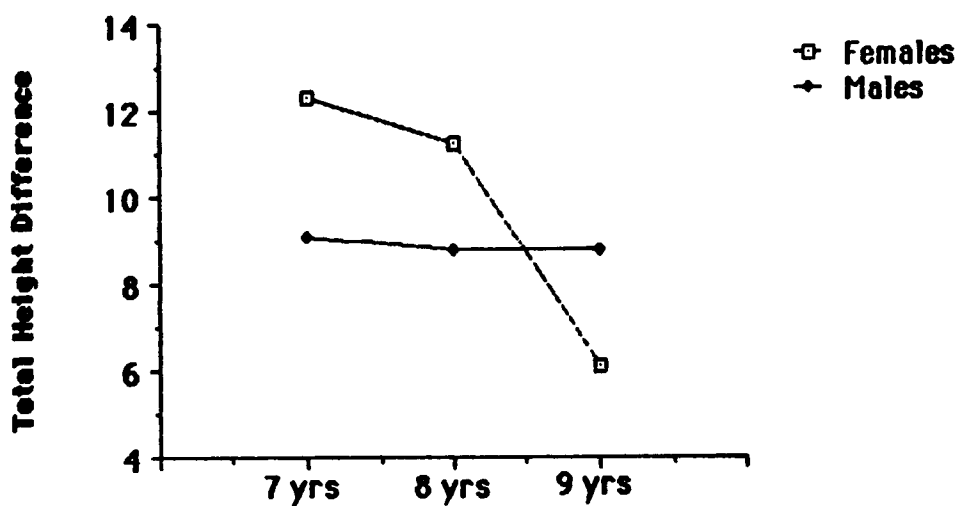
The sixth and seventh subproblems (Chapter 1, p. 11) sought to determine the relationship between the difference scores for each age level and sex. An age by sex, (3 X 2)

MANOVA on difference scores produced a significant multivariate main effect for age ($\Lambda = .653$, $F = 3.03$, $p = .0043$) and no significant main effect for sex ($\Lambda = .908$, $F = 1.29$, $p = .288$). The resultant univariate analyses were evaluated with planned contrasts run between age groups for each SBFM measure where appropriate. The multivariate age by sex analysis resulted in a significant multivariate interaction ($\Lambda = .52$, $F = 1.85$, $p = .019$). Planned contrasts were run between age by sex groups to clarify the trends within each measure. Only significant effects ($p < .05$) were reported.

Univariate Analyses for each Difference Score

Total Height The univariate main effect age was not significant ($F = 1.18$, $p = .315$). The planned contrasts for the age by sex interaction did not yield any significant differences for total height (Figure 1). However one contrast produced a result which approached significance, i.e., that 9-year-old females had better body image scores than 7-year-old females ($p = .06$).

Trunk Length The univariate planned contrasts for age indicated that: (a) there was a significant difference between 7- and 8-year-old children ($F = 4.63$, $p = .05$), and (b) there was a significant difference between 8- and 9-year-old children ($F = 4.63$, $p = .036$). The difference scores from the above results indicated that 7-year-olds



	N	Mean SD	N	Mean SD	N	Mean SD
Females	11	12.3 (3.78)	10	11.28 (6.29)	8	6.11 (5.93)
Males	9	9.09 (6.12)	10	8.77 (7.98)	12	8.78 (9.53)
Combined	20	10.86 (5.10)	20	10.03 (7.11)	20	7.71 (8.21)

Figure 1. Age by Sex Evaluation of Total Height Difference Scores.

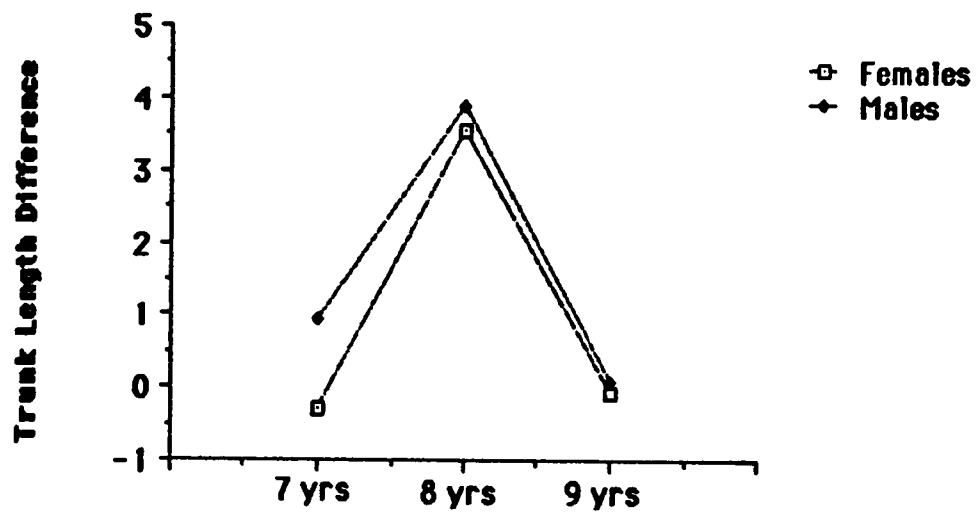
estimated trunk length better than 8-year-olds, and that 9-year olds estimated this variable better than 8-year olds. There were no significant planned contrast differences ($p > .05$) in trunk length for the age by sex interaction (Figure 2).

Leg length The planned contrasts for age indicated that there was a significant difference between 7- and 8-year old children ($F = 5.04$, $p = .029$) where the 8-year-old children had lower difference scores (Figure 3). The age by sex contrasts also indicated that: (a) there was a significant difference between 7- and 9-year-old females ($F = 7.33$, $p = .009$), and (b) there was a significant difference between 7- and 8-year old females ($F = 4.36$, $p = .042$). In each instance the older group of females had better body size estimation of leg length (Figure 3).

Hip Width: The univariate main effect for age was not significant ($F = .76$, $p = .47$). The planned contrasts did not reveal any significant age by sex contrasts for hip width (Figure 4).

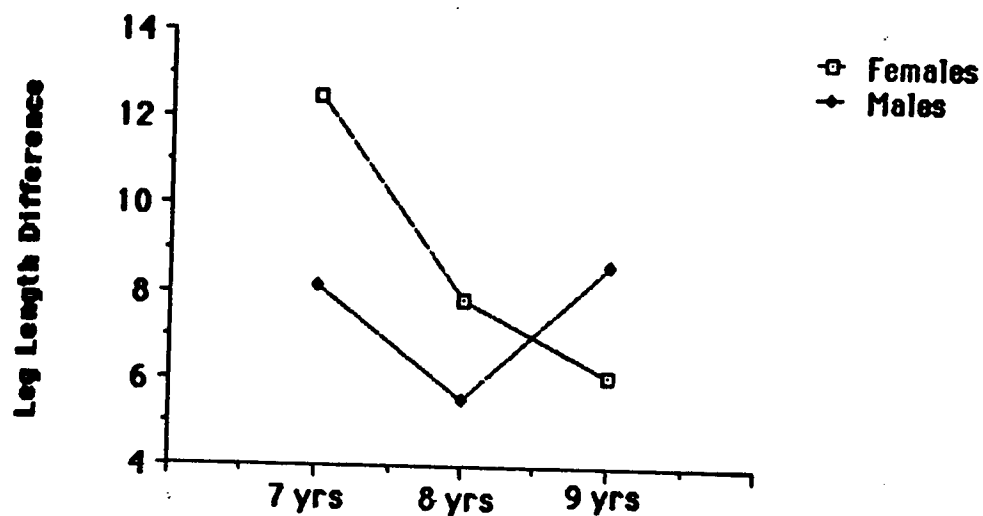
Summary

The results support the theoretical notion of a relationship between body size estimation for age and age by sex. There were age differences in trunk length and leg length. In addition, there were age by sex differences for total height and leg length. All significant findings



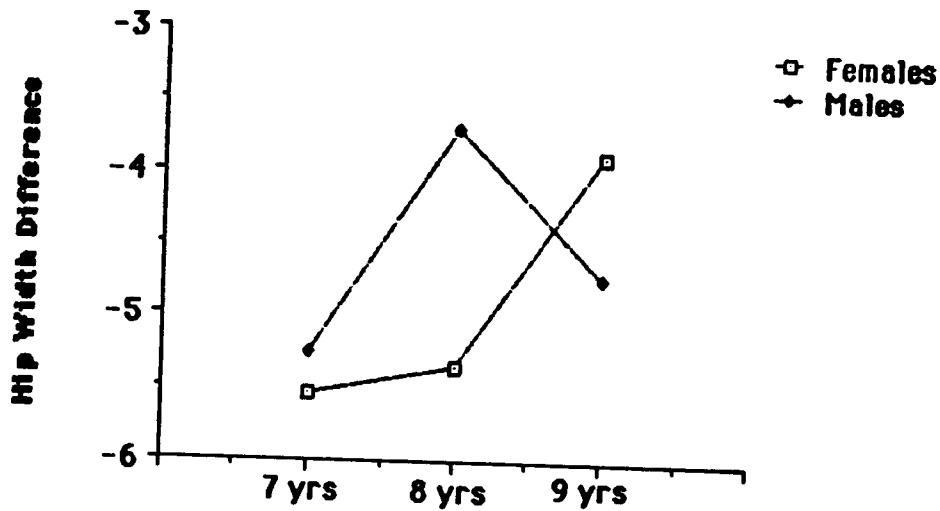
	N	Mean SD	N	Mean SD	N	Mean SD
Females	11	-.31 (5.77)	10	3.54 (3.54)	8	-.08 (3.71)
Males	9	.94 (3.99)	10	3.87 (5.28)	12	.08 (7.68)
Combined	20	.26 (4.96)	20	3.71 (4.38)	20	.02 (6.26)

Figure 2 Age by Sex Evaluation of Trunk Length Difference Scores.



	N	Mean SD	N	Mean SD	N	Mean SD
Females	11	12.52 (3.38)	10	7.88 (4.65)	8	6.13 (3.99)
Males	9	8.16 (6.26)	10	5.56 (5.42)	12	8.68 (6.01)
Combined	20	10.56 (5.24)	20	6.72 (5.06)	20	7.66 (5.33)

Figure 3. Age by Sex Evaluation of Leg Length Difference Scores.



	N	Mean SD	N	Mean SD	N	Mean SD
Females	11	-5.53 (2.54)	10	-5.34 (3.14)	8	-3.89 (2.75)
Males	9	-5.26 (4.37)	10	-3.70 (2.39)	12	-4.73 (2.14)
Combined	20	-5.14 (3.38)	20	-4.52 (2.84)	20	-4.39 (2.37)

Figure 4. Age by Sex Evaluation of Hip Width Difference Scores.

provided affirmative response for subproblem 6 and age by sex affirmation for two measures in subproblem 7. These results suggest trends for age and trends for age by sex differ for various segments of the body.

Subproblem 8: The Relationship Between Children's Body Size Estimations and (a) Type of Physical Education Program, and (b) Physical Activity Experience Outside of School

The final subproblem (Chapter 1, p. 12) sought to determine the relationship between SBFM scores and amount of movement activity, i.e., (a) within school in a traditional physical education program verses that of movement education program, and (b) outside of school physical activity experiences versus no extra school experiences.

(a) Age by Program Type Evaluation of Difference Scores

Multivariate Analyses of Difference Scores

An age by program type, (3 X 2), MANOVA on body-image scores produced a significant multivariate main effect for age ($\Lambda = .675$, $F = 2.77$, $p = .0082$) and no significant main effect for program type ($\Lambda = .926$, $F = 1.01$, $p = .4095$). The resultant univariate analyses were evaluated with planned contrasts run between age groups for each SBFM measure where appropriate. The multivariate age by program type analysis did not result in a significant multivariate interaction ($\Lambda = .611$, $F = 1.36$, $p = .149$). Planned contrasts were run between age by program type to

clarify the trends within each measure.

Univariate Analyses for each Difference Score

Total Height The univariate main effect for age was not significant ($F = 1.08$, $p = .382$). The planned contrasts for the age by program type interaction did not demonstrate any significant ($p > .05$) differences for total height (Figure 5).

Trunk Length The univariate planned contrasts for age indicated that: (a) there was a significant difference between 7- and 8-year-old children ($F = 4.39$, $p = .041$), and (b) there was a significant difference between 8- and 9-year-old children ($F = 5.02$, $p = .029$). The above contrasts indicated that 7-year-olds and 9-year-olds had better body size estimation of the trunk length variable than 8-year-olds.

The planned contrasts for the age by program type interaction produced one significant difference ($F = 3.90$, $p = .05$), i.e., between 8- and 9-year-old children in a traditional physical education program. Among the children who had traditional physical education, 8-year-olds were underestimating and 9-year-olds were overestimating, but both were approximately an equal distance from zero or accuracy. Although not significant, a close relationship existed between 7- and 8-year-old children in a movement education program ($F = 3.65$, $p = .061$) in which the 7-year-

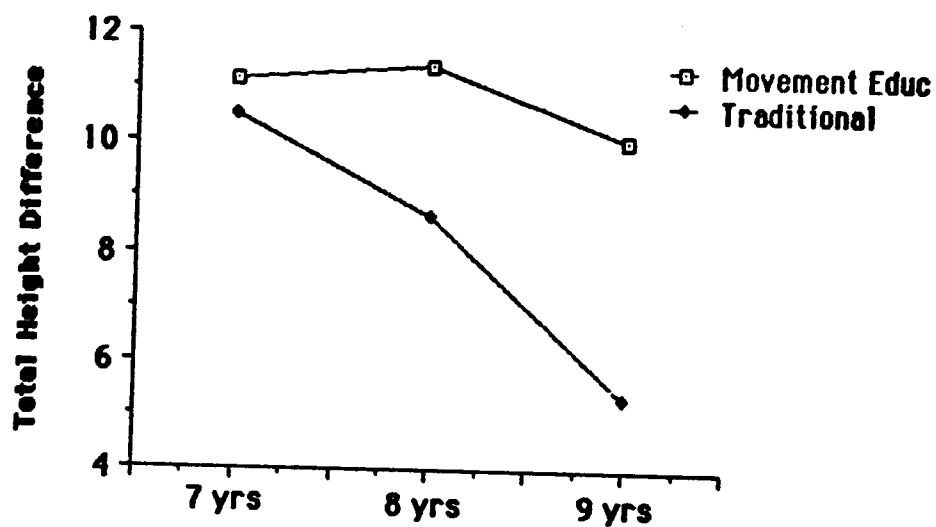


Figure 5. Total Height Difference Scores by Program Type and Age.

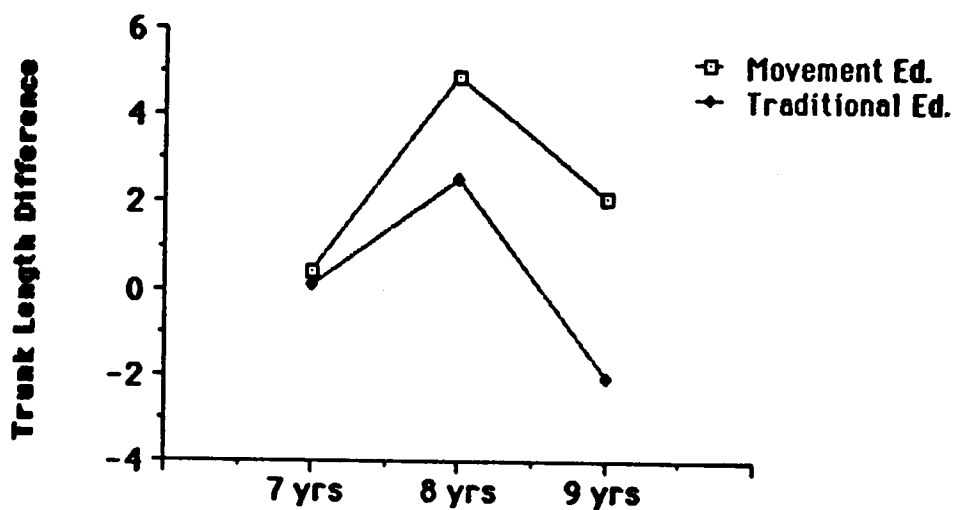
olds were eliciting lower difference scores in trunk length than the 8-year-olds (Figure 6).

Leg Length The planned contrasts for age indicated a significant difference between 7- and 8-year-old children ($F = 5.15$, $p = .027$). The 8-year-old children had lower difference scores than the 7-year-old children indicating a better body-image of leg length for the younger children. The planned contrasts for the age by program type interaction did not reveal any significant differences ($p > .05$) for leg length (Figure 7).

Hip Width: The univariate main effect for age was not significant ($F = .41$, $p = .840$). The planned contrasts did not reveal any significant age by program type differences ($p > .05$) for hip width (Figure 8).

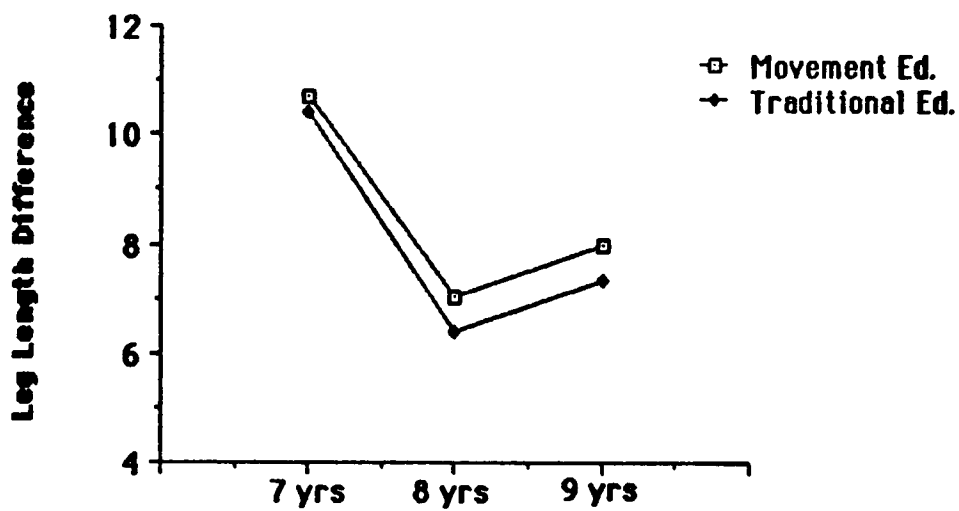
Summary

The results suggest that some relationship does exist between SBFM scores and program type and age. There were age differences in trunk length and leg length. In addition, there were age by program type differences for trunk length where 8- and 9-year-olds were both estimating approximately equal distance from zero. Even though program type was not a significant factor itself an age by program type difference did occur.



	N	Mean SD	N	Mean SD	N	Mean SD
Move. Ed.	10	.42 (4.77)	10	4.87 (4.87)	10	2.09 (6.86)
Trad. Ed.	10	.09 (5.41)	10	2.54 (3.72)	10	-2.06 (5.12)
Combined	20	.26 (4.97)	20	3.71 (4.38)	20	.02 (6.26)

Figure 6. Trunk Length Difference Scores by Program Type and Age.



	N	Mean SD	N	Mean SD	N	Mean SD
Move. Ed.	10	10.72 (5.01)	10	7.04 (5.14)	10	7.98 (5.08)
Trad. Ed.	10	10.39 (5.73)	10	6.40 (5.23)	10	7.34 (5.83)
Combined	20	10.55 (5.24)	20	6.72 (5.05)	20	7.66 (5.33)

Figure 7. Leg Length Difference Scores by Program Type and Age.

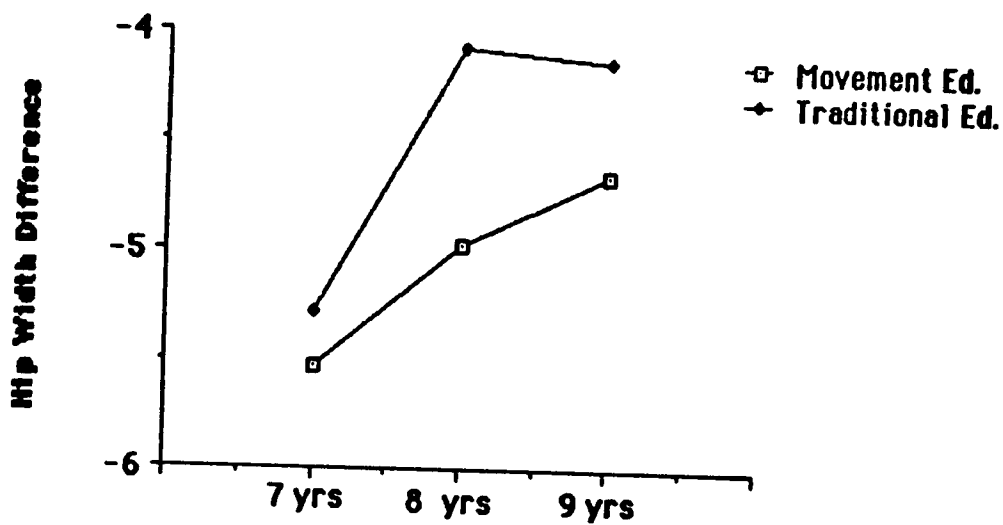


Figure 8. Hip Width Difference Scores by Program Type and Age.

(b) Age by External Experience Evaluation of Difference Scores

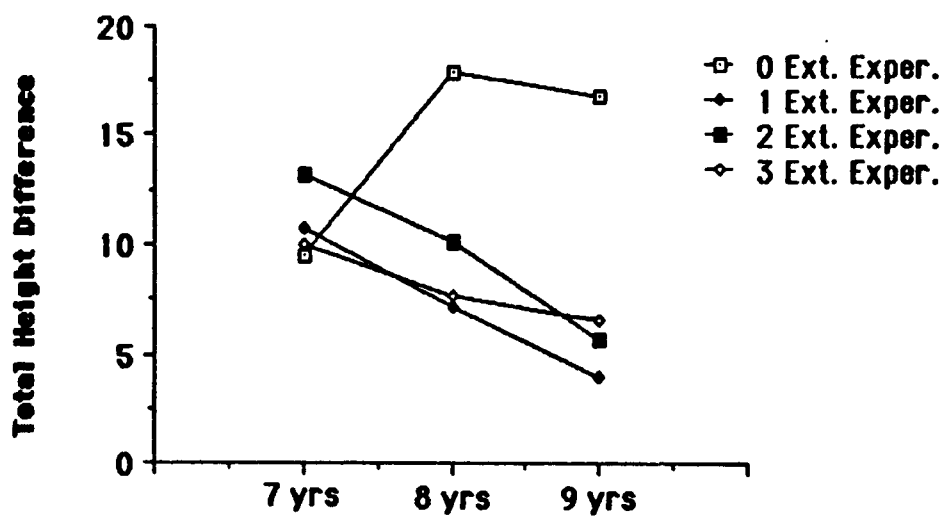
Multivariate Analyses of Difference Scores

An age by external activity experience, (3 X 2), MANOVA on body-image scores produced a significant main effect for age ($\Lambda = .638$, $F = 2.77$, $p = .0088$) and no significant main effect for external experience ($\Lambda = .638$, $F = 1.35$, $p = .177$). The resultant univariate analyses were evaluated with planned contrasts run between age groups for each SBFM measure where appropriate. The multivariate age by physical activity experience analysis did not result in a significant multivariate interaction ($\Lambda = .332$, $F = 1.32$, $p = .105$). Planned contrasts were run between age by physical activity experience to clarify the trends among the measures.

Univariate Analyses for each Difference Score

Total Height The univariate main effect for age was not significant ($F = .99$, $p = .379$). The planned contrasts did not reveal any significant contrasts for age. The univariate main effect external experience was significant ($F = 3.27$, $p = .029$). The planned contrasts for the age by external experience interaction (Figure 9) indicated that:

(a) 9-year-old children with external experience had significantly better body-image of total height than 7-year-old children with external experience ($F = 6.15$, $p = .014$),



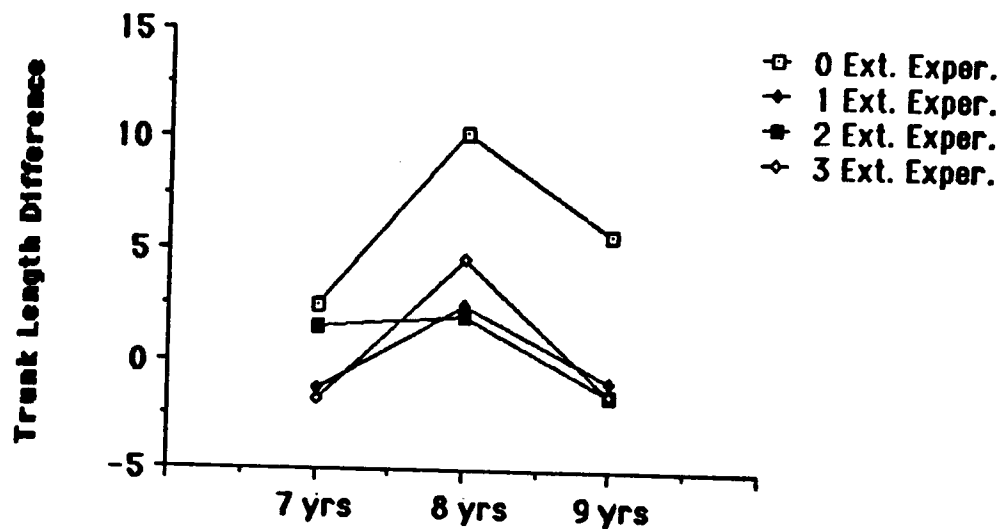
	N	Mean SD	N	Mean SD	N	Mean SD
0	5	9.46 (8.51)	3	17.9 (5.63)	4	16.78 (14.78)
1	5	10.80 (3.04)	7	7.21 (6.02)	5	3.98 (6.27)
2	5	13.22 (4.67)	8	10.13 (7.64)	5	5.64 (1.84)
3	5	9.94 (3.07)	2	7.65 (4.31)	6	6.50 (2.24)
Combined	20	10.86 (5.10)	20	10.03 (7.11)	20	7.71 (8.21)

Figure 9. Total Height Difference Scores for External Experience and Age.

(b) 8-year-old children with external experience had significantly lower difference scores than 8-year-old children with no external experience ($F = 5.22$, $p = .027$), and (c) 9-year-old children with external experience had significantly lower total height difference scores than 9-year-old children with no external experience ($F = 9.91$, $p = .003$).

Trunk Length The univariate main effect for age was significant ($F = 4.50$, $p = .016$). The planned contrasts for age (Figure 10) indicated that: (a) 7-year-old children have significantly lower difference scores of trunk length than 8-year-old children ($F = 7.33$, $p = .009$), and (b) 9-year old children have significantly lower difference scores of trunk length than 8-year-old children ($F = 6.86$, $p = .012$).

The univariate main effect for external experience was significant ($F = 4.26$, $p = .009$). The planned contrasts for the age by external experience interaction indicated that for trunk length: (a) 7-year-old children with no external experience had lower difference scores than 8-year-old children with no external experience ($F = 4.68$, $p = .036$), (b) 8-year-old children with external experience had lower difference scores than 8-year-old children with no external experience ($F = 5.22$, $p = .027$), and (c) 9-year-old children with external experience had lower difference scores than 9-year-old children with no external experience ($F = 6.66$, $p = .013$).



	N	Mean SD	N	Mean SD	N	Mean SD
0	5	2.54 (3.29)	3	10.37 (2.12)	4	5.75 (8.69)
1	5	-1.30 (1.31)	7	2.50 (3.76)	5	-.94 (5.20)
2	5	1.56 (6.06)	8	2.04 (3.01)	5	-1.58 (4.35)
3	5	-1.78 (7.13)	2	4.60 (6.36)	6	-1.68 (5.82)
Combined	20	.26 (4.96)	20	3.71 (4.38)	20	.02 (6.26)

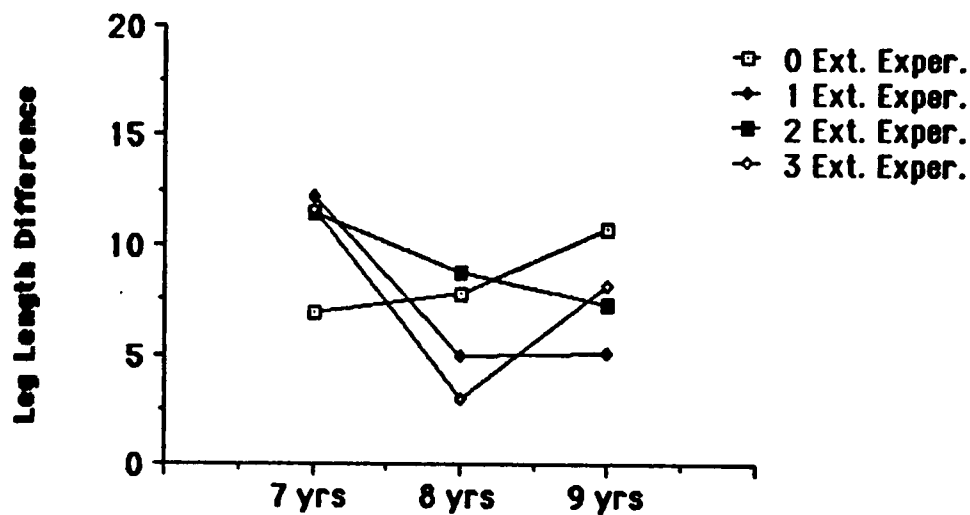
Figure 10. Trunk Length Difference Scores for External Experience and Age.

Leg Length The univariate main effect for age was significant ($F = 3.24$, $p = .047$). The planned contrasts for age indicated a significant difference between 7- and 8-year-old children ($F = 6.10$, $p = .017$) with the 8-year-old children demonstrating lower difference scores. The planned contrasts for the age by external experience interaction also revealed a significant difference between 7- and 9-year-old children with external experience ($F = 7.01$, $p = .001$) where the 9-year-olds scored closer to 0 (Figure 11).

Hip Width The univariate main effect for age was not significant ($F = .58$, $p = .838$). The planned contrasts did not reveal any significant age by external experience differences for hip width (Figure 12).

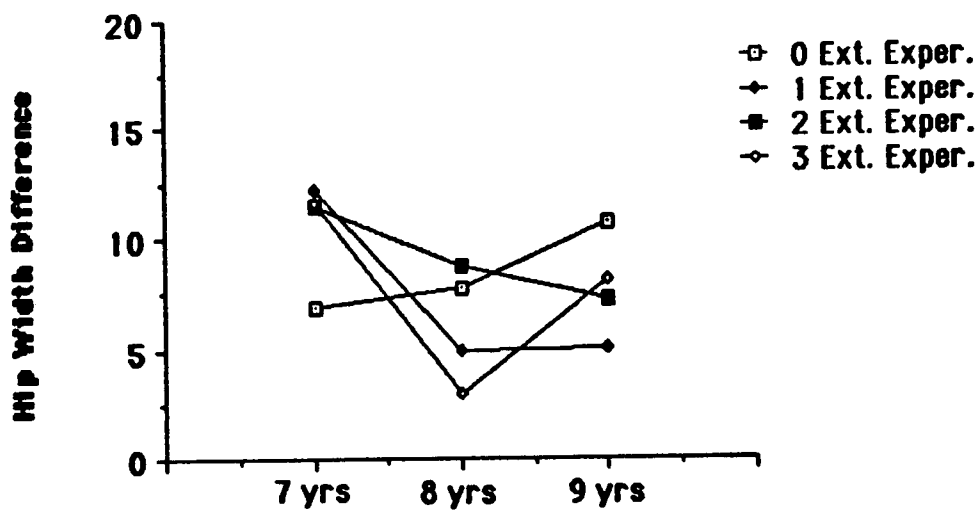
Summary

The results indicate that there is a strong relationship between estimating body size dimensions with age and the interaction of age and extra school experience. There were age differences in trunk length and leg length. In addition, there were age by external experience differences for total height, trunk length, and leg length. Children with external experience consistently demonstrated difference scores closer to 0, with increases in age, than children who do not participate in external activities.



	N	Mean SD	N	Mean SD	N	Mean SD
0	5	6.90 (6.27)	3	7.83 (4.27)	4	10.68 (7.42)
1	5	12.20 (3.89)	7	4.97 (4.03)	5	5.02 (2.09)
2	5	11.50 (2.70)	8	8.78 (6.08)	5	7.24 (3.78)
3	5	11.62 (6.79)	2	2.95 (2.47)	6	8.20 (6.73)
Combined	20	10.56 (5.24)	20	6.72 (5.06)	20	7.66 (5.33)

Figure 11. Leg Length Difference Scores for External Experience and Age.



	N	Mean SD	N	Mean SD	N	Mean SD
0	5	-3.56 (3.32)	3	-5.50 (1.97)	4	-3.83 (2.91)
1	5	-5.90 (3.75)	7	-4.37 (3.61)	5	-4.44 (2.57)
2	5	-7.34 (2.51)	8	-4.23 (2.43)	5	-4.28 (2.30)
3	5	-4.82 (3.65)	2	-4.75 (4.74)	6	-4.82 (2.50)
Combined	20	-5.41 (3.38)	20	-4.52 (2.84)	20	-4.39 (2.37)

Figure 12. Hip Width Difference Scores for External Experience and Age.

CHAPTER V

DISCUSSION

The overall purpose of this study was to determine if the SBFM, Stevens' Block Figure Model, was a valid and reliable instrument for 7-, 8-, and 9-year-old children estimating body size. The findings of this study were discussed in relation to the specific literature reviewed. The discussion was organized into three sections: (a) the relationship between the two measures and the best method of scoring, (b) reliability assessment, and (c) further validation of the instrument.

The Relationship Between the Two Measures and the Best Method of Scoring

The Stevens' Block Figure Model (SBFM) is an instrument designed for measurement of perceived body size in children. The children in the study were successful in using the blocks to build a model similar in appearance to themselves. The number of blocks available and the variability of size allowed the instrument to be understood and utilized in a simple manner by the children. The simple task of stacking blocks to build a defined shape was one with which the majority of children could relate. The task took approximately 15 to 20 minutes to complete. The scoring of the task is multidimensional with the respective difference

scores of actual minus estimated body dimensions of:

- (a) total height, (b) trunk length, (c) leg length, and
- (d) hip width.

Previous techniques designed for testing body size estimation included a variety of instruments, i.e., projective techniques (Goodenough, 1926; Beck, 1944), objective tests (Lickert, 1932); Vincent & Dorsey, 1968), and non-projective techniques (Werner et al., 1957; Shontz, 1965; Dillon, 1962). The varied nature of the results from the variety of instruments which have been utilized over the years do not provide the evidence necessary to determine a specific pattern of relationships.

A valid and reliable instrument was developed by Dillon (1962) and utilized by other researcher's (Hart, 1971) which has been acceptable as an instrument for body size estimation. The SBFM incorporated Dillon's measurement perspective, but also provided a more realistic visualization of the actual body dimensions of height and width.

The degree and/or direction of the development of differentiation of the actual versus estimated measures was of major importance in subproblem 1. The initial subproblem was set forth to determine if differences and relationships existed between children's actual body measurements and their estimates of body size using the SBFM. There were significant differences between three of the ascending

scores from the SBFM and the actual body measures, i.e., total height, leg length, and hip width. This suggested that actual and estimated scores of body size estimation alone were not the same across the 7- to 9-year age range.

The trunk length variable demonstrated the closest approximation of the actual body size in the perceived estimates of the variables tested (Table 2 & 3, p. 67 & 69). Trunk length appears to be a variable that may be adequately perceived at this age level. If across 7- to 9-year-old children there were no differences between actual and estimated dimensions, then the results would suggest that children have perfect body-image concepts developed for these ages. The age of the children in this study, 7- to 9-years, suggest many developmental phenomena are occurring and perhaps the theory of proximodistal development is functioning. The theory suggests that children develop from the midline to the exterior, therefore, trunk length may be a body segment that becomes differentiated at an early age. However, because for the leg length, total height, and hip width measures there was a relationship, yet difference between the actual and estimated scores (Table 2, p. 67), the results suggest that there was variability that was not accounted for in these three measures. The results of this study: (a) indicate a tendency to underestimate the vertical components of body size and overestimate the

horizontal component, and (b) are strongly supportive of the results of other researchers (Dillon, 1962; Shontz, 1965; Woods, 1966).

Dillon (1962) found overestimation to be the trend with descending estimations and underestimation with ascending trials. Woods (1966) found a tendency toward underestimation of vertical dimensions and overestimation of hip and shoulder span. Shontz (1963, 1965) also found that the majority of children tend to underestimate the size of most body parts. The theories regarding overestimation and underestimation of body size vary throughout the literature. Researcher's (Woods, 1966; Shontz, 1965) believe that underestimation is related to a well defined and intact body-image, while overestimation is associated with disuse of the body. Research has provided evidence that children are capable of making differentiations in size and of providing estimates of their perceived body size (Hicks and Stewart, 1930). The conceptualization of body parts is evident within every child. The degree or direction of developed differentiation of this perception is unknown, but some conceptualization of body size does exist (Hicks & Stewart, 1930). The present study substantiated the viewpoint of Hicks and Stewart and provided specific evidence for four body dimensions; i.e., 7- to 9-year-old children: (a) had the best concept of body size for trunk length, (b) had less concept of the body size image for leg

length and total height, and (c) had little body size concept of hip width.

The best method of scoring the child's perceptions had to be determined from using either the individual's perceived estimated score or a difference score (actual minus estimated). The difference score was used throughout the analysis because it determined the degree of accuracy of the child's perception of each body part. If the difference score was equal to zero, or plus or minus two inches (block size), for any measure, then conceptually the child had an accurate assessment of his/her body size. Children with larger difference scores indicated less well developed body-image. As the difference score approaches zero, within plus or minus two inches, then this reflects better development of the concept of body-image within the individual child. The more accurate the child was the smaller the difference score. This difference score method allowed for a better developmental perspective when assessing the child by sex, age level, and experience. In addition, the sign of the difference score (actual minus estimated) indicated underestimation (+) or overestimation (-).

To assess the child's accuracy in body size estimation, the best method for building the model to estimate body part size was determined. This was accomplished through examination of the literature and the statistical analyses

used within this study. Many of the instruments which have been used to estimate body-image allowed the subject to judge perception of self or objects from a descending or ascending mode. The instrumentation in this study only allowed for estimations to be made in the ascending mode. The majority of researcher's (Hart, 1971; Dillon, 1962; Shontz, 1965) agree that descending estimates produce consistent overestimation and ascending estimates produce consistent underestimations. Although the ascending mode has not statistically been evaluated to be the best approach, several studies did refer to the ascending judgment as being closer to the actual estimate (Dillon, 1962; Hart, 1971; Shontz, 1965).

Summary

The results of this study and previous research support the fact that ascending estimations of body size are a viable measure for assessing children's body size. This research also supports the use of difference score to conceptually measure the degree or direction of body-size estimation as a functional assessment measure. Significant correlations suggest that a relationship between actual and estimated scores does exist. However, because the actual and estimated scores were significantly different there were unexplained variables which were functioning as well. To fully ascertain the reliability and construct validity of

the SBFM, the use of the difference scores as a measure of body-image were assessed to determine how the instrument functioned in relation to other predetermined theoretical constructs.

Reliability Assessment

Safrit (1986) defined reliability as the consistency of an individual's performance on a test. In this study, one half of the sample (30 children), stratified for age, sex, IQ, and physical activity/movement experience, were tested using the test-retest method. The intraclass correlation technique revealed that all four variables were highly reliable (Table 4, p. 71). Barrow and McGee's reliability scale indicated that hip width and total height were the most reliable, with $r = .97$ and $r = .96$, respectively.

Although hip width was the least accurate body-image variable for 7- to 9-year-old children, it ranked as the variable with the highest level of reliability. That is, the 7- to 9-year-old children consistently overestimated hip width to approximately the same degree. A possible explanation of this phenomena is that there were only four available hip width blocks from which the child could choose. When the reliability testing occurred the majority of the children (all but one) knew the exact hip width block they had chosen in the first test session. Therefore, the hip width reliability scores were expected to be extremely

high. There were two other reliability assessments (Dillon, 1962; Shaffer, 1964) of techniques to measure body-image found in the literature. Dillon (1962) reported reliability coefficients of $\underline{r} = .75$ for height and $\underline{r} = .40$ for width with $p < .01$. Shaffer reported reliability coefficients of $\underline{r} = .69$ for self height estimation. The present study produced reliable assessments of more body components than other previous studies (Dillon, 1962; Shaffer, 1964).

Summary

In summary, the overall test-retest results revealed that the SBFM is a highly reliable instrument for body size estimation in children 7- to 9-years of age with/for the variables of total height, leg length, trunk length, and hip width. The present study produced more reliable assessments of more body components than previous studies (Dillon, 1962; Shaffer, 1964).

Further Validation of the Instrument

Safrit (1986) stated that construct validity involves the degree to which an instrument measures abstract attributes or qualities that cannot be directly measured. One of the major objectives of this study was to determine the degree to which the SBFM measurements supported the theoretical explanation of the development of the concept of body-image in relation to age, sex, intelligence, and

physical activity/movement experience. Overall, the results suggested that the SBFM is a valid instrument for measuring children's body-image perceptions and also provides the potential for showing changes in the development of the body-image concept with age. The concept of body-image appears to be a complex phenomena which is theorized to follow mental patterns and is related to a variety of constructs. The constructs of age, sex, intelligence, and physical activity experience were evaluated. The body-image construct is conjectured to be positively related to age (Shaffer, 1964), intelligence (Fisher & Cleveland, 1958), and external experience (Witkin, 1965). Researchers (Woods, 1966; Hart, 1971; Gellert et al, 1971) suggested there are no sex or program type differences for body-image.

Age and Body Image

In subproblem 4, chronological age was analyzed in a stepwise regression and in a multidimensional stepwise regression (utilizing difference scores). The stepwise regression of age with actual and/or SBFM estimated measures produced significant relationships in every model, while the multivariate stepwise regression of age with SBFM difference scores showed no significance for any model. A possible explanation for this contrast was important in delineating the value in utilizing the difference scores for assessment. The multidimensional stepwise regression presented a more

accurate assessment of the child's true score. This assessment revealed that actual and estimated scores were both related to age which supported the positive theoretical developmental perspective. However, the difference scores were not related to age. The fact that the correlation was stronger for some variables than others, suggested that other phenomena were acting as well and that other factors might be interacting with age. Because the estimation of body size is a complex phenomena, age, in and of itself, was not significantly related to the difference scores, but became important when considered with other constructs.

Intelligence and Body-Image

In this study, reading and math IQ scores were evaluated in relation to the SBFM scores and significance was evident throughout. Each of the four multivariate stepwise regressions found the best fit model was for the model using the segmented order of variables within the regression. There did not appear to be any delineation between children's perceptions of the total body component or individual body segments in conjunction with IQ scores. It was apparent that children with higher IQ scores had more accurate assessments of their perceived body size utilizing the SBFM and a greater understanding of the body-image construct.

Early researcher's in the area of body size estimation

used basically projective techniques or objective tests to examine the relationship between IQ and body-image development. Goodenough (1926), Machover (1949), and Lickert (1932) all evaluated body-image through drawings in order to determine what developmental perceptions or misperceptions might exist within the child.

Researcher's defined body-image as a construct that encompasses cognitive, affective, and psychomotor components (Smythies, 1953; Witkin, 1965). Fisher and Cleveland (1958) suggested that the process of meaningfully organizing perceptual processes is one of the most difficult and complex cognitive tasks to develop. Thus, the role of the child's IQ, level of intelligence, in relation to perceptually evaluating his/her body size was an important construct to examine. In the present study intelligence was related to the ordered variables of: (a) trunk length, hip width, then leg length, or (b) total height and hip width. The difference score for the SBFM followed the theoretical projection of a positive relationship with intelligence, thus providing evidence for construct validity.

Age and Sex

The results of this study supported the work of other researchers regarding the theoretical construct of age and sex. The analysis of sex as a main effect revealed no significant differences and supported the theoretical

construct. The age variable and age by sex interaction did reveal significant differences for some variables of the SBFM. Analyses were made to determine if older children's difference scores were significantly smaller than younger children's scores, and if any significant sex by age differences existed. The multivariate analysis revealed a significant effect for age ($p = .004$), and for the age by sex interaction ($p = .019$). No significant multivariate sex main effect was present ($p > .05$). Planned contrasts revealed 7- and 9-year-old children evidenced lower difference scores in estimating trunk length than 8-year-olds (Figure 2, p. 82). Also 8-year-olds demonstrated lower difference scores in estimating leg length than 7-year-olds (Figure 3, p. 83). The major changes in the ability to perceive body size estimation appeared to be occurring around age eight.

This study found some significant age by sex interaction differences within 7- to 9-year-old females, where the older group of females were estimating leg length better than the younger groups, but there were no significant difference for the 7- to 9-year-old males (Figure 3, p. 83). Sex differences generally do not show up at this young age, but are an important construct to consider. Although there was no significant difference in body-image between the males and females at 7-, 8-, and 9-years of age, the females were

demonstrating some developmental trends of body-image through these ages, and males were not. Previous research (Stiles, 1975; Schilder, 1950) suggested that boys may have more movement opportunity than girls, and that greater movement opportunity is associated with more accurate body-image representations and thus that boys might have different trends than girls in the development of body-image. The results of this study in relation to the literature suggest a need to examine this trend across a greater age range and the use of a longitudinal design. Although there were no sex differences at any age, there was a difference in the developmental trend of the body-image of leg length.

In this study, the planned contrasts of total height revealed an age by sex difference (although not significant, $p = .06$) where 9-year-old females had better estimation of total height than 7-year-old females. The variable of leg length also revealed that 9-year-old females had lower difference scores than 8-year-old females and 8-year-old females had lower difference scores than 7-year-old females. Although no sex differences were evident between males and females, age by sex interaction differences were evident within the females as a group, whereas the males demonstrated no significant differences as a group. Since females mature earlier than males, perhaps enough changes begin to occur around the age of eight to elicit the within

sex differences.

The theoretical constructs regarding age and sex suggest that children's body-image perceptions improve as the child grows older and that sex by itself does not account for differences in body-image using the SBFM. Gellert et al, (1971) found that self recognition by children improved significantly from 5.4- to 12.8-years and no significant sex differences were found. Shaffer (1964) tested children in the fifth through eighth grades and found that underestimation decreased slightly as the child increased in age. Shaffer also found sex differences were evident in that females underestimated their own height more than males. Woods (1966) suggested that age and sex remain as categorizing variables rather than as contributory variables. Finally, McFee (1968) found an increased accuracy of estimating body dimensions develops with age, and sex differences were evident with males estimating body size dimensions better than females.

The variable of hip width did not demonstrate any significance throughout the entire study. This was consistent with the results of other researcher's (Woods, 1966; McFee, 1968; Hart, 1971) who found the horizontal dimensions of shoulder span and hip width greatly overestimated by all children regardless of age or sex. The variable of hip width appears to be a body segment which has

not been conceptualized by 7-, 8-, and 9-year-old children. Even though children only had four possible hip width blocks from which to choose, in comparison with the actual measures, the hip width was greatly overestimated by all children. This may be the result of the difficulty in defining where the hips are in relation to other body parts or the fact that the hips are not a body component referred to in movement activity at this young age. Children cannot conceptualize that which they cannot delineate as a body segment.

Overall, the age by sex analysis revealed that both variables are components functioning in the phenomena of body size estimation. As independent components their contribution is not as great, but as multiple variables they do evidence an influence on the body-image phenomena. Although there were no sex differences at 7-, 8-, or 9-years of age, there were positive age differences, and there was a difference in the developmental pattern of body-image between the sexes. The theoretical perspective of the interaction of age and sex were supported and extended, thus providing evidence of construct validity for the SBFM.

Program Experience with Age

Researcher's have been interested in determining the effect that the amount and depth of physical activity experience has in influencing the overall body concept of

the child. This study examined experience from two viewpoints: (a) experience within the schools in regard to the type of physical education program teaching methodology, and (b) experience outside of school in regard to the number and amount of extra activities participated in by the child 7- to 9-years of age.

The results of this study did not find any significant differences between children in two different types of physical education programs. The multivariate analyses did reveal a significant main effect for age ($p = .008$), but no significant effect for program type. The planned contrasts did reveal some program type by age differences. The results revealed that 7- and 9-year-olds estimated trunk length better than 8-year-olds (Figure 6, p. 88). These results parallel the results from the age by sex subproblem. Differences appear to be occurring at around eight years of age, such that changes within the age group as a whole occur. The leg length variable also showed that 8-year-old children had a better body-image of leg length than 7-year-olds (Figure 7, p. 90). The planned contrasts also revealed two significant age by program type differences. Differences revealed that 8-year-olds in a traditional program significantly underestimated trunk length, while 9-year-olds overestimated, but both were approximately equal distance from zero (Figure 6, p. 88).

Individuals researching the contrast of movement

education versus traditional physical education programs (Tanner, 1969; Robertson, 1974) support an opposite viewpoint. These researchers indicated that underestimation was related to feelings of inadequacy and overestimation was related to feelings of adequacy and greater control over the environment. The movement education program difference, although not significant, indicated that 7-year-olds were more accurate in estimating trunk length than 8-year olds. The results of the present study imply that something occurs at about 8-years of age to significantly affect the child's perception of body size.

The changes in teaching approach in elementary school physical education programs have prompted researchers to determine if developmental differences might occur in these programs. Several researcher's (Robertson, 1974; Tanner, 1969) have examined the body-image concept by comparing children in a movement education program with that of a traditional physical education program. Robertson (1974) found children in a movement education program had significantly greater scores on body-image than children in a traditional program. Tanner found no significant differences between the two program types, but found that children in the movement education program had more positive feelings in regard to their movement. The results of this study conflict with Robertson and support Tanner, however

the instrumentation for the three studies was not the same.

Several possible explanations exist for the lack of differences between the two teaching methodologies of movement education and traditional physical education which did not materialize in this study. The sample of children at each of the two schools were stratified for socioeconomic status, available extracurricular activities inside and outside of school, and the number of times each attended physical education classes each week.

The overriding factor which seemed to elicit the differences between the groups was in the number of times and with whom they received physical education each week. The children in the traditional program attended physical education two times each week. The second grade children (7- and 8-year-olds) at the movement education school received physical education twice a week, while the third graders (8- and 9-year-olds) were in physical education three times a week. The movement education children also received physical education from an additional physical education teacher (characterized as a traditional/skill/games approach) once a week, in addition to a 30 minute recess period each day. The movement education approach probably could not initiate differences in children's movement abilities when only being taught by this approach two to three times a week. It is not apparent how many times a week is needed to teach movement education to elicit

a difference, if indeed a difference does/can exist. The characteristic movement education school, in this study, was viewed as having a large traditional component inherent within the program as well. Although no significant differences were found between the two program types, significant age and age by program type differences were evident within the planned contrasts.

External Experience with Age

The results of this study indicated that the amount and depth of external activity experience is a strong factor in influencing more accurate body size estimation by children. The multivariate analysis revealed a significant main effect for age; and the univariate analyses for trunk length and leg length also revealed significant age main effects. A significant external experience main effect was also evident for the total height and trunk length variables ($p = .029$, $p = .009$, respectively).

The planned contrasts revealed age differences where 7- and 9-year-olds were estimating trunk length better than 8-year-olds and 8-year-olds had better estimations of leg length than 7-year olds. This trend was identical throughout the analyses and supplied strong support for development and perceptual changes occurring around the age of 8-years. Something appeared to occur around 8-years of age that significantly affected the ability to estimate body

size more accurately.

The planned contrasts for the age by external experience interaction revealed significant evidence to support the fact that children with greater physical activity experience have more accurate assessment of body size in general. Three of the four individual variables (total height, leg length, trunk length) each revealed significant contrast differences within the analyses. The results indicated that: (a) 7-year-old children with no external experience estimated trunk length better than 8-year-olds with no external experience, (b) 9-year-olds with external experience estimated total height and leg length significantly better than 7-year-olds with external experience, and (c) 8- and 9-year-old children with external experience estimated total height and trunk length significantly better than 8- and 9-year-olds with no external experience. The effect that an increased amount and depth of external experience can have on the child's perception is evident both within groups and between groups.

Physical educators and researchers often have tried to determine if more physical activity/movement experience elicits greater overall physical functioning. Researchers suggested that development of the body-image proceeds much the same way as other growth and development characteristics. The child progresses through stages that

begin with a global perspective of the self and environment to a defined and developed focus on the self and environment (Witkin, 1965; Schilder, 1950). This global entity becomes differentiated through contact in and with the environment through movement experiences to develop a precise body boundary (Witkin, 1965). As this development occurs, feelings about the self and self-image become important to the child. Stiles (1975) and Schilder (1950) each viewed movement as enhancing the body image and the overall perceptual abilities of the child as well. Holden (1960) found significant improvement in the body-image definitiveness of handicapped children's drawings after attending a two week summer camp. Holden hypothesized that the vigorous activity utilized in the camp clarified the children's image of themselves. The results of this study supported the above research in that: (a) children with greater movement experiences and contact with the environment had better body size estimation in 7- to 9-year-old children, and (b) the external experience by age consistent results for total height and varied results on the segments suggest a total body to particular part developmental trend.

The difference between a child having no external physical activity outside of school and a child having one to four extra activities outside of school made a great difference in the child's general and ultimately overall

body-image development. The premise of more involvement and physical activity to enhance body-image development lends support to increasing the amount of activity for children in the developmental years, i.e., increased activity both inside and outside of school. Because the age, external school experience, and experience by age findings followed the theoretical framework, further evidence of construct validity was provided.

Summary

The SBFM was an appropriate instrument for estimating perceived body size in children 7- to 9-years of age. The instrument presented a task that was easily understood and versatile for each child. The reliability coefficients were sufficiently high to establish that the instrument is consistently measuring the body-image construct. Evidence for construct validity of the SBFM difference scores was provided by the fact that the theoretical conjectures regarding intelligence and the interactions of age, sex, and physical activity experience were supported and enhanced.

CHAPTER VI

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to evaluate the SBFM as a valid and reliable instrument for the measurement of perceived body size in children 7- to 9-years of age. The analyses were organized to determine: (a) the relationship between actual and estimated measures and the best method of scoring, (b) the degree of reliability, and (c) the degree of construct validity of the SBFM. Eight subproblems were utilized to evaluate the above in relation to age, sex, intelligence, and physical activity/movement experience.

The subjects included 60 children, 7-, 8-, and 9-years of age from two individual schools in the Tennessee area. The four independent variables that were examined in conjunction with the SBFM included: (a) total height, (b) trunk length, (c) leg length, and (d) hip width.

A correlated t-test was used to determine the relationship among the four actual measurements taken on the child and the four estimated measurements from the SBFM. Reliability coefficients were calculated using an intraclass correlation technique (Safrit, 1986). A stepwise multivariate analysis of age, IQ, physical education program type, and external experience with the difference scores

from the SBFM were calculated with $n = 60$. Wilks' Lambda criterion ($p < .05$) was used to evaluate the multivariate F. The Max-R technique (Joyner, 1985) was utilized in order to determine the variables which would produce the "best fit" for the models.

Previous techniques designed for testing body size estimation included a variety of instruments (Goodenough, 1926; Lickert, 1932; Shontz, 1965). The variety of instruments which were utilized over the years make it difficult to determine the nature of the pattern of relationships among the various measures that influence body-image development. This study sought to develop a new instrument for body size estimation that was realistic to the child and increased the number of body segments examined.

Results indicated that the SBFM is a valid and reliable instrument for the measurement of perceived body size in 7- to 9-year-old children. The use of ascending scores was consistent with results in the literature (Hart, 1971; Dillon, 1962; Shontz, 1965) that suggest ascending scores produce consistent underestimation of vertical body size components and overestimation of the horizontal components, but remains a viable measure for assessing body size estimation. The use of difference scores to conceptually measure the degree or direction of accuracy of body size

estimation as a functional assessment was also supported. For the global measures of each dependent variable across all the independent variables, significant correlations between actual and estimated measures were evident, but other unexplained variables were functioning as well.

The reliability results indicated that the SBFM was a highly reliable instrument for estimating the body size variables of total height, trunk length, leg length, and hip width in 7- to 9-year-old children.

Construct validity of the instrument was established by evaluating the trends of the difference scores of the SBFM in reference to the theoretical constructs of age, sex, intelligence, and physical activity/movement experience. Body size estimation is a complex phenomena which develops and acts in conjunction with a variety of constructs. The body-image construct was affected by intelligence, age, and external school experience, but was not directly a function of sex or physical education program type. None of the above constructs could be singled out as the primary contributing factor. However, intelligence and the interactions of age with sex and physical experience were shown to be factors related to the pattern and level of development of body-image in 7- to 9-year-old children.

Conclusions

The purpose of the present study was to evaluate the SBFM as a valid and reliable instrument for the measurement of perceived body size in children 7- to 9-years of age. Body-imaging is a complex phenomena that acts primarily in conjunction with the constructs of age, IQ, and external physical activity experience. The results of the data suggested:

1. The SBFM is a viable measure to detect the degree of the development of body size/image utilizing: (a) an ascending modality, and (b) the difference scores of actual minus estimated of each SBFM component.

2. The SBFM is a highly reliable instrument for body size estimation in children 7- to 9-years of age with/for the variables of total height, trunk length, leg length, and hip width.

3. The SBFM is a valid measurement instrument based on the theoretical conjectures regarding age, sex, intelligence, and physical activity/movement experience.

Recommendations

This study has demonstrated that the study of body size estimation is complex and that many variables need to be incorporated to provide an accurate evaluation of the construct. The following recommendations for future

research are related to the evaluation of the body-image construct through the use of the SBFM:

1. Manufacture the instrument in light weight, but stable material.
2. Manufacture the hip width blocks in a greater variety of sizes, such that hip width can be assessed more accurately.
3. Conduct research such that ascending and descending estimations can be evaluated.
4. Conduct research such that younger and older groups of children can be evaluated.
5. Conduct research such that the construct of motor development and/or physical development can be evaluated in relation to body size estimation.
6. Conduct research such that body size estimation can be examined from a longitudinal perspective.

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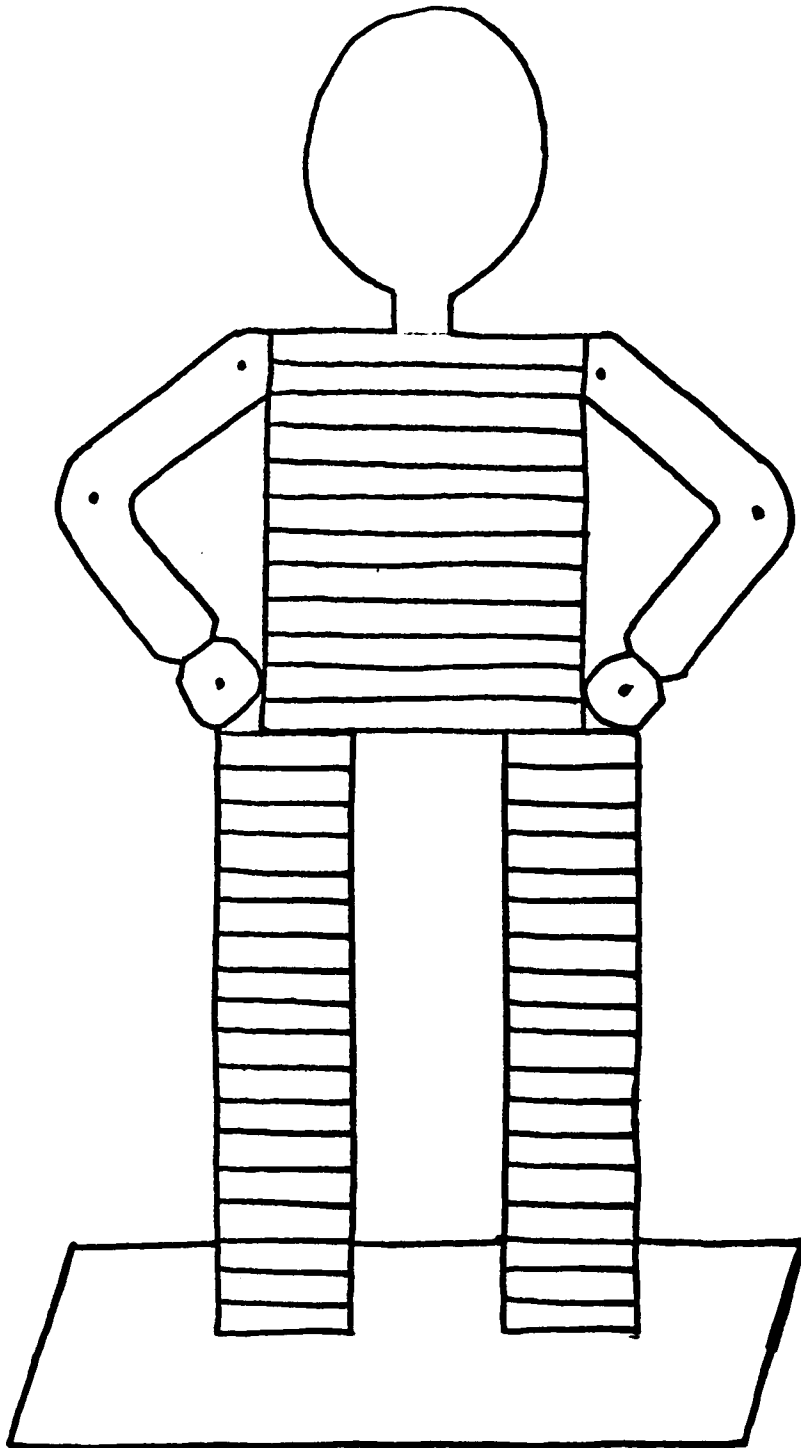
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APPENDICES

APPENDIX A

STEVENS BLOCK FIGURE MODEL

STEVENS BLOCK FIGURE MODEL



APPENDIX B

INDIVIDUAL SEGMENTS OF THE SBFM

INDIVIDUAL SEGMENTS OF THE SBFM
 *(Dimensions may vary in accordance
 with regulation lumber size)

Section	Dimensions*	Number of Blocks	Range of Height
Baseboard	2"x11"x30"	1	1.56"
Legs	2"x4"x6"	24/leg	1.56"-35.81"
Trunk	2"x6",8",10",12"	18/set	1.56"-26.69"
Arms	2"x4"x8"	2	length = 16"
Head	one consistent size will be used		

APPENDIX C

LETTER TO RESEARCH COORDINATOR OF SCHOOL DISTRICTS

LETTER TO RESEARCH COORDINATOR OF SCHOOL DISTRICTS

December 15, 1988

Dear

I am writing to request permission to conduct a research study at two elementary schools. As a doctoral student at The University of Tennessee, I am currently investigating the use of a new instrument designed to measure the perceived body size estimations of children. The purpose of my study, therefore, is to derive valid and reliable measures which establish the instrument as a measuring device for children.

I would like to test approximately 60 total students (30 students per school), 7- 8-and 9-years of age, during two different testing sessions. Each session will require approximately 20-40 minutes/student over a period of four to six weeks. Approximately one-half of the original sample will be selected to repeat the test procedure, following the initial data collection, such that reliability of the instrument can be assessed.

I would also like to utilize the instrument across different types of physical education programs. I am interested in contrasting a traditional physical education program with that of a movement education program to determine if any differences exist. In conjunction with this, I would like to request permission to have access to student records, in order to obtain IQ scores for correlation with other variables.

Confidentiality will be maintained as no names will be associated with data collection measures. All data will be numerically coded and only group results will be used in reporting the data. Results of the study will be forwarded to the research coordinators of each school district.

I hope that this letter and the enclosed material will provide sufficient information regarding the nature of my study. If you have any questions or need additional information, please contact either my advisor, Dr. Patricia Beitel, or me (974-5111). I appreciate your time and consideration of my request and I will be in contact with you in the near future.

Sincerely,

Deborah A. Stevens
Depart. of PE and Dance
University of Tennessee
Knoxville, TN 37996-2700

APPENDIX D

SCHOOL COMPATIBILITY CRITERIA AS ASSESSED BY INDIVIDUAL
PHYSICAL EDUCATION INSTRUCTORS WITHIN
THE SCHOOL DISTRICTS TESTED

SCHOOL COMPATIBILITY CRITERIA AS ASSESSED BY INDIVIDUAL
PHYSICAL EDUCATION INSTRUCTORS WITHIN
THE SCHOOL DISTRICTS TESTED

1- Socio-economic classification: _____

2- Number of times children receive physical education
each week:

3- Is the physical education program taught by a
specialist with a degree in elementary physical
education?

If the answer is no, how many elementary physical
education courses were you required to take in your
undergraduate program?

4- What is the length of the physical education period?

5- Would you classify the physical education program at
the present school as a traditional program, a
movement education program, or some other type?

APPENDIX E

LETTER TO PARENTS/DETAILS OF STUDY

LETTER TO PARENTS/DETAILS OF STUDY

January , 1989

Dear Parent:

As a doctoral student at The University of Tennessee, I am interested in conducting a research study with 7-8- and 9-year old children at your child's school. I have developed an instrument designed to measure the perceived body size estimates of children. I have received permission/support for this study from the school system, principal, and teachers of your child.

The device involves the children building a model out of blocks which is similar in size to their own estimate of themselves. The study will be trying to determine overall, if: (a) children are capable of estimating their own size, and (b) the block figure model is capable of measuring these perceptions. The testing will occur in two separate sessions. Session I will involve taking the following measurements on your child: head height, total height, leg length, trunk length, and hip width. Session II will involve the child building a body figure out of the wood blocks which he/she feels is the same size as himself/herself. The above measurements will be taken on the block figure model and these will be compared with the original measurements to determine the child's ability to estimate his/her own size. Approximately one-half of the sample will be selected to repeat the test procedure a second time to assess the reliability of the instrument. Access to your child's school records is also needed to obtain IQ scores for comparison with the overall variables.

The testing session will be free from anxiety for the child due to the simple nature of the task and the positive reinforcement which will be associated with each child's performance. Confidentiality of children's scores will be maintained. Participation by subjects is strictly voluntary and you and/or your child are free to withdraw at any time. There will be minimal or no effect on school activities due to careful scheduling with your child's teacher.

At this time, I am asking that you read this letter of explanation and the attached Parental Consent Form. If you agree to allow your child to participate, please sign the consent form and complete the parental checksheet for student selection. Place your signed consent form and parental checksheet in the attached envelope. Have your child return this to his/her homeroom teacher by February , 1989. Please return both forms in the envelope provided to school by your child, as soon as possible. If you have any questions, please feel free to call me at work (974-5111) or at home (584-8476). Thank you very much for your time and consideration.

Sincerely,

Deborah A. Stevens
Department of Physical Education & Dance
University of Tennessee, Knoxville
37996-2700

APPENDIX F

PARENTAL CONSENT FORM

PARENTAL CONSENT FORM

I understand that the purpose of this research is to determine the degree to which children are capable of estimating their own body size.

I understand that the activities include taking the following measurements on my child: head height, total height, leg length, trunk length, and hip width.

I understand my child will be building a body figure out of blocks in comparison to his/her own size.

I confirm that my child's participation as a subject is entirely voluntary. No coercion of any kind has been used to obtain my permission.

I understand that there will be no effect on my child's status/grade in any school activity whether he/she does or does not participate in this study.

I understand that I may ask questions, withdraw my consent, and/or terminate my child's participation at any time, without penalty, during the project. I also understand that my child may refuse to participate and/or stop participating at any time, and no coercion will be used with him/her.

I have read the letter explaining the procedures that will be used in the study and understand what will be required of my child as a subject.

I understand that some children will be selected to repeat the test procedure to assess reliability of the instrument.

I understand that there are no risks to the individual, but that results will allow for a better understanding of how children perceive themselves in space.

I understand that my child's school records will be examined to provide the researcher with IQ scores for use in the study.

I understand that all of my child's scores will remain confidential and that only group results will be used in reporting the data.

I wish to give my permission for my child to participate as a subject.

Signature Parent/Guardian: _____

Child's Name: _____

Home Address: _____

Phone Number: _____

Child's Date of Birth: _____

Current Date: _____

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APPENDIX G

PARENTAL CHECKSHEET FOR STUDENT SELECTION

PARENTAL CHECKSHEET FOR STUDENT SELECTION

Parent's Name _____

Student Name _____

The following information is necessary to determine the students eligibility to participate in the study. Certain criteria are needed to derive a sample of students similar in selection. Please circle the appropriate answer to the following:

1- Student's age: 7 years 8 years 9 years

2- Student's birthday: _____ _____ _____
 Mo. Day Yr.

3- Student's sex: Male Female

4- How long has the student attended the current school?

_____ years

5- How long has the student participated in the physical education program at this school?

_____ years

6- Is the student free of corrected vision problems?

Yes No

7- Has the student demonstrated any signs of serious personality disturbances, hearing loss, brain damage, or other psychomotor disturbances?

Yes

No

8- In what kind of organized dance, physical activity program, or competitive sport program, outside of school, does your child participate? Please name the sport or activity in which your child participates, and how often they participate in that activity each week.

Activity/Dance/Sport Program	Frequency/week	#years
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

9- Will you give your permission for your child's school records to be examined by the investigator?

Yes

No

10- If chosen for the sample, will you give permission for your child to participate in the study?

Yes

No

APPENDIX H

LETTER OF SUPPORT FROM THE PRINCIPAL

LETTER OF SUPPORT FROM THE PRINCIPAL

Dear Parent,

Attached you will find information regarding a research study which will be conducted by Debbie Stevens, a doctoral student at The University of Tennessee. I have given her permission to conduct this study with 7-8- and 9-year old children and have offered my assistance with this research.

I would appreciate it if you would take 5-10 minutes to read the enclosed materials. If you choose to allow your child to participate, please fill in the checksheet and return it to your child's teacher as soon as possible. I appreciate your cooperation in this endeavor.

APPENDIX I

PROTOCOL FOR TEST SESSION I

PROTOCOL FOR TEST SESSION I

Test Session I:

1- As the student entered the room, introductions were made. An explanation of the measurements that were going to be taken was given and the student was then asked to proceed to the location for measuring total height.

2- The child's actual height (to the top of the head) and total height (to the top of the shoulder) was recorded while standing using the anthropometer. Head height was derived by subtracting actual height from total height. Measurements were made and recorded.

3- The child moved next to the table in the room and was instructed to sit straight and tall on the table with the hands resting in the lap. The student was shown the measuring instrument (anthropometer) that would be placed along the back to assess their sitting height. The measurement was taken from the top of the head to the surface of the table and the total was recorded.

4- The student was instructed next to stand so that hip width could be determined. The child was shown the measuring instrument that would be used and was told that the measurement would be taken from the back of the child from one side of the hip to the other. The child turned around and the measurement was derived and recorded.

5- At this point students were introduced to the SBFM instrument. The child was able to see what the completed model would look like that they were going to build in session II. The child was told that what we were trying to do was to build a person out of blocks that was similar to their same size.

6- The meaning of the terms trunk, height, and width were discussed. The trunk was described as being "that portion of your body that sits on the top of your legs. It does not include the head or neck and is similar to the shape of a rectangular box". Height was explained as "the total distance from the top of the head to the bottom of the feet". The child was then asked to touch the top of the head and the bottom of the feet to simulate his/her total height. Width was explained as being "how wide one is from one side of the body to the other. People are able to measure width or wideness through the hips or shoulders". It was explained to the children that this study was interested in examining the width of the hips. The child was then asked to touch the hips and show how wide he/she might be from one side to the other. The child was asked to think about the terms "trunk", "height", and "width" and told that those terms would be used in test Session II. Following this discussion the child was returned to the classroom by the investigator.

APPENDIX J

SUBJECT SCORE SHEET

SUBJECT SCORE SHEET

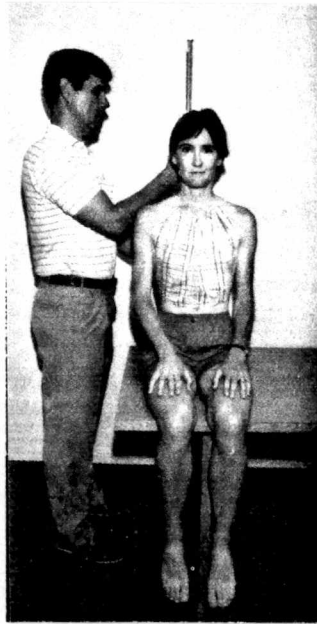
Subject _____ Age _____
 Class _____ Sex _____
 School _____ ATS _____
 Activity Level _____

	ACTUAL MEASUREMENTS	BLOCK FIGURE MEASURES
ACTUAL HEIGHT	(w/head) _____	(tl.height+head height) _____ + _____ _____
TOTAL HEIGHT (w/o head)	_____	_____
LEG LENGTH	(act.ht.-sit.ht) _____ - _____ _____	_____
TRUNK LENGTH	(sit.ht.-hd. ht.) _____ - _____ _____	_____
HIP WIDTH	_____	_____
SITTING HEIGHT	_____	COMMENTS: _____ _____
HEAD HEIGHT	(act.ht.-tl.ht.) _____	_____ _____

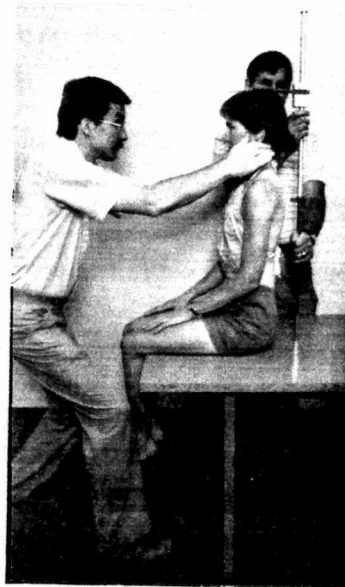
APPENDIX K

SITTING HEIGHT MEASUREMENT

SITTING HEIGHT MEASUREMENT



Measurement of sitting height (front view).

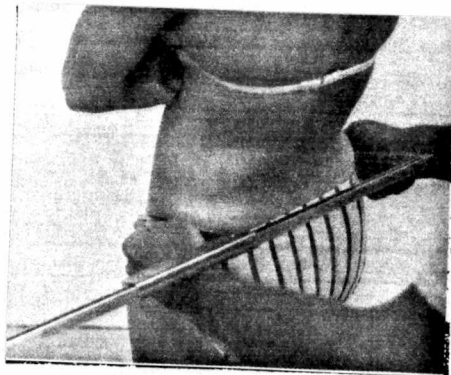


Side view of sitting height measurement: illustrating proper positioning of subject.

APPENDIX L

HIP WIDTH MEASUREMENT

HIP WIDTH MEASUREMENT



Anthropometer in place for biiliac
breadth measurement.

APPENDIX M

PROTOCOL FOR TEST SESSION II

PROTOCOL FOR TEST SESSION II

Test Session II:

1- The child was directed to the back of the room where he/she was greeted. The investigator then asked each child, "Do you remember us talking in the first session about the three words, trunk, height, and width?", "Do you remember where your trunk is located?", "Does it sit on top of your legs?", "What shape is the trunk?". The child responded and corrections to the response were made, as necessary. The investigator then proceeded to ask about height and width, "Do you remember what height means?", "Do you remember what width means?", "Show me where the top of your height would be...the bottom". Similar questions were repeated using width measures. Once a clear understanding of these terms was determined, then the child and the investigator proceeded to the front of the room.

2- The child's attention was directed to the SBFM and the various sets of blocks at the tables on each side of the model. The investigator asked the child, "Do you remember what it is that we want to do with these blocks?". If the child responded that he/she was going to try to build a model that was similar in size to himself/herself, then the investigator proceeded. If this purpose was unclear, then it was reviewed with the child.

3- The child was directed to look at the four sets of blocks on the table to the right of the model. The child was told that these were the blocks which would be used to make the trunk portion of the model. The child was asked, "Do you notice any difference in the size of the blocks?", "Which block is the smallest?", "Which block is the largest?". The investigator asked the child to look at the width of his/her hips and to place the hands on each side of the hips. The child was told, "Look at the width of your hips and look at the width of each block on the table... which block do you think is closest to being the same size as your hips?". The child chose the corresponding block and the baseboard was set in accordance with this size. (It was necessary to complete this step first, in order to adjust the building of the model in conjunction with one of the four hip widths)

4- The child's attention was then directed to stand behind a taped line that was four feet away from the model. The child was told that the blocks on the left side of the model would be used to build the legs. The child was reminded that the initial purpose was to build a pair of legs as close as possible to the size of his/her own leg length. The child was asked once again to show the investigator where the top of his/her legs were located.

5- The investigator began stacking blocks equally for the left and right leg. The child was instructed to tell the investigator to stop when he/she felt the SBFM legs were the

same size as his/her own leg length.

6- The child had previously chosen the trunk width, therefore, the height of the trunk was all that remained to be estimated. The child was reminded once more that the trunk ranges from the top of the legs (hips) to the top of the shoulders, excluding the head and neck. The assistant began stacking blocks until the child said stop, indicating the child felt the trunk length matched his/her own size.

7- The arms and head were added to the model and the child was allowed to assess how well he/she had done.

8- The investigator observed the subject's behavior throughout the model building and recorded appropriate notes regarding each subject's reactions.

9- The arms and head were attached and the child was allowed to view the finished product. The child was congratulated on doing a good job and then was returned to the classroom.

10- The investigator then recorded the desired measurements and prepared for the next subject.

VITA

Deborah Ann Stevens was born in Roanoke, Virginia, on February 3, 1955. She attended elementary and junior high school and was graduated from Cave Spring High School in June, 1973. She attended Madison College where she was a member of the varsity volleyball team and graduated in 1977. From 1977 to 1984, she taught elementary physical education and coached softball. In August 1984 she accepted a graduate teaching assistantship at The University of Tennessee, Knoxville, and graduated with a Master of Science degree in Physical Education in August, 1985. She accepted a faculty position at The University of Tennessee, Knoxville from 1985 to 1987. In 1987 she accepted a graduate teaching assistantship to complete her work in the doctoral program.

She received the Doctor of Education degree with a major emphasis in Motor Behavior/Motor Development in August 1989. She will be employed by the Department of Sports Medicine and Management, Pfeiffer College in Misenheimer, North Carolina after graduation.