A PILOT STUDY: DEVELOPMENT OF A PROFILE RECORD FOR APPRAISING MOTOR DEVELOPMENT OF THE HANDICAPPED CHILD IN ELEMENTARY SCHOOL

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ABSTRACT

A PILOT STUDY: DEVELOPMENT OF A PROFILE RECORD FOR APPRAISING MOTOR DEVELOPMENT OF THE HANDICAPPED CHILD IN ELEMENTARY SCHOOL

by David A. Fuller

The purpose of this study is to develop a theoretical profile record for appraising the motor progress of physically handicapped children through the six year period of elementary school. A review of related literature includes consideration of such topics as: norms for physical growth and development; perceptual aspects of motion; motor development of handicapped children; and descriptions of some longitudinal growth charts presently being utilized for recording developmental progress in children.

The motor development record form designed through this study is based primarily on the profile method. The profile is a graphic presentation of levels of achievement in motor performance at a given time over a period of several measurements. The selected motor tasks which have been included in this profile are of two general categories: the skill tests; and basic motor patterns. The former tasks are concomitant with norms for elementary school children (grades

1-6), being scored on a sex-grade percentile rank basis, while the latter (motor patterns) were selected as significant stages of normal child development and are more suitable for appraising progress of the severely handicapped child. A rating scale has been devised for use with the profile which allows a more detailed and individualized evaluation of motor development. This profile has been developed on a theoretical basis, and its value cannot be established until it has been practically applied.

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INTRODUCTION

In the past thirty years there has been a great deal of interest and progress in the study of human growth and development. Results of this work have generated an interest in finding better ways of examining and interpreting specific developmental processes, and for determining their relationship to the individual's total development. Those who work with the growing child (family doctor, teachers, etc.) are generally aware of the importance of periodically evaluating each child's developmental progress. Unfortunately, in most instances the means for systematically doing so have not been made available to them.

While a great deal of information concerning normal development has been published, such information is seldom included in a child's school record. The child's health or physical development history often consists only of height and weight measurements. The probable explanation for the "failure" to include developmental progress in movement and fitness on an individual's record, is that the information has not been organized in a form which would be suitable for fairly comprehensive evaluation and diagnostic purposes in

the school situation. Another problem has been the lack of a complete definition of essential motor functions, with standards for rating or judging developmental progress in the area of behavioral development. This information would be especially useful for application to physically handicapped children, where there has been a dearth of published data for this form of development.

PURPOSE OF THE STUDY

It is the intent of this study to develop a longitudinal record, utilizing the profile method to appraise selected motor tasks in a physically handicapped child. This is to be accomplished by:

1. identifying and selecting developmental data which are of diagnostic or prognostic value for evaluation of motor behavior in children, ages 6 through 12;
2. defining standard measures in relation to developmental levels of specific phases of motor activity--for analysis of motor performance in handicapped children;
3. translating the selected motor task measures into a simple profile for recording levels of achievement of motor development of handicapped children in the elementary school setting.

DEFINITION OF TERMS

To avoid the confusion of interpretation which exists in much of the terminology associated with many aspects of growth and development, definitions of certain terms--as used in this study--are given here. Growth is considered an increase in size--of the organism as a whole, or any of its parts. It involves quantitative qualities such as height and weight, which can be physically measured. Development is regarded as some increase in skill or degree of complexity in a function. Progressive achievement of more difficult motor patterns is a form of development. A motor skill may be described as an activity involving body movement which is dependent on training or learning, and may be improved through physical repetition. A basic motor pattern is a form of body movement which evolves as a normal expression of maturation. It is some aspect of the sequential phases which are common in the development of all normal children. Motor capacity is considered the total potentiality a child possesses for performing a motor act. (Performance implies the "doing" of something.) Motor ability is the extent to which the motor capacity is expressed in some measurable form. It may be used synonymously with motor achievement. Gross motor acts involve the use of the large muscle groups

and generally entail movement of the whole body, while fine motor tasks involve more coordinated effort--such as manipulations with the fingers. Handicapped is used to describe any individual who is limited in motor performance, regardless of etiological considerations.

SCOPE OF THE STUDY

This study is the effort of one investigator to convert selected aspects of developmental data into simple, meaningful techniques for evaluating selected motor tasks in developmental progress of handicapped children. The profile is to be designed for children of the elementary school level (approximately 6-12 years of age), for recording motor development over a six year period. This study does not undertake the evaluation of the proposed theoretical profile in an actual school setting.

CHAPTER II

REVIEW OF RELATED LITERATURE

A review of related literature will be discussed herein under the categories of: physical growth; motor development; perceptual aspects of motion; motor development of the handicapped child; and methods of recording growth and development.

PHYSICAL GROWTH

Growth may be considered quantitative change, or measurable variations of body size, proportions, and mass. The common human pattern of over-all growth seems to be controlled by the same factors in all children. The individuality of growth is manifest in total body and segment size, and in the ages at which it occurs. The literature provides extensive coverage of normal growth--from infancy to early adulthood. Height and weight norms may be found in charts and tables of a variety of design and statistical form. The norms presented in most of the recent studies are quite comparable, which indicates the uniformity of distribution in these growth elements in the maturing child.

Norms of height and weight for the American child must periodically be re-evaluated and revised. This is necessary due to the general variations which have gradually evolved. In a study of adolescent-age groups, it was determined that the boys and girls now are..."taller and heavier than those of the same age, grade, and school of 24 years ago. Girls average 1 inch taller and 6 pounds heavier. Differences for boys are over two inches and ten pounds."[1] This gradual change in growth norms is probably the result of generally improved nutritional standards. This view is supported by the fact that final, or adult growth averages have remained more nearly constant over this time. As Carter states:

> What environmental [nutritional] improvements appear to be doing is, in the main, to accelerate growth, so that full adult height is being reached earlier. Puberty is being reached at a steadily younger age in both boys and girls and almost full adult height in men is being reached on the average at eighteen or nineteen years of age...[2]

Investigators have determined that quite early in life, children fall into a "channel" for height and weight values, which can be projected up to maturity. It has been found

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[1]Anna S. Espenschade and H. E. Meleny, "Motor Performance of Adolescent Boys and Girls of Today in Comparison with Those of 24 Years Ago," Research Quarterly, XXXII (May, 1961), p. 187.

[2]Cedric O. Carter, Human Heredity (Baltimore, Maryland: Penguin Books, 1962), p. 101.

reliable enough so that any great deviation from the expected course should be given careful consideration.

> Weight measurements for a child usually fall in the same percentile group at succeeding ages or change only gradually from period to period. Children with weight and height measurements which (a) fall in different percentile groups, (b) shift percentile groups subsequently, or (c) fall near to or outside the 3rd and 97th percentile should be reviewed for growth failure.[3]

Utility as a diagnostic aid, of course necessitates recording the child's progress over a period of several years. No child seems to show a constant pattern when measured from month to month. If a record of height and weight data from previous teachers is kept up to date, a child's growth progress may be more accurately established. This is pointed out by Millard, who states: "Height and weight measures as conventionally used, have very little value for child study.... If the total pattern shows progress, monthly deviations may be ignored."[4]

Several writers have found that growth measures are not directly related to physical ability. "Height and weight

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[3]Ernest H. Watson and G. H. Lowrey, Growth and Development of Children (2nd ed. Chicago: The YearBook Publishers Inc., 1954), p. 59.

[4]Cecil V. Millard, Child Growth and Development In The Elementary School Years (Boston: D. C. Heath and Company, 1958), p. 95.

factors in general, showed a lower relationship to performance than did the age factor for both boys and girls"[5] In spite of such findings, these normative values remain essential factors in assessing total physical development of the individual child, and must be considered an integral part of the longitudinal profile.

> Early studies were confined mainly to height and weight. These two universally accepted measures of physical growth are still considered important tools for the assessment of growth status and the analysis of growth progress.[6]

MOTOR DEVELOPMENT

While the general term development has a variety of physical, social and psychological applications, it is used here in reference to motor skills or ability. The child's motor development may be defined as a gradual process of learning control and integration of his neuro-muscular responses. Motor control evolves much more slowly than does general body growth. The 2 year old child has already attained about half his final adult height, while his reaction

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[5]Marjorie Latchaw, "Measuring Selected Motor Skills in Fourth, Fifth, and Sixth Grades," Research Quarterly, XXV (December, 1954), p. 448.

[6]H. Harrison Clarke and J. S. Wickens, "Maturity, Structural, Strength, and Motor Ability Growth Curves of Boys 9 to 15 Years of Age," Research Quarterly, XXXIII (March, 1962), p. 27.

time at 5-1/2 years, and consistency of performance at 8-1/2 years--are about 50 percent developed.

A review of the literature in this area provides some interesting findings. The infant and pre-school age groups are quite well covered for norms in motor development. Physical skill testing at the secondary school level also provides a good deal of normative data on physical development. The six years of elementary school ages is quite another story. Most of the testing in this developmental period is done for one basic skill, or includes only two or three of the six elementary grades. More studies are needed similar to Johnson's,[7] which reports norms for several skills from tests that can be applied through the six elementary grades.

Human physical development, or body movement patterns, may be based on two principles: (1) Development from bilateral to unilateral body control; (2) Development from maximal muscle activity to minimum use of muscle action.[8] The first would include the major developmental directions

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[7]Robert D. Johnson, "Measurements of Achievement in Fundamental Skills of Elementary School Children," Research Quarterly, XXXIII (March, 1962), 94-103.

[8]D. Bruce Gardner, Development in Early Childhood The Preschool Years (New York: Harper & Row, 1964), p. 153.

of cephalo-caudal (head to foot) and proximo-distal (body center to extremities). The second refers to the transgression from gross to fine muscle cocrdination. It implies learning not only the use of appropriate muscles, but the inhibition of the non-essential muscle groups as well. A deficiency in this aspect of physical development, depending on the degree, may be reflected in the child who is "poorly coordinated"--to the severely cerebral palsied child.

The basic phylogenetic pattern of human development has been cited by numerous writers. Median age values have been established for achievement of specific skills (i.e. rolling, sitting, standing, creeping) in the infant and young child. In a discussion of skill patterns, Jones states:

> From the sequential growth studies of young children... conclusion that there are: (1) regularity in the emergence of behavior; (2) general maturational trends; (3) overlapping of functions at earlier ages which become more discrete as development takes place.[9]

The basic sequence of physical development is maintained in the handicapped child, although there may be a retardation in rate or achievement of some particular skills.

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[9]Theresa D. Jones, The Development of Certain Motor Skills and Play Activities in Young Children ("Child Development Monographs" No 26; New York: Bureau of Publications Teachers College, Columbia University, 1939), p. 15.

> Developmental sequence of children are orderly and predictable and, to a considerable extent, independent to the rate of development. ...Even in the presence of cerebral, sensory or other severe morphologic defects the sequential nature of behavior development is the rule. Some re-interpretations may be necessary where the given handicap in a child precludes the classical appearance of certain stages.[10]

The acquisition of coordinated movements has been described as a gradual unfolding of, or maturational control over, the neuromuscular system of the growing child. Gesell defines this achievement of motor skills as a combination of postural sets. "All co-ordinations, both gross and fine, imply postural adjustments--that is, adjustments of the organism as a whole to its environing conditions. Locomotion is a dynamic, repetitive projection of posture. Prehension and manipulation consist of closely knit series of postural adjustments. ...Motor behavior develops from the beginning by the expansion of a total reaction system and by the individuation of specific patterns within this system."[11]

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[10]Edward F. Lis, "Application of Newer Concepts of Growth and Development to the Handicapped Child and Implication for Crippled Children Programs," Newer Concepts of Growth and Development: Implications for Child Health Services (State MCH and CC Agencies of Michigan and Minnesota and the U.S. Children's Bureau, 1960), p. 145.

[11]Arnold Gesell and C. S. Amatruda, Developmental Diagnosis Normal and Abnormal Child Development (2nd ed. New York: Paul B. Hoeber, Inc., 1947), p. 185.

(An example of this latter form would be the development of thumb-finger opposition which evolves from the two arm, two hand, palmer grasp sequence in object manipulation.

The normal sequence of locomotor development would include in some form: support (hands) of head and upper body-prone position (9 weeks); body roll, supine to prone (5.5 months); sitting alone (6.2 months); pull-up to standing, supported (9 months); crawl, creep, etc. (movement across floor--any variation (8-10 months); walk with support (10-11 months); walk alone (14 months). The "emergence" age for each locomotor skill is based on average figures from several sources. The sequence of manual skills would include: reaching for objects--both hands (6 months); reaching for objects--one hand, object transfer from one hand to the other (7 months); opposition (finger-thumb) with small objects (9 months); deliberate release of objects (10 months); rolling a ball to someone, giving and taking objects with hands (11 months); building "towers" of two objects, throwing objects to the floor (15 months). Of course, these skills are interrelated and continuous, and cannot be considered completely isolated from general motor development.

> Development of different skills goes on concurrently although there is apparently a lull in the use of the old skills at the time a new one is emerging;

patterns overlap and dovetail into one another.[12] While these developmental "norms" have been achieved by the average elementary school child, they are often incompletely developed, or "missing" in the handicapped child. Thus, a longitudinal record of the physically handicapped child should appraise his developmental progress and also give insight for planning activity which is appropriate for a particular developmental level.

Motor ability has been defined as the extent to which the individual's motor capacity is expressed in some measurable form. There have been attempts to define a "general factor" in motor ability (as with intelligence), but these have been largely unsuccessful. Several investigators have succeeded, however, in determining specific factors upon which motor ability is dependent. Bayley[13] found that the factors most important in tests of motor abilities are "strength, speed, and coordination of movement." Espenschade[14] stated that the specific factors of : ..."Endurance; strength;

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[12]Jones, T. D., p. 6

[13]Nancy Bayley and Anna Espenschade, "Motor Development from Birth to Maturity," Review of Educational Research, XI (December, 1941), p. 568.

[14]Anna Espenschade, "Motor Development," Science and Medicine of Exercise and Sports (Edited by W. R. Johnson. New York: Harper & Brothers, 1960), 419-39.

coordination; speed and accuracy are abilities which directly determine motor performance." (These are the factors which are considered most essential by the majority of investigators.)

Many of the studies done with the elementary school child have investigated the relationship of motor ability to some other factor (height, weight, intelligence, etc.). In studies dealing with motor performance of children (ages 5-10), Cratty[15] reports that his findings indicate that the specific abilities become more pronounced as children mature and that "sex differences become evident in performance scores (after age 5, especially) as boys gain superiority." In a study by Seils[16] motor test scores of elementary school children were presented by showing partial correlations between motor performance scores and physical growth data (height, weight, and age). Seils administered motor ability tests of: running; balance; agility; jumping; throwing; striking; and catching. In almost all cases, the mean performance of both boys and girls showed an increase at successive grade

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[15] Bryant J. Cratty, Movement Behavior and Motor Learning (Philadelphia: Lea & Febiger, 1964), p. 200.

[16] LeRoy G. Seils, "The Relationship Between Measures of Physical Growth and Gross Motor Performance of Primary Grade School Children," Research Quarterly, XXII (May, 1951), 244-60.

levels. Skeletal maturity has been found to be a better index of motor ability than chronological age--due to the individual variations in growth and development. Other factors, such as obesity, may limit an individual's physical performance. Experience and motivation may also effect scores on motor tasks:

> Although the development of motor ability is dependent upon maturation, the acquisition of skill is influenced to a great extent by practice. Differences in performance, however, may be due not only to difference in opportunity for practice but to freedom from inhibition and to the child's attitude toward the activity.[17]

While the sequential nature of motor development has been pointed out, it should be emphasized that each child progresses in the various movement skills at his own pace. McCammon's comments on body-eye coordination are generally applicable to all motor skills:

> The development of eye-body coordination is quite individual in timing. Coming into existence in a fairly short period at some age between 4-1/2 and 7 years and appearing to depend on the development of the visual ability to fixate a moving object. Skill then improves quite rapidly over 3 to 4 years, following which there is typically little change to early maturity.[18]

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[17] Bayley and Espenschade, p. 568.

[18] Robert W. McCammon, "Newer Concepts of Physical Growth and Development of Children," Newer Concepts of Growth and Development: Implications for Child Health Services (State MCH and CC Agencies of Michigan and Minnesota and the U.S. Children's Bureau, 1960), p. 51.

As pointed out previously, there is a great need for motor skill testing in the elementary school--to provide developmental norms in a variety of physical skills. Such norms would significantly enhance the value of a longitudinal record which includes only height and weight measures.

> Paralleling the child's physical development as indicated by height and weight is the extent of his rhythm and motor coordination. (Large physical growth may falsely indicate maturity--if there is lack of coordination of body control). The extent of a child's motor development, then, provides an additional index of his maturity.[19]

Several writers have stressed the importance of providing the opportunity for motor activity at the time the child is actively interested and physically prepared. Millard relates these essential factors of maturity and motivation:

> It is advantageous to the child to learn the basic skills as early as possible. Where opportunity for motor learning (largely "natural") is delayed (illness) learning becomes difficult. In the early years nature provides random muscular exploration which gives the proper motivation at a time when growth needs are most demanding. Long delay in the opportunity finds the child at a stage of development where self-consciousness restricts the earlier, natural, exploratational, and often unrealized motivations.[20]

Millard also points out that the elementary school child

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[19]Millard, p. 115.

[20]Millard, p. 104.

learns few new motor skills, but builds upon those already learned, coordinating the simple or gross movements into more complex patterns. "When the child reaches elementary school age, his activity seems spontaneous, and the youngster at this level seems to enjoy skill learning for its own sake--the pleasure of movement itself. During these years more exact motor patterns become possible, with the development of fine muscle coordination. "The basic need for physical activity during this period is sometimes minimized in the school situation. This is unfortunate, since it has been demonstrated that movement is so essential for the child at this level. His creative impulses are closely associated with motor activity--he thinks and creates through movement (i.e., the child does not write a "play" situation, but "acts" it out). Wenar points out this maturational need for activity:

> ...must recognize the important role which the motor apparatus plays in a child's development. ...it enables him to explore his environment and to develop techniques for independent mastery of problem situations. ...it is activated during the flight which accompanies fear, the destructiveness which accompanies anger, as well as the inhibitions which accompany the formation of conscience; it allows for the expression of free energy in play and other creative activities.[21]

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[21]Charles Wenar, "The Effects of a Motor Handicap On Personality: I. The Effects On Level of Aspiration," Child Development, XXIV (June, 1953), p. 123.

PERCEPTUAL ASPECTS OF MOTION

Perception might be considered a phenomenon which involves a combination of psychological and physiological factors unique to each individual. The relation between perception and motion has been defined:

> A new theoretical approach to the problems of perceptual-motor integration, treating perception and motion as equivalent phenomena, proposes to account for the space-structuring of motion in terms of a geometrically organized regulatory mechanism. According to this theory, all motion is regulated by detection of spacial differences in patterns of stimulation. Such differential patterns are essential both for the process of stimulation of receptors and for integration of the specific space patterns of motion. Motion patterns are integrated at three levels--those of postural control, transport movements [travel through space] and manipulative movements.[22]

Vision plays an essential role and may be considered the primary means for gathering the most accurate perceptual information. As a child develops, he investigates his environment with eye movements until the information derived visually matches his motor information. Thus, movement and vision interaction is basic in perception, and either may assume the dominant role, depending on the situation, the experience, and the developmental level of the individual involved.

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[22]Karl U. Smith and W. M. Smith, Perception and Motion (Philadelphia: W. B. Saunders Company, 1962), p. 14.

> The stages of growth through which humans pass seem to influence perception greatly, partly because of the changing and increasing complexity of the neuromuscular apparatus and sensory receptors and partly because of an evolving capacity to explore and to act. Developmental change and perceptual change are closely interrelated as the ability to attach meaning and to act upon various kinds of information bear a direct relationship to particular stages in development of the organism.[23]

Perception is an integral part of motor performance, since the latter does not exist alone, but depends upon one's past experience and his own analysis of a given situation. Cratty defines perception as:

> ... the central portion of the situation-interpretation-action chain, leading to purposeful motor activity. Perception is a dynamic process, involving more than a response to sensory stimulation. It is a holistic term referring to meanings attached to an object, event or situation occurring within spatial and temporal proximity of the individual.[24]

A child begins interacting with the environment through his motor apparatus. Since he learns and organizes information about his environment through movement, motor patterns may be considered essential for information gathering in the developing child.

> We might also note that physical activity plays a vital role in the child's steadily maturing psychological and

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[23]Cratty, p. 89.

[24]Cratty, p. 75.

> social stabilization: he experiences a 'feedback' which stems from his own muscle action. The activities in which he engages inevitably result in informing him that certain behavior brings him personal, social and physical satisfaction and certain other activities are likely to produce discomfort--of a personal, social, or physical variety. Thus his muscular action has a direct role to play in the establishment of knowledge about himself and his world.[25]

It becomes apparent that motion and perception are closely related and interdependent. Every movement pattern involves some modification in the individual's perceptive activity. There are changes in object relations (figure-ground percepts) and judgements made as to the significance or insignificance of objects in the environment.

The perceptual process must necessarily be defined as a continuous phenomenon. Resultant interactions of the individual and his environment contribute to coordination, behavior and total personality. Cratty[26] describes the process in five stages, separate in time. The first stage deals with the preparatory set formation, which includes past experiences, social expectations, and muscle-visceral tonus--at both the conscious and unconscious level. The second step occurs as the "object" assumes a distinct identity and is in spacial-

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[25]Gardner, p. 136.

[26]Cratty, p. 91.

temporal proximity with the individual. Part three involves stimulation of the sensory end-organs of the perceiver. In step four, the "selection and interpretation" stage, the incoming stimuli are differentiated, selected, and given meaning. At this time the decision is made concerning the mode of action (reaction) to be followed by the perceiver. The last step in the process involves an evaluation of the decision--a feedback which contributes to the formation of later preparatory sets.

Kephart[27] defines four motor patterns which are significant in the perceptual learning of the child:

> (1) Balance and Maintenance of Posture. All spatial relationships in the world about us are relative. Right and left, up and down, behind and before are relationships which are not given directly by perceptual data. ...It is only through a constant and stable relationship to gravity that a point of origin for spatial relationships can be established. This stable relationship to gravity is achieved through the motor pattern of balance and posture. ...His balance and posture should be dynamic and fluid rather than rigid. It is only through such a dynamic relationship to gravity that a continuous awareness of its direction can be maintained.
>
> (2) Locomotion. The locomotor skills are those motor activities which move the body through space: walking, running, jumping, skipping, hopping, rolling, etc. It is with the pattern of locomotion that the child investigates the relationships within the space around him. By moving his body from one point to another, he learns to appreciate the properties of this surrounding space and the relationships between the

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[27]Newell C. Kephart, "Perceptual-Motor Aspects of Learning Disabilities," Exceptional Children, XXXI (December, 1964), p. 202.

objects in it. Out of such knowledge a space world with stable coordinates will develop.

(3) Contact. The contact skills are those motor activities with which the child manipulates objects. Involved are the skills of reach, grasp, and release. It is with the contact skills that the child investigates through manipulation the relationships within objects [development of form perception and figure-ground relationships]. ...The skills of reach, grasp, and release should be established well enough so that the child can divert his attention from the motor acts to the manipulation.

(4) Receipt and Propulsion. With the skills of receipt and propulsion the child investigates movements in space. Receipt skills involve those activities by which the child makes contact with a moving object [includes not only the pursuit of the moving object, but also the interpositioning of body parts in the path of a moving object--as catching]. The skills of propulsion involve those activities by which the child imparts movement to an object. Also included are the more continuous skills of pushing, pulling, and the like.

...we are not interested in whether or not the child can walk; we are interested in whether or not he can locomote in order to obtain information about objects in space. We are interested in a sort of motor generalization by which the reperatory of movements, whatever they may be, available to the child are used for the purpose of gathering information about the environment around him.

Motor learning is, to a large degree, dependent upon a child's emotional state. Psychological research has shown that the organization of a perception may be varied by changing an individual's preparatory set. Just as motor activity affects perception, so may perceptual factors influence the child's motor functioning. Evidence has been presented which supports the idea that the child only gradually separates his "self" from perceptual judgements: "Not until the eighth year does the child seem to realize that objects may

be viewed differently by another person. Prior to that time spatial judgements are made only within a personal reference system."[28] The fundamental relationship between motor development and perceptual evolution is further attested to by Smith:

> Development of perceptual control of the environment in children follows the differentiation of the motion systems and is dependent on it. Sensory deprivation in infancy leads to deficiencies in perceptual-motor co-ordination which can be interpreted in terms of sensory and neural abnormalities resulting from the restriction.[29]

MOTOR DEVELOPMENT OF THE HANDICAPPED CHILD

While data on motor skill and developmental progress is scant for the normal child in elementary school, such information is even more difficult to obtain on the physically handicapped child of this age group. It has been customary to excuse (exclude?) handicapped children from participation in physical education activities in the regular school, and in "special" classes for groups of handicapped children, the type of activities utilized have generally been non-structured and were not amenable to statistical measurement. In recent years, however, the all-encompassing effects possible through

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[28] Cratty, p. 102.

[29] Smith and Smith, p. 322.

physical activity has been more fully realized--and hopefully, developmental data on the handicapped will become available as more complete activity programs are implemented.

The nature of the intricate relationship of perception to motor development has just been reviewed. Since a physical handicap may greatly modify a child's perception of himself in relation to his environment--it can limit (psychological) his motor development, his personality, and his ability to learn. Thus, it becomes evident that a prevailing emotional attitude (or motivational level) may influence a child's physical ability and possibly, further diminish his total motor capacity.

> The individual's ego response to his physical disability is largely a reflection of the social reaction it elicits. If the latter is negative, therefore, he responds with feelings of self-depreciation, guilt, hypersensitivity, self-consciousness, and anxiety in facing new or competitive situations.[30]

Those who work with the handicapped child must realize the importance of his self-concept of size, conformation, and physical ability (his self-image).

> A person usually identifies his biological organism with himself. But he also sees his organism in another light as an important aspect of his environment; it is

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[30]David P. Ausubel, Theory and Problems of Child Development (New York: Grune & Stratton, 1958), p. 507.

> part of that with which he must learn to live. A child's or youth's being crippled or abnormal in physical size or proportions may color everything he says or does.[31]

It may be said, then, that while the potentiality of performance is limited by organic capacity, psychological factors determine the degree of motivation and the level of performance.

A development of skills based on motor learnings may contribute to a child's social ease and his personal security. Often, the child's social deviations may be directly related to a deficiency in motor ability. "Children with motor handicaps tend to explore their surroundings with less assurance, and find it difficult to maintain a realistic level of aspiration when contronted with motor tasks." Wenar comments:

> ... when faced with a motor task, the handicapped child can maintain a realistic attitude toward his capabilities for only a limited period of time; then, under the pressure of the frustrations of limited or unpredictable achievement, his attitude changes to a wishful one of what he would like to be able to do rather than what he is capable of doing.[32]

A significant share of the child's social attitudes and physical achievements is related to his past experiences--his home

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[31]Morris L. Bigge, Learning Theories For Teachers (New York, Evanston, and London: Harper & Row, Publishers, 1964), p. 201.

[32]Charles Wenar, p. 130.

environment and familial interactions.

> Achievement of new skills are dependent, not only upon specific maturation of the nervous system which determines physiologic readiness to learn, but also upon the presence of opportunity and stimuli, conversely upon the absence of overprotection, understimulation and over-expectation, as is not uncommon in the homes of handicapped children.[33]

Most of the studies done on motor development of handicapped children have been undertaken for the purpose of determining how the condition affects the motor response--rather than a measurement of physical ability per se. This is especially true for groups with pathologies involving the central nervous system (e.g., brain-injured; cerebral palsy). Strauss gives the following description of the brain-injured child:

> He is unable to do what normal children do automatically--rule out the unessential stimuli. All stimuli have equal valence to him, equal power to attract him. He is extraordinarily sensitive to a great variety of stimuli and what appears to be inattention is in reality preoccupation with many, unrelated and unessential details. ... Thus the different behavior of the brain injured child becomes a symptom of a condition one cannot see, but which is just as crippling to his performance in normal society as motor paralysis. [34]

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[33]Lis, p. 145.

[34]Alfred A. Strauss, "The Education of the Brain-Injured Child," American Journal of Mental Deficiency, LVI (April, 1952), p. 716.

As might be suspected, many brain-injured children suffer gross disturbances in perceptual ability. The lack of accurate detailed impressions of various bodily positions may interfere with the child's perception of his own body parts, and consequently, affect his movement. In an unpublished report to the faculty (University of California), Valerie Hunt demonstrated the importance of gross self-perceptions in structuring spatial relationships:

> Brain - damaged children, who were extremely inhibited in their movements, were placed in close proximity within a little 'house' which required that they maintain continual contact with each other's bodies. The remarkable improvement in their ability and/or willingness to move as well as in their verbal and social behavior following a number of such experiences led the investigators to conclude that, due to the frequent contact made with their fellows, a heightened awareness of various parts of their bodies was achieved, thus forming a clearer body image from which they could move and explore space.[35]

A great deal of work has been done by Eidinova, using active movements in the treatment of cerebral palsy. Her studies have done much to overcome the idea that this condition is incapable of reverse development and generally incurable. This has been possible by showing that many signs of cerebral palsy in children are dependent not on the gross destruction of cerebral tissues, but on complex neurological-

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[35]Cratty, p. 103.

functional difficulties, which may be reversible. Kinesi-therapy--therapy by active exercises--is the fundamental aspect of her treatment and it is based on the precision of separate movements and maximal voluntary effort of the patient.

> Various compensation-adaptation processes which take place actively in the brain in cerebral palsied children, assist in regeneration of destroyed nerve structures, re-establishment of lost communications, and the formation of new nerve communications, and this is shown clinically in the regression of signs.[36]

Eidinova found that the compensatory work was more effective if it is started at earlier disease stages of the affected children. The social and therapeutic benefits that the child may derive are also important outcomes of learning motor fundamentals. "The successful physical and occupational rehabilitation of cerebral palsied children is dependent primarily upon the efficient learning of motor skills."[37] In a study on a group of children with cerebral palsy, Mitchell found that on the average, they were generally smaller than

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[36] M. B. Eidinova and Ye. N. Pravdina-Vinarskaya, Cerebral Palsy in Children and Its Treatment (New York: The Macmillan Company, 1963), p. 7.

[37] Normal Garmezy and J. G. Harris, "Motor Performance of Cerebral Palsied Children As a Function of Their Success or Failure in Achieving Material Rewards," Child Development XXIV (December, 1953), p. 287.

normal children of the same age. The children were retarded in sitting and walking skills.

> It would appear that athetoid patients achieve sitting balance relatively early but are very considerably delayed in walking, that hemiplegic and paraplegic patients are only moderately delayed in sitting and walking, and that patients with spastic tetraplegia, or mixed types of cerebral palsy are very considerably delayed in both achievements.[38]

In a comprehensive study on the motor ability of mentally retarded children, Francis found that while the general pattern of change by age and sex was similar to that of normal children, the mentally retarded group was lower in motor ability than normal children of the same age.

> Direct quantitative comparisons between the motor proficiency scores of the mentally retarded and published data on normal children...[show]...that with the mentally retarded children studied, the means of both boys and girls on most measures were two to four years behind the published age norms of normal children. Furthermore, the discrepancy between the normal and the mentally retarded tended to increase with each advancing age level.[39]

Another study on the motor ability of mentally retarded children indicated that they were generally poor in balancing skill:

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[38] Ross G. Mitchell, "The Growth and Motor Development of Children with Cerebral Palsy," Cerebral Palsy Review XXII (July, 1961), p. 18.

[39] Robert J. Francis and G. L. Rarick, "Motor Characteristics of the Mentally Retarded," American Journal of Mental Deficiency LXIII (May, 1959), p. 810.

> ... the mentally retarded were largely unable to balance on one foot, only two of the 43 children reaching the maximum by balancing for one minute. The majority could balance for little more than 20 seconds. ...this was a relatively easy task for the normal group. Twenty-eight of the 43 balanced for one minute or more. ...results are particularly puzzling in that the retarded group supposedly did not include any children with brain damage.[40]

In studying the motor ability of blind children, Buell[41] found that those who lose their vision after six years of age are more readily adjusted to physical activities than children blinded in early childhood. He stated that recently blinded girls performed better (than girls blinded earlier) in running, throwing and jumping tasks. Boys who lost vision after age six were superior in throwing skill over boys who had never seen this activity. Buell lists four factors which affect the motor performance of visually handicapped children: (1) amount of vision; (2) duration of visual handicap; (3) attitude of parents toward their children; (4) the physical education received in school and elsewhere. This work with visually handicapped children, as well as that done with

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[40]Clifford E. Howe, "A Comparison of Motor Skills of Mentally Retarded and Normal Children," Exceptional Children XXV (April, 1959), p. 353.

[41]Charles Buell, "Motor Performance of Visually-Handicapped Children," Journal of Exceptional Children XVII (December, 1950), p. 71.

other groups, provides some evidence for the view that not only the magnitude of the handicapping condition--but the time (developmental stage) when it affects the child--is important.

In recent years, Carl Delacato[42] has done extensive work with various groups of physically (central nervous system) handicapped. His treatment techniques, which are based on the neurological method, have been successful where many other treatments have failed. Delacato stresses developmental tasks, eye dominance, and cross-pattern movements. The children are "trained" step by step, through the physical stages of development--crawling, creeping and walking. Those with severe motor handicaps are at first manually moved through the correct patterns. Gradually, the central nervous system responds to this training and begins to function correctly. A success at one stage will advance the child to the next higher-level motor task. In effect, this method of "movement" treatment is a means of retraining, or developing, certain portions of the motor area of the brain. The results thus far seem promising, and work is continuing

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[42]Carl H. Delacato, The Treatment and Prevention of Reading Problems (The Neuro-Psychological Approach) (Springfield, Ill.: Charles C. Thomas, 1959).

with this treatment.

It is a common practice to "group" handicapped children and consider them as a "type" (associated with others similarly afflicted)--rather than as individuals. It should be remembered that the home environment as well as that outside the home, may be quite different for two children with similar handicaps, and the diversity of experiences could well be reflected in dissimilarities in all phases of development:

> ... an increasing number of investigators...are emphasizing that children who are deaf, blind, deformed of certain tissues, brain injured or psychosocially retarded are not alike in common image, either as children, or in their handicaps, or in the impact the handicaps have on their growth and development. Their deformity has individuality and often a growth potential as does the innate behavioral development of the child which will reflect genetically endowed patterns and results of environmental opportunity.[43]

This actuality of individual variation among children--whatever their handicap--emphasizes the utility of a longitudinal profile of physical development. Handicapped children, regardless of the extent of their defects, are obviously subject to changes, and chances for recovery and further developmental progress should not be judged too pessimistically. In other words:

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[43]Lis, p. 148.

> ... a handicap can effect, often to an unknown and unpredictable degree, the child's behavior at any age. It is imperative, therefore, to evaluate whether the rate of development is temporary or permanent.[44]

RECORDING MOTOR DEVELOPMENT

In reviewing the literature, it was found that a major portion of the work done in tracing development through motor performance has been done with the infant and preschool child. Most of the attempts to measure developmental progress are based on a comparison of a given child to a "graph" of normal development on an age-motor sequence basis. An example of such a chart is the one devised by Gesell and Amatruda[45] which shows selected developmental sequences of motor behavior (Illustration 1). Studies of sequential development in handicapped children are most difficult to find, and most related work is concerned with treatment, rather than diagnosis--through study of motor patterns. There is also a general paucity of developmental data in selected motor skills for the child of elementary school age--normal as well as handicapped--especially for tasks which may be used to trace development over a six year period.

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[44] Lis, p. 144.

[45] Gesell and Amatruda, p. 11.

DEVELOPMENTAL SEQUENCES OF MOTOR BEHAVIOR

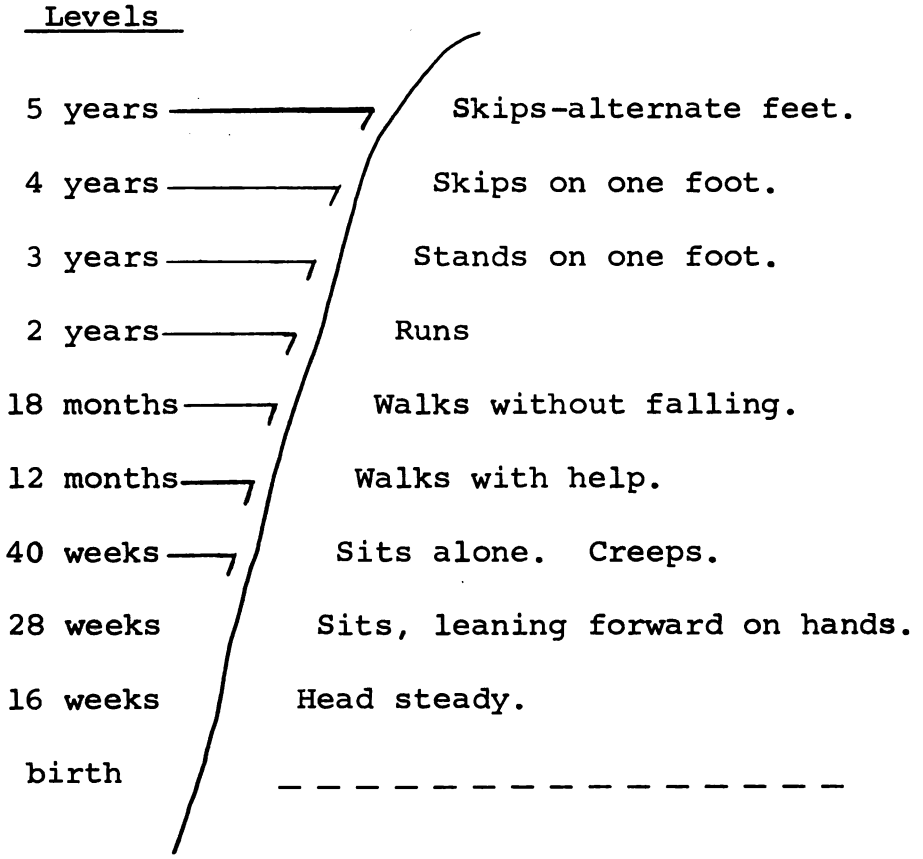

Illustration 1

Modified from: A. Gesell and C. S. Amatruda, Developmental Diagnosis Normal and Abnormal Child Development. New York: Paul B. Hoeber Inc., 1947. p. 11.

There have been several longitudinal profiles devised for recording normal growth and related aspects of physical development. Many of these may be utilized for recording a child's progress from birth to maturity, and most are primarily involved with quantitative measures (i.e., height and weight) based on normative population data. Other aspects of growth and development which are commonly used as maturational indicators include: ossification centers (especially bones of the hand and wrist.); dentition--tooth eruption; and posture ratings. Such qualities as personality, sociability, and intelligence are frequently included on this type of profile. Following is a brief review of some special techniques and construction methods of the more renowned of the several longitudinal records now in use.

The Wetzel Grid, developed by Norman C. Wetzel,[46] is a graphic form for plotting individual progress in physical growth. An advantage that the Wetzel Grid has over other growth records is the provision for differences in body build--"physique" classification. This form is designed for

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[46]Norman C. Wetzel, "Assessing The Physical Condition of Children I: Case Demonstration of Failing Growth and the Determination of "Par" by the Grid Method; III: The Components of Physical Status and Physical Progress and Their Evaluation," The Journal of Pediatrics XXII (March, 1943), 82-110; 329-61.

use with children from infancy through the whole growth period to maturity. (Another form is for infants only). It consists of two divisions, each of which serves a different function. The left part consists of weight (vertical axis) and height (horizontal axis) scales, with a set of diagonal lines running upward--which indicate the nine physique channels. Thus, this graph describes the child's body build and shows if his physique type is maintained throughout the growth period. The "Isodevelopmental levels" indicate a child's channel progress from year to year. These levels are marked off by lines cutting across the channels (there are ten levels between lines--the average upward progress in one year's time). The "auxodromes" or growth schedules, are a set of normative growth curves printed on the grid. They represent the varying growth rates of the different percentile groups. Thus, the child's profile would show his growth pattern (size and age) and his rate of progress, in terms of the normative curves (right side of the Grid). In addition, the Wetzel Grid also provides an estimation of the caloric requirements of the child (basal heat production scales--right side of Grid) at the different age levels, which are considered adequate for the maintenance of steady growth.

The University of Iowa Growth Forms, prepared by Howard V. Meredith, are another example of the longitudinal growth record. These forms include median, 16th and 84th percentile curves for showing a child's relative weight values, and also the mean plus standard deviation (above and below the mean) curves for height at all age levels--5 through 18 years. These forms provide a comparison between the growth curves of the child being measured and the Iowa norms for height and weight. There are separate forms for boys and girls. A similar profile by Harold Stuart records height and weight over an age range 2-14 years. On this longitudinal growth record, percentile curves (3, 10, 25, 50, 75, 90, 97) are drawn, so that a child's relative percentile position can be determined from the chart.

The Merrill-Palmer Logarithmic Developmental Graph[47] is a longitudinal record which provides a correction for distortion in growth curves. This distortion results when developmental age curves diverge at the upper limits, due to the use of equal age (chronological scale) units for representation of gradually decreasing growth increments. (The average

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[47]Leland H. Stott, The Longitudinal Study of Individual Development (Detroit: The Merrill-Palmer School, 1955), p. 92.

growth in inches is almost three times as great in the child from 1 to 2 years as in the same child from age 14 to 15. On the standard forms, however, the age units for plotting this growth curve are equal). By eliminating this distorition at the upper end of the growth record, the Merrill-Palmer form presents a more accurate growth pattern. This form can be used from birth to eighteen years and allows recording of several growth variables.

The Fels Composite Sheet[48] utilizes a method for plotting growth progress of children in terms of deviation from the group mean. Individual measures may be transcribed into standard scores (standard deviations) and plotted on the sheet. With this technique, many factors (any data for which means and standard deviations are available)--such as height, weight, dentition, motor scores, etc.,--may be recorded, and interrelationships between the various measures may be observed. Many group norms are reproduced on the back of the Fels Composite Sheet for reference, and at the bottom is a space for indicating illness so that its relation to growth patterns may be interpreted.

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[48]Lester W. Sontag and E. L. Reynolds, "The Fels Composite Sheet I: A Practical Method For Analyzing Growth Progress," The Journal of Pediatrics XXVI (April, 1945), 327-335.

SUMMARY

In this review of the literature, it was attempted to bring together all the essential aspects of growth and development in the growing child--both the normal and the physically handicapped. Motor ability was defined and the specific factors upon which it depends were determined to be: endurance, strength, coordination, speed, and accuracy. Several other functions (age, sex, etc.) were discussed in relation to motor ability. The perceptual process was found to be closely related to all motor activity of the child, in psychological implications of movement and formation of self image, as well as a motivating force for motor performance. The attempts to set standards for measurement or recording of growth and development were reviewed. Longitudinal records described include: the Wetzel Grid; the Iowa Growth Forms; the percentile growth chart by Stuart; the Palmer-Merrill Logarithmic Developmental Graph; and the Fels Composite Sheet. All these techniques were basically concerned with normal growth and development, and there was no study found which differentiated measurable variations in specific developmental tasks. The basic phylogenetic sequence of development was noted as being fundamental to all growing children. It is the individual adjustments and the

variations from this pattern which this study strives to define and record.

CHAPTER III

THE PROFILE RECORD

In this chapter, the longitudinal profile which has been developed through this study will be described. The basis, or frame of reference, of the profile will be established, with a review of the motor tasks involved and the criteria for their selection. The review of the selected motor tasks includes a rating scale which is to be used in conjunction with the longitudinal profile, in order to make the developmental record a more meaningful tool for evaluation of individual progress. The profile will be presented, with a discussion of the design used and how the profile is to be scored.

THE FRAME OF REFERENCE

The need for a standardized technique for determining motor development (through selected task appraisal), and a method for recording such information in handicapped children, becomes quite evident after a review of related literature. The necessity for this type of motor performance record has been substantiated by several writers. If adequate records of height, weight and motor ability were

maintained over a six year period, a child's physical profile could be more accurately established. This would be of value not only for determining the current status of a given individual, but would be a useful diagnostic tool--by showing the effects of specific pathologies which might alter the developmental pattern of a particular child.

> If a longitudinal study of a child has been maintained for some period, deviations from the expected 'channel course' quickly become apparent. Therefore, although a child may remain within the limits of average variation according to many developmental measures, some abnormality may easily be suspected if there is such a deviation from the expected course. [49]

Information of this kind is valid only if gathered over a period of several years. Most pediatricians keep developmental records of the child's first few years. This "record" should be continued in some form through the primary school years. As Jackson and Kelly have pointed out:

> It is an accepted practice in pediatrics to obtain height and weight measurements as a part of the routine physical examination. If these figures are accurate and obtained over a period of time for a given child, his pattern of growth under a given regimen of living will become known. ...Further, with nearly every disease process there is some impairment of growth and consequently the proper interpretation of height and weight values may make possible the early recognition of a

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[49] Watson and Lowrey, p. 69.

> disease and continued observation may give a good index as to the success of therapy.[50]

A longitudinal record is infinitely more valuable than an isolated (cross-sectional) measurement of development or ability. As McCammon points out:

> . . . likeness in two people at a point in time in any measurement is no guarantee that the courses followed in getting there have been similar.[51]

The long range profile is valuable not only for reviewing development but also for planning an individualized activity program for the child in need.

> Timing of all therapeutic procedures becomes an individual matter. Each child must be observed longitudinally so that prescription of treatment is based on a careful assessment of the assets and deficits and their pattern of changes with growth.[52]

The longitudinal profile allows any child to be compared to an "average" score for a particular area in a given age group. At the same time, it allows a comparison of each child with himself (i.e. his progress) at successive age levels--which is by far the more meaningful measure. (Especially with the handicapped child, since established

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[50] Robert L. Jackson and Helen G. Kelly, "Growth Charts for Use in Pediatric Practice," The Journal of Pediatrics XXVII (September, 1945), p. 215.

[51] McCammon, p. 57.

[52] Lis, p. 152.

norms generally exclude the physically deficient child in a determination of the "average" value in any area.) Ausubel comments on this status appraisal:

> Normative treatment of physical growth data reveals many age uniformities as well as the orderliness of growth in the form of predictable age level changes in various quantitative, qualitative and sequential aspects of development. Such data are also extremely useful as a standard for evaluating the current status of a given child and for ascertaining whether he maintains his relative position in his age group from one year to the next.[53]

As the child matures, changes may be observed in his motor patterns of performance. Knowledge of these changes and a reliable technique for evaluating them would be the basis for understanding not only the motor aspects, but the individual's development in totality. Many variations occur in the general growth and developmental pattern among children. The problem is to decide when the variation is extreme enough to be considered abnormal. Since the child is a constantly changing organism, recording development at any one time in this progression would be of very limited value. A longitudinal record is preferred to determine his relative position in a given population.

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[53]Ausubel, p. 499.

> The child's performance must, therefore, be evaluated not only in regard to what he can do at the time of the test, but also in relation to his past experiences and achievements and to his potentialities. A sound understanding . . . and a timetable of normal motor development should, therefore, be the basis for comparison to abnormalities and deviations from the norm.[54]

In his article on motor development of cerebral palsied children, Mitchell[55] pointed out the lack of longitudinal data on the subjects as a particular deficiency in the study. Most studies on groups of handicapped children would be similarly restricted, since there has long been a general laxity in providing the opportunity for developing their movement potential (motor capacity), to say nothing of the recording of such development. The longitudinal profile which provides for interpretation of essential developmental tasks not only facilitates evaluation of current status of the handicapped child, but would also serve as a diagnostic tool, an evaluation of program methods, and an indication for planning more suitable procedures in the future.

SELECTION OF MOTOR TASKS

The developmental tasks upon which this profile is based

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[54]Elizabeth Zausmer, "The Evaluation of Motor Development in Children," Journal of the American Physical Therapy Association XLIV (April, 1964), 247-50.

[55]Mitchell, 3-4; 17-19.

may be considered in two categories: the four motor skill tasks; and a group of basic motor patterns. The norms for the motor skills (tests) are taken from Johnson's study.[56] In choosing motor tasks for this profile, they were examined as to relative incorporation of the specific factors of motor ability. It was decided that the elements of speed, accuracy and coordination of movement should be given primary consideration--with the strength and endurance factors weighted less--in the choice of activities. The reasons being that the latter two elements are more difficult to measure (in specific tasks) in young children, and also, these develop very gradually in the primary years, which makes progress more difficult to evaluate.

The "kick" test involves coordination of movement, as well as accuracy (target). The "jump and reach" test is a fundamental measure of motor ability, and is a combination of speed, coordination and strength ("power"). The "pass and catch" test involves coordination and accuracy in use of the upper limbs and trunk, and may be categorized as a combination of fine and gross movements. The "zig-zag run" is a measure of coordination (agility), speed, and to a degree--body strength. Another reason for choosing these

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[56]Johnson, 94-103.

tasks is the fact that they are not interpreted on a pass-fail basis, but may show achievement over a wide range of scores. These motor tasks were also favored since they satisfied the following conditions: (1) Available over a six year period--elementary grades 1-6; (2) Given to a sufficient number of children to provide significant norms; (3) Provide scores with age-percentile ratings; (4) Tests are easily administered and require no "special" apparatus; (5) Test procedure is outlined in detail; and (6) The motor tasks are amenable to longitudinal scoring and have an internal motivational factor for children of this age range. The Johnson study had a fifth test--batting, which was not used in this profile, since special equipment was required. A review of the four skill tests and the associated data (norms, etc.) is available in the appendix.

The second category of developmental tasks consists of the "basic motor patterns." These tasks were selected from the sequential developmental "skills" of normal physical growth. They include locomotor and manipulative tasks which have been considered essential maturational "landmarks" by many authorities in the field of child development. These tasks have a chronological age equivalency (normal development) range of approximately 7 months to 3 years, and are

to be used as motor progress indicators for those children who are too severely handicapped to perform some, or all of the above motor skills. Thus, the child's motor progress may be recorded at this primary level of development, and results of individual programming may be reflected--even in the severely (physically) restricted child. Again, the pass-fail method of scoring motor development is considered inadequate, and a special rating sheet has been devised (Illustration 4) for use with the longitudinal record. These basic developmental tasks are considered motor "patterns" rather than skills, since they are normally achieved "naturally" as a product of maturation, rather than as a learned motor activity.

THE PROFILE DESIGN

General Considerations

This profile was designed in an effort to fulfill the following basic requirements:

(1) Understandable--it should be easy to interpret, with a minimum of explanation necessary.

(2) Simplicity--the scoring and recording process should be relatively simple and not overly time consuming.

(3) Comprehensive--the profile should be functional for children with a variety of handicapping conditions, and a wide range of abilities.

(4) Meaningful--it should be a useful tool for defining and recording individual motor progress over a six year period of development.

In addition, the three main components in the analysis of a motor activity--as outlined by Zausmer[57] were contemplated in the design (these being consideration of: developmental levels; the motivation to perform the activity; and the quality of the obtained performance). This profile was designed with cognizance of the concept that while a given child will resemble other children in his general pattern of development, his individual time-table is strictly his own. The profile is designed to relate individual progress in light of the child's own rate of development--using the norms as an indication of his relative position in a similar age group of children. The percentile basis for scoring motor skills was considered more meaningful than a method involving deviations from the mean, and the motor tests were chosen on this basis. The following comments by Watson

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[57] Zausmer, 247-50.

concerning growth records were considered in designing the developmental profile:

> When sequential measurements can be made, the percentile method for recording height and weight are much more useful than tables stating means and standard deviations. It is more important to know that a child is consistently maintaining a given relationship (in height and weight) to other children of his own sex and age than it is to know that he is tall or short.[58]

It may be noted that all the motor tasks used in the profile are based on normal developmental data, rather than using "norms" from handicapped groups. This was done for the following reasons: The handicapped child is constantly striving for "normalcy" (i.e., his gait, speech, posture, etc.) so why use scores from other than a normal population? Secondly, since environment (especially parents) and age of onset of the handicapping condition may play such an influential role in a child's ability or motivation--two children with the "same" condition may be quite dissimilar in motor achievements possible at a given age. Thirdly, a profile which is based on scores of normal children may be used to indicate relative progress by any child, regardless of handicap, and by the normal child as well.

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[58]Watson and Lowrey

The Profile Method

The profile is a graphic presentation of "stages" in various aspects of development, of levels of achievement or measurable degrees of motor development of a child at some given time. The various levels are expressed relative to norms or standards of specific motor tasks, and in terms of a common scale unit (mean, percentile, etc.). The profile itself is in the form of a line connecting the points on the common scale representing the various levels of development, or--the attained level for each motor task--without implication of a connection or relationship between the different tasks.

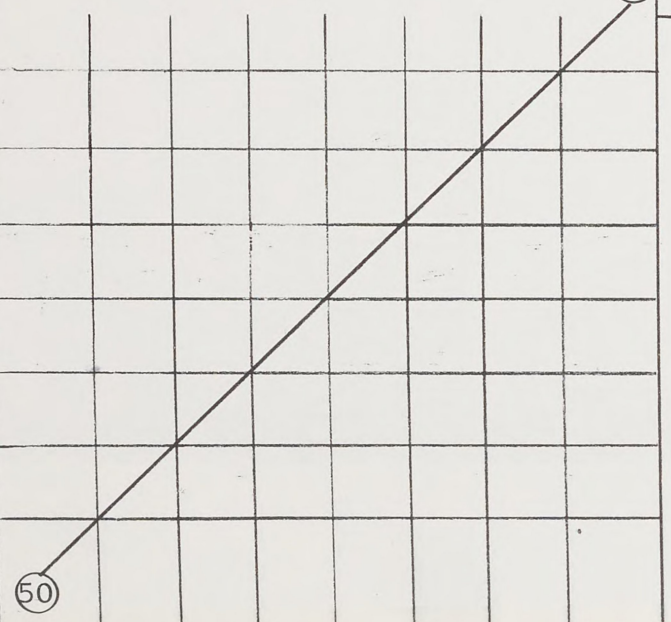
Separate profiles have been designed for boys and girls, since there is some variation in the skill norms-- between the sexes. The general design is the same, however (Illustrations 2 and 3). At the bottom are the chronological age (age at the time of testing), and the usual corresponding grade level. On the left side of the graph are: the developmental age (achievement level) and the related (median) age norms (from Johnson) for skills #1 and #2 ("KICK" and "JUMP AND REACH"). On the right side are the norms for motor skills #3 and #4 ("PASS AND CATCH" and "ZIG-ZAG RUN"). To the right of the profile chart itself, there are two

"information" boxes. The upper one is for recording the child's name, date of birth, the recorder's name, and the date of recording. The lower one shows the basic developmental patterns which may be scored on the profile. In the center of the profile form, the upper part includes the section for plotting scores from the skill tests. The line running across diagonally represents the standard of reference (50th percentile) for all skills plotted. Just below this is a section for recording skill scores which are below norm values (cannot be plotted above). In the lower section, the achievement of basic motor tasks (developmental patterns) may be scored at each age level. The rating sheet (Illustration 4) which has been designed for use with the profile record provides for a more detailed recording as to the quality of performance in the motor tasks. This rating scale considers such factors as motivational level of the child, level of performance, and individual variations in performing a given motor task.

USE OF THE PROFILE

This developmental profile should be used in conjunction with one of the longitudinal growth profiles which have been reviewed. One of the Iowa Growth Charts would be recommended,

Developmental Age	SCORES SKILL #1 KICK (points)	#2 JUMP AND REACH (ins.)	DEVELOPMENTAL PROFILE OF SELECTED MOTOR TASKS--BOYS	SCORES SKILL #3 PASS AND CATCH (points)	#4 ZIG-ZAG RUN (sec.)
12					
11	34	11.5		46	7.9
10	33	10.0		43	8.0
9	32	9.5		38	9.0
8	29	8.5		32	9.0
7	25	7.5		25	9.8
6	23	6.5		17	10.9



GRADE	NAME / DATE OF BIRTH	DATE	AGE	RECORDER
1				
2				
3				
4				
5				
6				

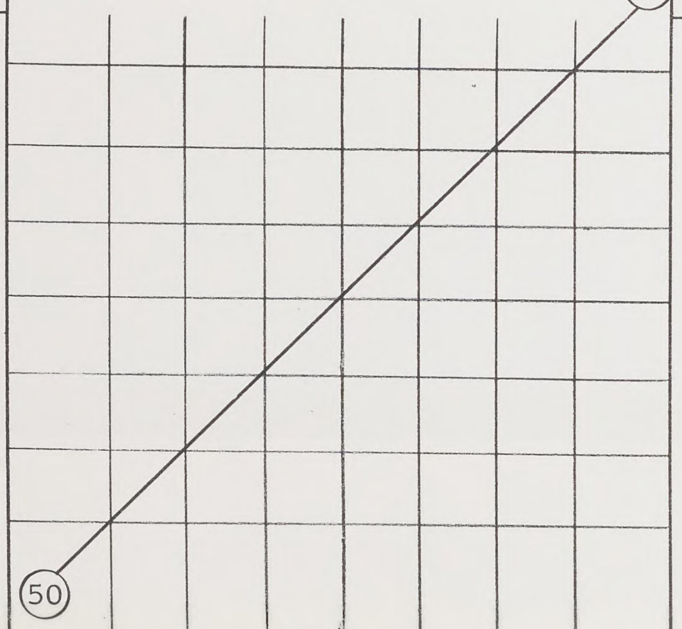
BASIC MOTOR LEVEL		SKILL SCORES BELOW NORMS								
		#1								#1
		#2								#2
		#3								#3
		#4								#4
3	H	000	000	000	000	000	000	000	H	
		123	123	123	123	123	123	123		
2	G	000	000	000	000	000	000	000	G	
	F	000	000	000	000	000	000	000	F	
	E	000	000	000	000	000	000	000	E	
1	D	000	000	000	000	000	000	000	D	
	C	000	000	000	000	000	000	000	C	
	B	000	000	000	000	000	000	000	B	
.5	A	000	000	000	000	000	000	000	A	
Chronological Age		6	7	8	9	10	11	12		
Grade		1	2	3	4	5	6			

LEVEL		BASIC MOTOR PATTERNS
A	1	roll, supine to prone
	2	sitting, with support
	3	sitting, without support
B	1	pull up to standing position
	2	crawl, hitch, etc.
	3	creep, cross pattern
C	1	opposition with small objects
	2	deliberate release of objects
	3	rolls ball to someone
D	1	walk, with support
	2	stand alone
	3	walk alone
E	1	climb stairs--with railing
	2	pick up objects without falling
	3	seats self in chair
F	1	throws objects
	2	tower building--several blocks
	3	catches large ball
G	1	walk backwards
	2	up & down stairs--2 ft. each step
	3	jumps with both feet
H	1	walk on tiptoes
	2	up stairs--one foot each step
	3	stand on one foot--few seconds

Illustration 2. Longitudinal Profile for Boys

Developmental Age	SCORES SKILL #1 KICK (points)	SCORES SKILL #2 JUMP AND REACH (ins.)
12		
11	32	10.0
10	31	9.5
9	29	8.5
8	25	7.5
7	24	7.5
6	22	6.0

DEVELOPMENTAL PROFILE OF SELECTED MOTOR TASKS--GIRLS



SCORES SKILL #3 PASS AND CATCH (points)	SCORES SKILL #4 ZIG-ZAG RUN (sec.)
41	8.1
38	8.4
32	9.5
25	9.5
21	9.9
15	11.6

NAME _____

DATE OF BIRTH _____

GRADE	DATE	AGE	RECORDER
1			
2			
3			
4			
5			
6			

SKILL SCORES BELOW NORMS

#1									#1
#2									#2
#3									#3
#4									#4

BASIC MOTOR LEVEL									
3	H	000	000	000	000	000	000	000	H
		123	123	123	123	123	123	123	
2	G	000	000	000	000	000	000	000	G
	F	000	000	000	000	000	000	000	
	E	000	000	000	000	000	000	000	
1	D	000	000	000	000	000	000	000	
	C	000	000	000	000	000	000	000	
	B	000	000	000	000	000	000	000	
.5	A	000	000	000	000	000	000	000	
Chronological Age		6	7	8	9	10	11	12	
Grade		1	2	3	4	5	6		

LEVEL		BASIC MOTOR PATTERNS
A	1	roll, supine to prone
	2	sitting, with support
	3	sitting, without support
B	1	pull up to standing position
	2	crawl, hitch, etc.
	3	creep, cross pattern
C	1	opposition with small objects
	2	deliberate release of objects
	3	rolls ball to someone
D	1	walk, with support
	2	stand alone
	3	walk alone
E	1	climb stairs with railing
	2	pick up objects without falling
	3	seats self in chair
F	1	throws objects
	2	tower building--several blocks
	3	catches large ball
G	1	walk backwards
	2	up & down stairs--2 feet each step
	3	jumps with both feet
H	1	walk on tiptoes
	2	upstairs--one foot each step
	3	stands on one foot--few seconds

Illustration 3. Longitudinal Profile for Girls

because of the simplicity of recording and interpreting data, and its percentile basis. It would enhance the diagnostic value of the profile record if some provision were made for recording the child's history of significant illnesses. (Similar to that of the Fels Composite Sheet.) If such information were recorded along with growth and motor development data, possible effects of certain pathologies on the child's total development might be determined.

This profile provides for recording of two measurements each year (grade level). It would be desirable to schedule the testing periods in the same two months (i.e., September and June) every year. Along with the several obvious advantages of this routine, there is the factor of "seasonal growth spurts." Reynolds and Sontag, and other investigators ..."have demonstrated the existence of a seasonal factor in growth, for height, weight, and ossification."[59] The testing and recording procedure should be as highly standardized as is possible. This would involve such factors as: dress (preferably gym clothes) of the children; the area used for testing; testee preparation (motivation, etc.); and uniformity of scoring techniques.

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[59]Sontag and Reynolds, p. 348.

Whenever feasible, the child should take the skill tests (Johnson's)--regardless of his ability level. If he scores in any skill within the range ("SCORES"--sides of the profile) given, his position may be recorded on the top section of the profile. This is done by following the line corresponding to his chronological age (or grade level at the time of testing) upward, and coming across from the score achieved (or where approximated from the listed norms)--and placing a dot on the line. The skill scores presented on the profile are the median values for the given developmental ages. By reviewing the percentile tables (Appendix B), the exact percentile rank for the child's score may be found. If the child can perform in a skill test--but his scores are below the range of the norms--his score should be recorded in the proper (skill number and age) space, in the middle section of the profile ("SKILL SCORES BELOW NORMS"). In this way, the child's relative "progress" can be determined between test applications, even though his ability in one particular skill may not be developed enough to "graph." If the child is handicapped to the extent that he cannot perform the motor skills for any score, he may be "tested" at the "basic motor pattern" level. The information box to the lower right of the profile describes the basic patterns and the corresponding

"level" of each. The lower section of the profile proper is used for recording the child's achievement level in these tasks. The basic motor patterns are arranged in levels (A-H)--from simple to more complex. (Normal developmental age range of these motor tasks is approximately 7 months to 3 years.) The selected tasks in levels A, B, D, E, G, and H are primarily locomotor in nature, and those in levels C and F are manipulative (arms and hands). These basic motor patterns should be performed on gym mats (except for "stair" climbing). "Unassisted" in relation to performance of these tasks indicates no aid from the tester, or any type of apparatus. By "inking" in the circles corresponding to the particular task level (letter and number) achieved, the child's abilities at each age may be charted, and yearly advances in these basic patterns may be shown.

This recording of basic motor task achievement is necessarily only an approximation, and to enhance the value of this profile, a detailed description of the child's ability in a particular task should be recorded for reference--on the rating sheet (reverse side of the profile). For example, a child may not be able to creep in a cross pattern, (right leg-left hand move forward at the same time, then left leg-right hand, etc.) but may move along the mats on his hands

and knees in some other manner. A written description of this should be included with the level (i.e., "B-3") and the date. Thus, even though a child may be at the same achievement level in successive years on the profile, some developmental progress may be noted in the more detailed description on the accompanying rating scale. The rating sheet should be considered a valuable supplement to the longitudinal record. Some of the suggestions of Zausmer[60] have been incorporated into this (Illustration 4) rating scale.

The child's name and date of birth are recorded at the top of the rating form. The rating "KEY" (lower right corner of the form) gives the symbols for motivation level and achievement scores. The rating form allows recording of test results for two test applications each year (grades 1-6). At the bottom of the form the date (month-year), and motivational level at the time of testing are recorded. The task being rated (i.e., C-1; D-2; Skill #4; etc.) is listed under "TASK LEVEL." The task achievement ("SCORE") is plotted by placing a dot in the center of the appropriate score (achievement level 1; 2; 3; 4; 5; or 6) row on the

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[60]Zausmer, 247-50.

NAME_______________________ DATE OF BIRTH: ______

RATING SCALE FOR DEVELOPMENTAL MOTOR TASKS

TASK LEVEL	SCORE							COMMENTS Variations, Adjustments, etc.
	6							
	5							
	4							
	3							
	2							
	1							
	6							
	5							
	4							
	3							
	2							
	1							
	6							
	5							
	4							
	3							
	2							
	1							
	6							
	5							
	4							
	3							
	2							
	1							
	6							
	5							
	4							
	3							
	2							
	1							
	6							
	5							
	4							
	3							
	2							
	1							
	6							
	5							
	4							
	3							
	2							
	1							
Motivation								
DATE								
GRADE		1	2	3	4	5	6	

RATING KEY

Motivation:
- O--no attempt made
- T--tries, but gives up easily
- TT--tries repeatedly even with successive failures

Achievement Score:
- 1--unable to perform task
- 2--performs task with assistance
- 3--partially performs the task, without assistance
- 4--performs task without assistance, fluctuating pattern
- 5--improved speed and co-ordination--good pattern
- 6--high level performance--indicates readiness for higher level task

Illustration 4

vertical line which extends from the date of testing (lines to the left and right of the associated grade level lines). The recorder's comments concerning each particular task may be written on the right side of the rating scale.

It might be necessary in some cases to utilize all three of the profile "sections" to record motor achievement. For example, the child who is very limited in use of his hands may be scored in "basic" motor levels C and F, the SCORE BELOW NORMS section for the jump and reach skill, and the upper section (graph) for the Kick (#1) and run (#4) tasks. Individual adjustments in test application may be made, and these should be noted in the written description (rating sheet) accompanying the profile form. For instance, a crippled child may take the "zig-zag run" test in his wheelchair and his score ("time" for the test) recorded. Since this is his mode of travel, his "progress" in ability to use it might well be scored. (It would undoubtedly be interesting for the child as well--allows him to compete.) Similar adjustments (with recorded notations--rating sheet) can be made for crutches, etc.

For the handicapped child who is older than the average child in a particular grade, the "Grade" (bottom of profile should be used in plotting his achievement (the age may be

crossed out, to indicate that the grade is being used in recording his scores). The four motor skills may be graphed (upper section) by joining the dots between tests over the six year period. To differentiate the skill "curves," different designs (i.e., dots, dashes, etc.) or different colors may be used. (This key should be constant for all forms used.) The skill tests may be given twice a year, coincidental with the growth measurements, and scores may be plotted in the upper section (the second one plotted between the chronological age lines), or recorded in the middle ("SCORES BELOW NORMS") section. For the basic motor pattern tasks, however, the achievements are recorded on the profile just once for each age (grade) level--preferably at the beginning of each year. The child's progress in these basic motor tasks should be appraised twice each year on the rating sheet. This gives a more detailed analysis of progress, and would be more useful in evaluating the program being used.

CHAPTER IV

SUMMARY OF THE STUDY

In this study, an attempt has been made to devise a longitudinal record for tracing motor development of handicapped children in an elementary school (ages 6-12) setting. The profile method of construction has been incorporated into the record, which has been designed for such purposes as: a quantitative measure (developmental norms) of current status in motor development; a measure of individual motor progress over a six year period; for determining the effectiveness of activity programs; and for diagnosis of special needs in planning activity programs for handicapped children. The profile has been constructed so that a child represents his own "yardstick" of developmental progress, with provision for comparison of his relative position (motor achievement norms) in a given (age-grade) population.

In the review of related literature, an attempt was made to recount the essential aspects of normal growth and development of children, including perceptual aspects of motor activity. The limited data on motor development of physically handicapped children was reviewed and discussed. In a brief review of some of the more renowned longitudinal

records, it was noted that these forms were chiefly for recording such quantitative values as changes in height and weight (growth progress). It was concluded that the pass-fail type of motor tasks are of limited diagnostic value and should not be included on this profile form. The skill tasks (Johnson study) chosen fulfilled such requirements as ease of administration, applicability for a six year period (elementary school), and a presentation of test scores in percentile form. The "basic motor patterns" were included so that motor progress might be recorded for those children who are too physically restricted to perform the skill tasks. A rating sheet--which was developed for use with the profile record--provides a more detailed measurement of motor development. It includes consideration of such factors as the child's attitude (motivation) at the time of testing, a performance "score" for level of achievement in any particular task, and space for notations of individual adjustments in performing specific tasks.

As noted in the review of related literature (Chapter II), there is a great deficiency in this particular aspect of contemporary physical education. It is hoped that this study will provide some insight into this area, and perhaps, be

prolusory of much additional research which remains to be accomplished in this field.

CONCLUSIONS

The value of the longitudinal profile which has been developed through this study cannot be established until the "theory" is tested in an actual school setting. Only through the extended application of the selected motor tasks can their suitability for inclusion in a longitudinal record of motor progress of handicapped children be determined. While this proposed profile remains speculative as to utility for diagnosing motor progress or for evaluating a physical activity program, just the attempt to validate such information should provide many desirable outcomes. If the profile is used over a period of several years--regardless of its intrinsic value--the institution of the motor testing alone will provide much additional information in an area which has long been deficient in the compilation of such data.

RECOMMENDATIONS

As recommended in the study, the developmental profile should be used in conjunction with one of the longitudinal

growth records (i.e., Iowa Growth Forms), to provide a more complete picture of the child's development.

This motor profile might be made more comprehensive by inclusion of additional skill tests. Some type of "balance" task, and possibly a "pure" strength test would be worth considering if the pertinent normative data becomes available. Seashore[61] has developed a beam-walking test (dynamic balance) for children in the elementary grades, which may be scored on a percentile basis. A strength test (i.e., grip strength) might also be included in this profile as a measure of motor progress, although there are certain associated difficulties in this type of testing at the earlier elementary level. Metheny[62] has emphasized this problem of motivation, or "maximum effort" of the subject, which "may become acute" in younger children.

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[61]Harold G. Seashore, "The Development of a Beam-Walking Test and Its Use in Measuring Development of Balance in Children," Research Quarterly, XVIII (April, 1947), 246-59.

[62]Eleanor Metheny, "The Present Status of Strength Testing for Children of Elementary School and Preschool Age," Research Quarterly, XII (March, 1941), 115-30.

APPENDIX A

SKILL TEST ADMINISTRATION

The following directions for conducting and scoring the four motor skill tasks were taken from the Johnson[63] study (p. 98-100).

#1 KICK TEST

Equipment. One soccer ball.

Markings. On a flat wall space, a target area 5 ft. high and 10 ft. wide is marked with one-half inch tape. This area is divided into five equal rectangles placed perpendicular to the floor. The number 5 is taped in the center rectangle, number 3 is taped in the rectangles adjacent to the center rectangle, and number 1 is taped on the two remaining rectangles. On the floor three lines 3 ft. long are marked: one is 10 ft. from the wall; one 20 ft.; and one, 30 ft. from the wall.

Directions for performance. The subject places the soccer ball behind the 10 ft. line marked on the floor. From that position he attempts to kick the ball in such a manner that it may hit the wall target. The subject kicks three times from each of the lines marked on the floor. Two practice kicks are made at each line before the three kicks for the record are made.

Scoring. The subject receives the number of points indicated on the target area into which the ball is kicked. If the ball is kicked on a line between two areas, the score is that for the area with the large number. A ball kicked from in front of the restraining floor line counts 0, and another trial is given.

#2 JUMP AND REACH

Equipment. Chalk dust, and one piece of construction paper, 6 in. wide and 3 ft. high, ruled off in half inches.

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[63] Robert D. Johnson, "Measurements of Achievement in Fundamental Skills of Elementary School Children," Research Quarterly, XXXIII (March, 1962), 94-103.

Markings. Horizontal lines are drawn on the construction paper one-half inch apart. The paper is fastened to the wall at such a height that the 0 line on the chart is just below the point that represents the standing reach of the shortest performer.

Directions for performance. The subject stands with one side of his body parallel with the wall chart. He dips his forefinger in chalk, reaches as high as possible, and makes a chalk mark on the chart. He then jumps upward as far as possible and makes a mark on the wall at the peak of his jump.

Scoring. The score is the inches (to the nearest one-half inch) between the two chalk marks. The subject is given five jumps, with the highest jump recorded as his score. The subject is not allowed to take any preliminary steps forward before the jump.

#3 PASS AND CATCH

Equipment. One 8-1/2 in. playground ball (grades 1,2,3) and a regulation-sized volleyball (grades 4,5, and 6).

Markings. A 3 ft. square is placed on a flat wall with one-half inch tape. Its bottom line is 4 ft. from the floor. An inner square, 10 in. in from all four sides, is placed on the wall target. Starting 3 ft. from the wall, and in line with the wall target, there are placed five 2 ft. squares, each 1 ft. behind the other.

Directions for performance. With both feet inside the first square the subject stands facing the wall target and throws the ball at the wall target; keeping both feet inside the square he attempts to catch the ball in the air when it rebounds from the wall. The throw should be made with an underhand motion. After two practice trials the subject is given three trials for record when he is in each of the five squares.

Scoring. Two points for successfully throwing the ball in or on the inner wall target square; two points for successfully catching the rebounding ball in the air while standing in the floor square; one point for successfully throwing a ball in or on the outer wall target square; one point for successfully catching the rebounding ball in the air on or

outside the floor square. The subject's score is the total points scored from all five squares. If the subject steps out of the square while throwing, the throw is nullified and another trial is given.

#4 ZIG-ZAG RUN

Equipment. Four folding chairs and one stop watch.

Markings. Four folding chairs are placed 6 ft. apart on a gymnasium floor and between a starting line and an X placed on the wall of the gymnasium. The first chair is placed 6 ft. from the starting line, and the last chair is placed 6 ft. from the wall. The X, 6 in. in size, is 4 ft. from the floor and placed on the wall. The length of the starting line is 1 ft. There should be an area 20 ft. long behind the starting line that is free from obstruction.

Directions for performance. The subject is instructed to stand behind the middle of the starting line and, on the command "Go," to run either to the right or left of the first chair, to zig-zag around the three remaining chairs, to touch the X, to return in the same manner, and to touch the starting line with his foot.

Scoring. Time to the nearest tenth of a second required for running the course. Three trials are given, with the shortest time being the score. For any of the following fouls the subject is required to run the course again: having any part of the forward foot over the starting line when the command is given; not zigzagging around the chairs in the prescribed manner; and not touching the X on the wall before returning toward the starting line.

APPENDIX B

TABLE OF PERCENTILES FOR SKILL TESTS:
GRADE 1, BOYS AND GIRLS

% ile	Kick--pts.		Jump and Reach--in.		Pass-and Catch--pts.		Zig-Zag Run--sec.	
	B	G	B	G	B	G	B	G
100	34	30	11.5	10.5	34	29	8.0	8.8
95	28	27	9.0	8.5	26	23	9.2	9.4
90	27	26			24	21	9.4	9.9
85	26	25	8.5	8.0	23	20	9.8	10.0
80					22	19	9.9	10.4
75	25	24	8.0	7.5	21	18	10.0	10.8
70			7.5	7.0	20	17	10.2	10.9
65	24	23		6.5	19		10.4	11.0
60		22	7.0		18	16	10.6	11.4
55	23			6.0		15	10.8	11.5
50			6.5		17		10.9	11.6
45	22	21		5.5		14		11.8
40			6.0		16	13	11.0	
35	21			5.0	15	12	11.2	
30	20	20	5.5		14	11	11.4	12.0
25		19		4.5	13	10	11.6	12.2
20	19	18	5.0	4.0	12		11.8	12.4
15	18	16	4.5		11	9	12.0	12.6
10	17	14	4.0	3.5	10	8	12.2	12.8
5	14	10	3.5	3.0	9	5	12.8	13.4
0	12	8	3.0	2.5	6	3	13.0	13.6

Adapted from R. D. Johnson, Research Quarterly, XXXIII (March, 1962), p. 98.

TABLE OF PERCENTILES FOR SKILL TESTS:
GRADE 2, BOYS AND GIRLS

% ile	Kick--pts.		Jump and Reach--in.		Pass-and Catch--pts.		Zig-Zag Run--sec.	
	B	G	B	G	B	G	B	G
100	36	35	12.5	11.0	39	35	7.6	7.8
95	33	33	10.0	9.5	38	31	8.0	8.2
90	31	31	9.5	9.0	34	28	8.4	8.6
85	30	30			32	27	8.8	8.8
80	28	29	9.0	8.5	31	26	8.9	9.0
75		28	8.5		30	25	9.0	9.4
70	27	27		8.0	29	24	9.2	9.5
65		26			28	23	9.4	9.6
60	26		8.0	7.5	27	22	9.5	9.8
55		25			26	21	9.6	
50	25	24	7.5		25		9.8	9.9
45				7.0	24	20		
40	24	23				19	9.9	10.0
35	23	22	7.0	6.0	23	18		10.2
30	21	20	6.5		22	17	10.0	10.4
25	20		6.0		21	16	10.1	10.8
20	19	19		5.5	20	15	10.2	
15	18	18	5.5	5.0	19	14	10.6	11.0
10	17	16	5.0	4.5	17	12	10.9	11.2
5	14	14	4.5	4.0	13	10	11.2	11.8
0	10	12	4.0	3.5	8	7	11.4	12.0

Adapted from R. D. Johnson, p. 99.

TABLE OF PERCENTILES FOR SKILL TESTS:
GRADE 3, BOYS AND GIRLS

% ile	Kick--pts.		Jump and Reach--in.		Pass-and Catch--pts.		Zig-Zag Run--sec.	
	B	G	B	G	B	G	B	G
100	40	36	13.0	12.0	41	38	7.4	7.4
95	37	34	11.5	10.0	40	34	7.8	8.0
90	36	32	11.0	9.5	39	33	8.0	8.2
85	34	31	10.0	9.0	38	32	8.2	8.4
80	33	30			37	30	8.4	8.8
75			9.5	8.5	36	29	8.6	8.9
70	32	29			35	28	8.7	9.1
65	31	28	9.0	8.0	34		8.8	9.2
60	30	27			33	27	9.0	9.3
55		26	8.5			26		9.4
50	29	25		7.5	32	25		9.5
45		24			31		9.2	9.6
40	28		8.0	7.0	30	24	9.3	9.8
35	27	23				23	9.4	
30		22			29	22	9.6	
25	26	21	7.5	6.5		21	9.8	10.0
20	25	20	7.0	6.0	28	20	10.0	10.4
15	23	19	6.5		27	19	10.2	10.6
10	22	18	6.0	5.5	25	18	10.4	10.8
5	20	17	5.0	5.0	21	16	10.6	11.0
0	16	16	4.5	4.5	17	13	10.8	11.2

Adapted from R. D. Johnson, p. 100.

TABLE OF PERCENTILES FOR SKILL TESTS:
GRADE 4, BOYS AND GIRLS

% ile	Kick--pts.		Jump and Reach--in.		Pass-and Catch--pts.		Zig-Zag Run--sec.	
	B	G	B	G	B	G	B	G
100	42	39	15.0	14.0	50	43	7.0	7.2
95	38	37	13.0	11.0	47	40	7.6	7.8
90	37	35	12.0	10.5	45	39	7.8	8.0
85	36	34	11.5	10.0	43	38	8.0	8.4
80	35	33	11.0		42	37	8.2	8.6
75		32	10.5	9.5	41	36	8.4	8.8
70	34	31	10.0		40	35	8.5	9.0
65				9.0		34	8.6	9.1
60	33	30			39		8.7	9.2
55			9.5	8.5	38	33	8.8	9.4
50	32	29				32	9.0	9.5
45	31		9.0	8.0	37		9.1	9.6
40					36	31	9.2	9.7
35	30	28		7.5	35	30	9.3	9.8
30	29	27	8.5	7.0	34	29	9.4	10.0
25		26	8.0		33	28	9.6	10.2
20	28	25		6.5	32	27	9.8	10.4
15	27	24	7.5	6.0	31	26	10.0	10.6
10	25	22	7.0	5.5	30	24	10.2	10.8
5	23	20	6.5	5.0	27	21	10.6	11.2
0	19	16	6.0	4.5	23	16	10.8	11.4

Adapted from R. D. Johnson, p. 101.

TABLE OF PERCENTILES FOR SKILL TESTS:
GRADE 5, BOYS AND GIRLS

% ile	Kick--pts.		Jump and Reach--in.		Pass-and Catch--pts.		Zig-Zag Run--sec.	
	B	G	B	G	B	G	B	G
100	43	40	16.0	15.0	57	53	6.6	6.8
95	40	38	14.0	13.0	54	50	7.0	7.2
90	39	36	13.0	12.0	52	45	7.2	7.4
85	38	35	12.5		50	44	7.3	7.8
80	37	34	12.0	11.5	48	43	7.4	
75	36	33		11.0	47	42	7.5	
70	35		11.5	10.5	46	41	7.6	8.0
65		32	11.0		45	40	7.8	8.1
60	34	31	10.5	10.0	44			8.2
55						39		8.3
50	33		10.0	9.5	43	38	8.0	8.4
45		30			42	37	8.1	8.5
40	32		9.5	9.0	41		8.2	8.6
35		29			40	36	8.3	8.8
30	31	28	9.0	8.5	39	35	8.4	8.9
25		27		8.0	38	34	8.5	9.0
20	30	26	8.5	7.5	37	33	8.6	9.2
15	29	25	8.0	7.0	36	32	8.8	9.4
10	28	23	7.5	6.5	34	31	9.0	9.8
5	26	20	7.0	6.0	33	29	9.2	10.0
0	23	14	6.5	5.5	29	24	9.4	10.2

Adapted from R. D. Johnson, p. 102.

TABLE OF PERCENTILES FOR SKILL TESTS:
GRADE 6, BOYS AND GIRLS

% ile	Kick--pts.		Jump and Reach--in.		Pass-and Catch--pts.		Zig-Zag Run--sec.	
	B	G	B	G	B	G	B	G
100	44	42	17.5	16.0	59	55	6.0	6.6
95	41	40	16.0	14.0	56	51	6.8	7.0
90	40	38	15.0	13.0	54	49	7.0	7.2
85	39	36	14.0	12.0	53	47	7.2	7.4
80	37	35	13.5		52	46	7.3	7.5
75		34	13.0	11.5	51	45	7.4	7.6
70	36		12.5		50	44	7.5	7.7
65	35	33	12.0	11.0	49	43	7.6	7.8
60					48		7.8	7.9
55		32	11.5	10.5	47	42		8.0
50	34			10.0	46	41	7.9	8.1
45		31	11.0			40		8.2
40	33				45		8.0	8.3
35	32	30	10.5		44	39	8.1	8.4
30				9.5	43	38	8.2	8.6
25	31	29	10.0		42	37	8.4	8.8
20	30	28		9.0	41	36	8.5	9.0
15	29	27	9.5	8.5	40	35	8.6	9.2
10	28	25	9.0	8.0	39	33	8.8	9.6
5	26	20	8.5	7.0	37	31	9.2	10.0
0	23	15	8.0	6.5	34	28		10.5

Adapted from R. D. Johnson, p. 103.

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