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This document is Part I of a two-part project whose goal was to identify the sequential development of child behavior from birth through age seven and to identify the materials which could be used to strengthen or initiate a behavioral facet. Research on child development was collected, organized, and analyzed for correlative events pertinent to the developmental taxonomy. A survey of materials produced by American manufacturers was made. Section I of the document is the introduction, and Section II reflects physiological development emphasizing motor development, sensation, perception, and learned responses. Section III covers cognitive development, Section IV investigates communication skills, and Section V reflects social and personality development. Section VI is composed of summary graphs indicating the information gained in the developmental study, and Section VII contains an extensive bibliography and a subject index to the bibliography. (DO)

CHILD DEVELOPMENT AND MATERIAL SURVEY

PART I - TECHNICAL REPORT

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FINAL REPORT
Contract Number OEO-4190

This report is submitted in partial fulfillment of the requirements of Contract Number OEO-4190. These findings are based on ENKI Corporation research, and do not necessarily reflect the opinions of the Office of Economic Opportunity.

PART I

TECHNICAL REPORT

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PART I - TECHNICAL REPORT

PROJECT PROCEDURES

GOALS

The goal of this project was to identify the sequential development of behavior in the child from birth through age seven and to identify the materials which could be used for strengthening or initiating a behavioral facet.

PROCEDURE

The basic procedure was to acquire and to organize the existing research information on child development, analyzing it for correlative events pertinent to the developmental taxonomy. At the same time, the survey of material available through American manufacturers was made. Manufacturing rationale utilized in the development of the materials and technical assistance employed by the manufacturer were also determined. As soon as the developmental taxonomy was completed, it was organized into major developmental categories. Inquiries were then made of university laboratory schools to determine their approach in developing or strengthening the behavior identified in the taxonomy and their use of the applicable materials.

To identify the sequences on the scale and to determine if these sequences could be identified in the child by a nonprofessional, a survey of approximately one hundred fifty children ranging from university preschool laboratories to Head Start children was made.

The following is a detailed discussion of the procedures utilized. Results of the procedures are discussed in the technical section.

Research Data Collation

The collation of research data was conducted through a literature survey. The initial survey covered the literature in all fields of child development from the present through 1950. Psysiology, medicine, child research psychiatry, psychology, and educational journals were included in the survey. The list of journals covered is included in the Appendix.

Established laboratory schools at recognized universities throughout the country were surveyed for current research activities which would supplement this program. A list of these schools is also included in the Appendix.

Data was compiled utilizing the McBee Card System. As data was collected, the articles were abstracted. Content of the abstract was limited to data specifically oriented to child development. The rigidly adhered to criteria in acquiring data was as follows:

Developmental Phenomena

Only data specifically delineated as behavioral phenomena, and acquired in a controlled situation was included in the study. This does not imply that only the data from laboratory situations was included. Ancedotal or observational data were included if evidenced by sophisticated and controlled observational techniques.

Historical reports by parents or recall reports were not included. This approach required considerable ingenuity and innovation in surveying the literature. This survey recognized that developmental abilities would be revealed in those experimental designs in which the abilities were the independent or dependent variable as well as in those designs in which the abilities themselves were under examination. Consequently, unlike many literature surveys which utilize only the research reports specifically designed for the acquisition of a particular data segment, this survey scrutinized research activities whose primary goal was not oriented toward the needs of this study. As an example, in many conditioning experiments basic visual abilities are utilized as a controlled variable. These we incorporated into this study as an index to visual perceptual organization at a particular age. Naturally, this approach yielded a considerable amount of information not normally available in research reports.

The abstract cards do not reflect the total content of each study, but only that information which is pertinent to this particular research, and which reflects a behavioral aspect of the developing child. Titles on the abstract and in the bibliography will not necessarily reflect the pertinency to this taxonomy of the data collected. On the other hand, many titles to research reports were misleading. They inferred that behavioral data was under investigation although, essentially, the articles were dealing with theoretical discussions of phenomenological topics. Because of the restricted purpose of this survey, such articles were not abstracted but their basic contents were noted. All articles which were read and reviewed are listed in the Bibliography.

Data was organized according to developmental sequences, and cross-correlated with chronological age. All data were then reviewed by the research committee. As a result of this review, particular areas were identified for additional investigation. This additional investigation consisted of a complete review of the topic, independent of the chronological date of the original research report. All available data in the literature was acquired for that topic.

It should be noted that during the initial research bibliographies of the reviewed reports were surveyed, and any reports identified as pertinent to the project were abstracted regardless of publication date. One reason for initially limiting the survey to 1950 was that, during a preliminary review, it was found that much research and literature were repetitive or a reconsideration of earlier research findings. Also, because of staff and fund limitations, it was necessary to set some limit. The year 1950 was arbitrarily chosen, but, as indicated, wherever additional information was needed or verification of research results could be accomplished, this limitation was set aside.

The developmental taxonomy is the result of these intensive research methods.

Material Survey

The material survey was conducted in three discrete phases. The first was a letter to manufacturers in this area identified with equipment pertinent to the age range of this taxonomy and conducting a significant amount of business. These manufacutrers were notified of our study and their cooperation was requested. Of the approximately 500 companies that were contacted in this manner, 100 offered their cooperation and supplied information regarding their product lines.

A questionnaire, devised to identify certain criteria regarding the materials being manufactured by them was sent to these 100 manufacturers. Approximately 50 responded with detailed information, and the results of the survey are included in the appropriate section on material manufacture survey.

In preparing for the initial contact, it was found that although a number of companies are listed as manufacturers of educational and play materials, their major output is a single line or a simple repetition of some other line. Quite often, they simply manufacture printed cards or blocks which are

duplicative of the products of other companies.
cooperation of these manufacturers was not requested.

The second phase in the identification of materials to be utilized was conducted when the behavioral taxonomy was sufficiently well organized to yield descriptive data for the major developmental steps. A questionnaire was designed to obtain from child development centers and laboratory schools information regarding the materials and techniques utilized in the development or strengthening of the particular developmental sequences. The data compiled from these schools was then incorporated into the study. A copy of this questionnaire is included in the Appendix.

The third phase of the study was a detailed breakdown of those materials identified by the schools an manufacturers. The materials were matched to the particular behavioral phase of the taxonomy in which they might be useful. This analysis was conducted by the ENKI Corporation staff in conjunction with preschool experts who acted as consultants. In categorizing the materials, great care was taken to avoid rigid grouping. For example, blocks can be useful in a number of categories including manipulation, visual perception, numerical conception, and geometric organization, etc. Often teachers utilize materials only in the manner in which they have been recommended, unaware of the multiplicity of application possible with the materials. Our approach in classification enables the teacher to utilize the materials to their optimum.

Data Verification

Based on the results of the behavioral taxonomy, selected representative segments of the taxonomy were organized into a scale whose data points are not necessarily equally distant (See Appendix). These were sent to child development centers and Head Start centers for review. The personnel were asked to have individuals who had known the child at least thirty to sixty days to note whether or not they had observed indicated behaviors in the child. The goal was not to determine if the child could perform a particular behavior pattern, but, rather, to determine if it had been observed. Results of this study indicate that the sequences developed in this taxonomy are valid.

SECTION I - INTRODUCTION

This report reflects the findings of a recent study designed to identify the sequences of the preschool child's development, and the materials applicable to the development or strengthening of a particular developmental phase. The purpose of this investigation was to define the sequential developmental stages of the young child independently of chronological age. The purpose of this guideline is to achieve the ability to evaluate the child as an individual, determine his abilities on a developmental sequence scale and, thus, to identify the succeeding phases into which he should progress. With this approach it is possible to focus remedial efforts on those phases of development which require the greatest assistance and to do this on an individual basis in order to assist the child in compensating for experiences he has lacked during his development.

Utilizing the findings of this study, a teacher can more readily assist the child in moving from his present level of development to a level which considers both his abilities relative to his peer group and recognizes his over-all individual developmental level.

The advantage of this approach over the chronological age approach is that many children, if required to perform at a specific chronological age level, may be required to develop a behavior facet which is not in sequence to the level at which they are performing; consequently, the child would be required to skip a certain phase of the sequence, weakening his over-all developmental structure. The findings of this report make it possible to analyze the individual child to determine for any facet of his development, determine his present level of function, and recognize the next phases of development in which he should receive assistance. In this manner it is not only possible to judge where the child is, but whether he is ready for the next step and what this step should be, rather than arbitrarily selecting a step based on chronological age.

The procedure to identify the developmental sequence was a review of over 3,000 articles in the literature published between the late 1800s and 1968. Included in this study are a number of research reports which are unpublished and were submitted by various laboratory schools. From these reviewed articles, approximately 2,000 were found pertinent to this investigation and utilized in constructing the developmental taxonomy. In selecting data from these reports, stringent criteria were maintained. The data used reflects experimental results, rather than theoretical considerations by the authors. A unique application of research reports was made, in that many research studies were not designed to supply developmental data, but either the independent or dependent variable was found to be applicable to the data required in this study.

As an example, studies on learning rates would utilize visual perceptual stimuli which identified an ability of the child to discriminate certain perceptual phenomena. It was possible, therefore, to acquire considerable more data than was formerly investigated in child development research. Because of this particular application for the acquisition of data many of the study titles referenced in the index are not specific to the application used in this study; so that, a learning study may be listed under a visual perceptual phenomenon reference.

The hard data acquired through this technique was plotted on a sequence basis against chronological age for comparison purposes, and cross-correlated against interrelating functions. Based on this technique, any data which appeared to deviate significantly from the sequence of development was carefully evaluated before inclusion. In including deviant data, a determination was made of the cause for the over-all deviation. Once a deviation in data was identified, the deviant data was scrutinized and the apparently pertinent data was re-evaluated to determine which was more valid. Based on the final analysis, the developmental sequences reported herein were developed.

Bibliography

Section VII of this report is a bibliography in two parts. One part is the numbered alphabetical chronological listing of all studies utilized in developing this report. The other section is an index of bibliographical numbers, organized according to specific subject matter, so that the interested investigator has a bibliography reflecting the data sources for the various sections in this report. We believe this will be of considerable value to other research activities.

Material Survey

Concurrent with the advancement of the developmental taxonomy, applicable materials for strengthening or developing a particular behavioral activity were researched. University laboratories, schools, child development experts, and manufacturers were surveyed to determine their planning, construction and utilization of materials. The laboratory schools and child development experts were surveyed primarily to determine how materials are used in a non-designed fashion. Manufacturers were questioned to determine the expertise associated with the development of materials, planning and production criteria. The result of the findings were then organized along the developmental sequence to identify the materials that are applicable to various phases of the child development taxonomy.

Report Organization

The report on the developmental taxonomy is organized in the following sequence. Section II of the report reflects the physiological development of the child with major emphasis on: 1) motor development; 2) sensation and perception; 3) learned responses. Section III covers cognitive development. Section IV investigates the communication skills, based on both the physiological and cognitive development of the child; and, Section V reflects social and personality development. Section VI is composed of Summary Graphs reflecting the information gained in the developmental study.

Part II is the Material Survey, which demonstrates applicable materials for the various developmental phases.

SECTION II - PHYSIOLOGICAL

The physiological development is the primary block on which the complex behavior of the developing child is based. This section will identify the sequences of physiological development, ranging from neuromuscular to the sensory.

MOTOR DEVELOPMENT

Reflexes

Reflex responses are present at birth in all healthy children, although the appropriate stimulus is difficult to determine at birth.

Startle reaction to sound, as well as plantar reflex, grasping reflex, crossed leg extension (830,848,1354) head turning, penis erection, and sucking (170,729) are noted immediately after birth.

Some responses, such as the pain response, are absent at birth, but appear soon after. The pattern of sensory-motor responses to pin-pricks (1212) shows that from a few hours to a few days there is no overt response. Diffuse crying with body movements, and an inability to identify the source of irritation can be seen by the end of the first week. By 300 days, the perception of the pin or the approaching arm of the adult is enough to elicit a withdrawal response. From 11 to 15 months the perception of the stimulus reveals an ability to: 1) cope with the situation as a game; 2) accept the pin-prick; 3) defend himself. Tearing, for example, was seen to develop from initial dampness at 13 days to actual tears by 34 days of age. Other spontaneous responses seen in the first ten days of life include: crying, sneezing, stretching, mouthing and yawning, opening the mouth, chewing, sucking and smiling (621). Sucking ability also increases with age up to ten months, with the breast nipple preferred to both bottle and dry nipples (729).

Other responses, such as placing reactions, were found to be related to birth weight (1928), in that the reaction was present on the first day for infants weighing 1800 gms or more, but appeared between the 5th and 60th days for infants with birth weights 1600 gms. or under.

Additionally, some responses occur as a reaction to undetermined stimuli, such as the movements of hand to head, which increase from the 1st to the 19th week (211), and begin to disappear by the end of the 20th week.

Many of the reflex responses occur in reaction to stimuli which startle the infant, such as being dropped (848). Most of the reflex responses extinguish within a few months. The arm and leg responses to being dropped, which are exhibited at birth, disappear by 4 weeks.

It is generally found (830,1354) that the moro reflex disappears during the three to four month period. The other reactions extinguishing during this time period or shortly thereafter are: tonic neck response, grasping reflex, and crossed leg extension.

Orality

The beginning of thumbsucking appears between birth and three months (1022, 1783, 1843), with all of the children engaging in this behavior by 14 months. The average age that sucking stopped was 44 months. Hunger is the primary variable associated with thumbsucking in infants from birth to one year. In addition to this primary variable, secondary variables associated with thumbsucking are teething and position of body.

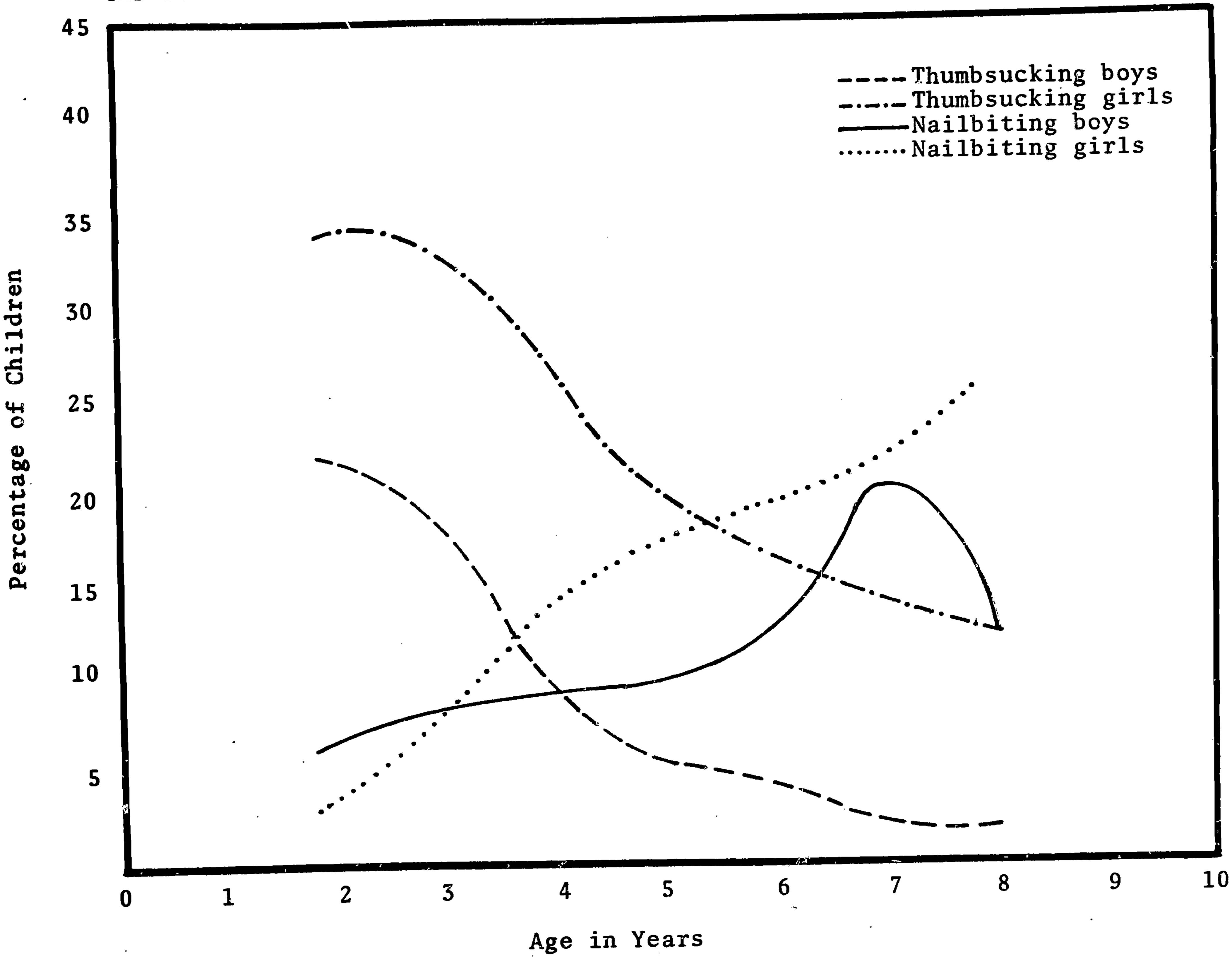
Some authors (783) postulate that oral behavior serves as a tension reducer. This is based on research indicating that the oral behavior (feeding) of infants age birth to ten days was not related to their weight or to the amount of formula eaten. Figure 1 summarizes the finding on thumbsucking and nailbiting.

Elimination Processes

At one month, the infant eliminations are numerous and sporadic. By four months there is a delay between feeding and evacuation; and, at nine months the infant can begin to respond to training. When the infant is about one year old, there seems to be a training relapse; but, by fifteen months there

Figure 1.

THE DEVELOPMENT OF THUMBSUCKING & NAILBITING



is general bladder and sphincter control. At eighteen months there is better control, but not sufficient to prevent occasional "accidents". By the age of two the child shows fairly consistent control with pre-elimination warnings. (590).

General Growth

Growth curves of height, weight, and body surface area show the most rapid acceleration from birth to eight years. The neonate's body type is slender (with the exception of the head) but broadens out and gains weight rapidly from birth to eleven months. The most rapid growth in height was found from birth to two years. Up to three months male infants are slightly taller and heavier than females (1307). This is reflected in a greater head-lifting strength among the males, particularly if they are breastfed (129). The male infants also maintain a one-inch height superiority from the third to the eighteenth month (1634). Between eighteen months and eight years there are no sex differences in height. Males show a slight weight superiority up to 54 months at which point the females catch up and there are no differences up to eight years.

There are some sex differences in favor of males in the formation of deciduous teeth between 4 and 13 months (1722). After this period, both sexes develop teeth at about the same rate: median incisor, 6 to 8 months; lateral incisor, 7 to 10 months; canine, 17 to 20 months; 1st molar, 12 to 16 months; 2nd molar, 17 to 24 months.

Effects of Abnormality on Growth

Deviations from the normal pattern of growth are not uncommon. Gross prematurity (under four months), or, otherwise abnormal births are, for instance, related to a retarded growth rate after birth. Infants born prematurely are significantly below normal weight ranges through the first year and one-half (1610). During the first six months, the growth rate itself is slower in the prematurely born (1232). After this period, growth rate increases, enabling the prematurely born to attain heights and weights within the normal range.

These infants are also significantly different from normally born infants in pain threshold, vision, irritability, and muscle tension ratings (678).

Placing reaction, present at birth when delivery is normal, does not become evident until between the fifth and the sixtieth day with prematurely born infants (1928).

Infants who have undergone prenatal stress are not differentially affected until after the fourth month of life. After the fourth month, however, normal motor and language development are apt to be retarded (978).

All of these effects are necessary considerations in any evaluation of growth. However, since they are related to abnormalities, rather than general normative development, our discussion will be limited to the above remarks.

Hand and Arm Movements

The neonate manifests the ability to cling to an object placed into his hand. The strength of this clinging response rises significantly from birth (4.4 lbs.) to four months (6.7 lbs), and remains static until seven months. From seven months to one year there is a significant decline to 2.2 lbs. While the response of both hands closing on a rod remains fairly stable from birth to one month, responses involving closing and gripping the rod rise significantly. There is difference in strength between hands, favoring the left hand until one year, when the difference in strength becomes a factor of handedness (727,728).

The ability to reach toward and grasp an object begins at about 2 months (1876). Although arm movements towards an attractive object start at 2 months, unilateral action decreases as bilateral action increases from 3 to 4 months. At 4 months unilateral action increases with a wide grasping response at the object, and by 5 months direct grasping is observed (952, 590, 876). This response is not to be confused with the previously mentioned grasping reflex which is evidenced at birth.

A preliminary stage to purposeful grasping is the ability to scratch and clutch objects at about four months (506). The palmer grasp (use of the fingers against the palm of the hand) is first seen at about five months (664), and is universal at eight months.(1315). The two-handed scooping grasp appears with or immediately following the occurence of the palmer grasp at about the fifth month and is part of the general behavioral pattern at six months (1611).

A squeeze grasp with limited use of the thumb is noted at six months (664), followed between the eighth and ninth month by adequate use of thumb and forefinger. By the end of the first year the infant employs thumb/forefinger with little assistance from second and third fingers (586, 664, 1611).

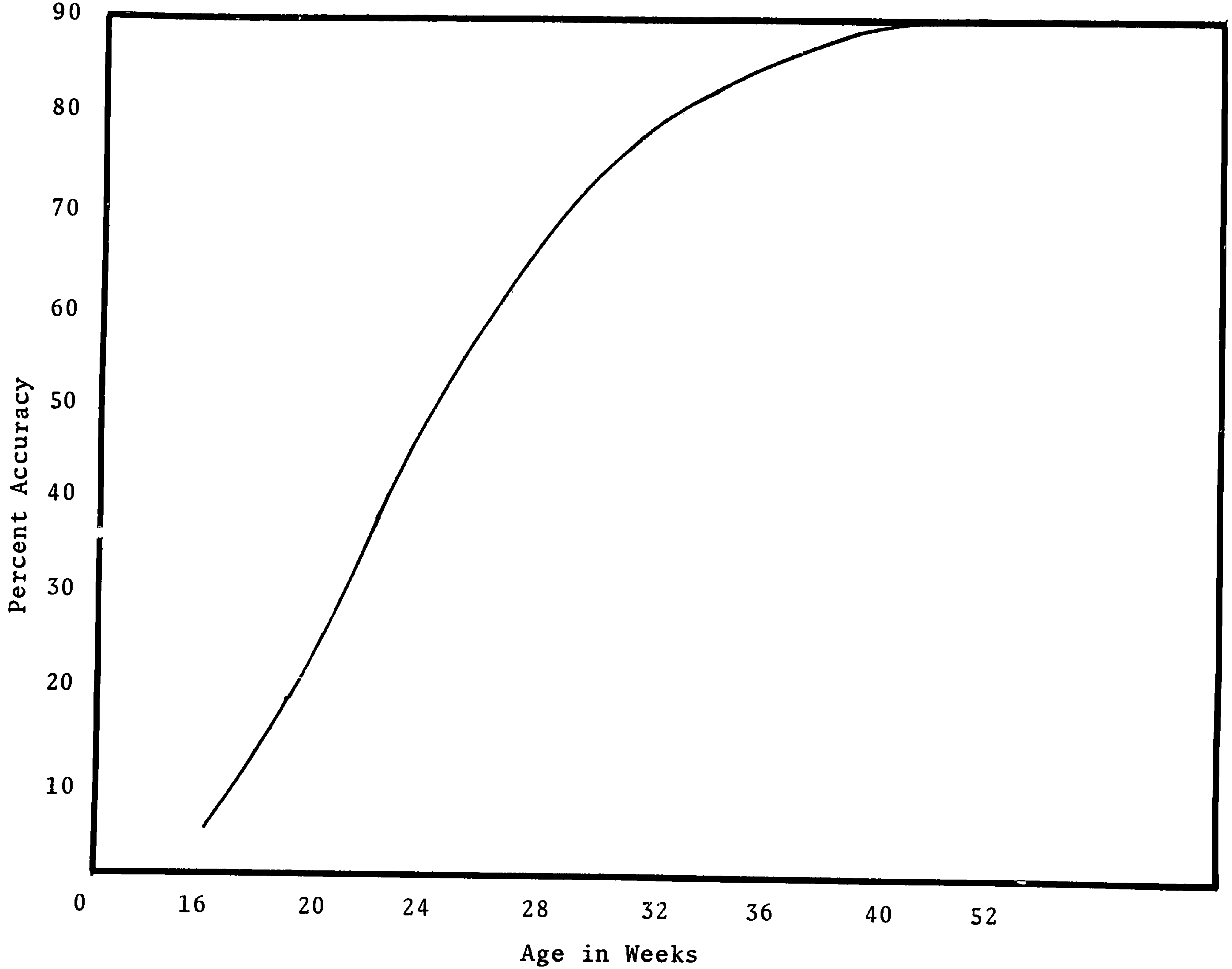
Once the grasping reflex has declined in strength (at about six months) purposeful object-release begins development (1611) and by fifteen months, the infant is able to accurately release small items when required (586). Full manipulative use of the hands is achieved by one year, or immediately thereafter.

Reaching for an object is a difficult task for young infants up to six months, but becomes easier as age increases (724). Underreaching is much greater than overreaching for all ages (3 - 14 months) (722). Figure 2 reflects the increase in reaching accuracy as a function of age.

After the ability to reach and grasp objects, the child develops the ability to coordinate the manual matching of two objects, e.g., spoon into cup (28). By eighteen months he is able to coordinate the placement of pegs into holes of similar shape, as well as build 3-block towers. By thirty-six months the ability to correctly place objects into a form board is reached, as well as other complex eye-hand coordination tasks (590, 722, 896, 904). From this time on the child continually improves on these skills and reflects reduced performance time.

Figure 2.

REACHING REACTION IN YOUNG CHILDREN



Although the child is able to build towers by 18 months, he has more difficulty in tower building with cylinders than with cubes (896) until age 4-1/2.

The next level of hand/arm movement complexity is the ability to touch moving objects. Figure 3 reflects the rate of this development, and also reflects the relative long time necessary for complex eye-hand coordination to mature (724). Similarly, the speed of tapping matures to age five, when the child taps at 80% of adult norms (660). The ability to track on a rotary pursuit task is an example of the more complex hand coordination tasks which require years to mature (ages 5 to 8) (379,638).

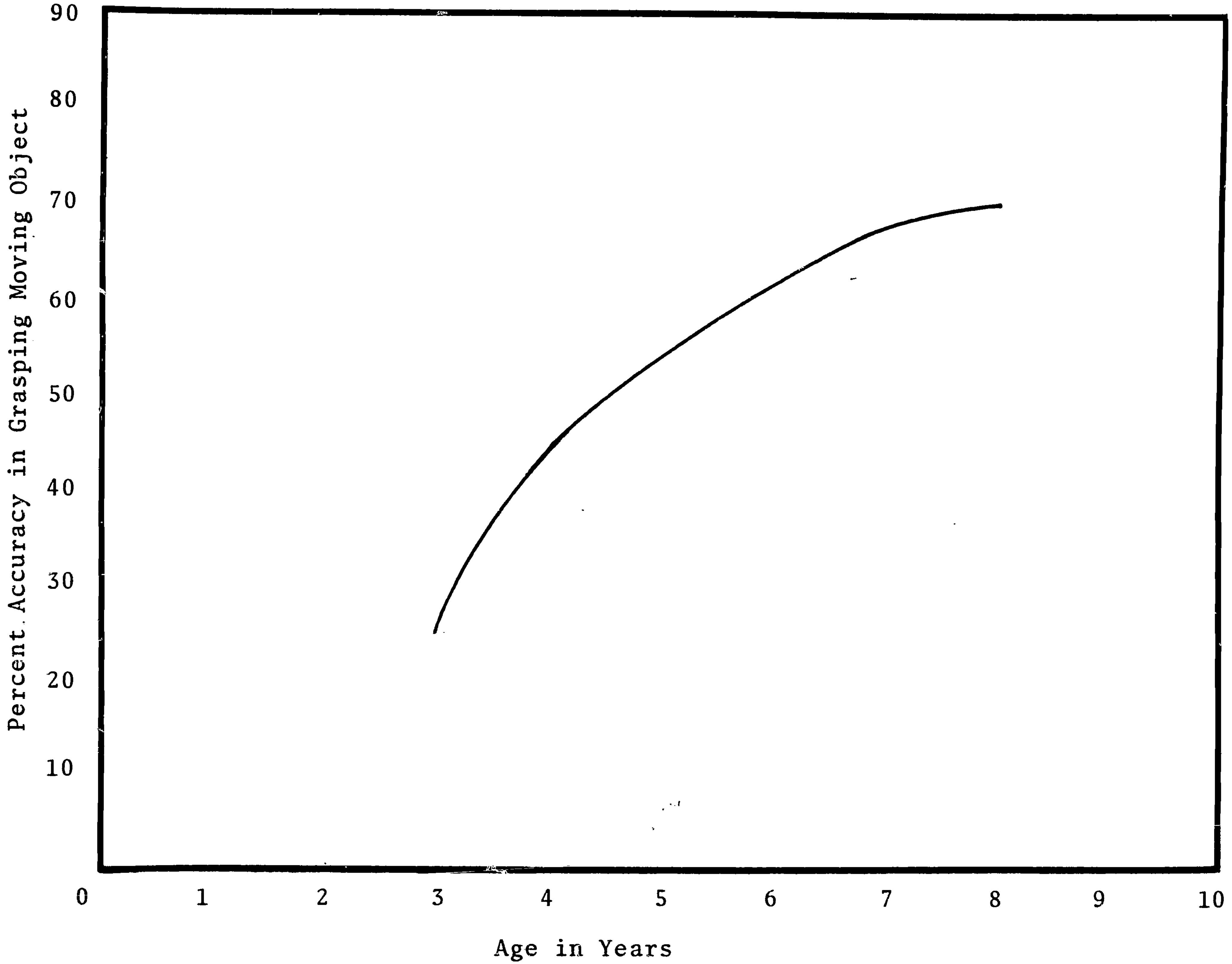
A number of studies report ethnic and racial differences in reaction time for reaching behavior (737, 1276), but the findings are inconclusive and contradictory. It can, therefore, be concluded that this aspect of physiological development is simply a function of individual differences.

Hand Preferences

The initial arm movements occur at about two months, and are unilateral with preference for the left hand. This coincides with the findings indicating greater grasp in the left hand. The infant then shifts to bilaterality at about 6 months with unilaterality recurring by the eighth month. The unilaterality is now for the "preferred" hand (397, 596, 1917). The vacillation between unilateral and bilateral hand use

GRASPING A MOVING OBJECT

Figure 3.



continues until about four years. Considerable confusion is common during this stage. Between four and eight years the bilateral confusion diminishes (37, 66) until the use of the dominant hand becomes consistent.

This trend for handedness seems to correspond to that found for eyedness. There is a pattern for right or left handed children to be right or left eyed (1802). By the age of five the preference for the dominant eye is similar to that found for older children and adults. By age five to eight years, consistency is found for unilateral handedness, eyedness, and footedness (133).

Locomotion

The simplest form of locomotion is creeping ability. This behavior has its antecedent in head lifting and knee jerking during the first few weeks of life. These movements are followed by head and chest raising and knee thrusts by 8 weeks (554, 805, 1217). The simplest low creeping behavior is observed by 20 weeks, and a high creep by 30 weeks (27,39,589, 593,1213, 1216).

Sitting ability develops concurrently with crawling behavior. At first the child rolls himself from a supine into a prone position (5 to 6 months). The ability to pull himself into a sitting position occurs at between 6 to 7 months (554, 589, 805, 1217, 1369, 1370) and, by eight months, 90% of the children are able to sit independently.

As the child masters the sitting and creeping ability he starts pulling himself upright (8 to 12 months), as an antecedent to walking (395, 1228, 1369, 1370, 1597). Within 30 days of the achievement of independent standing the child initiates walking with assistance, and within 60 days he is able to walk a few steps independently, and several feet within 90 days. The latter stage occurs within 12 to 18 months (589, 1228, 1369, 1597). Within two months after mastering forward walking the child masters backward walking (110), and initiates stair climbing with the use of hands at about the same time (16 to 24 months). The next progression is in walking up and down stairs without use of hands, and walking on tip-toes (2-1/2 years) (27, 110, 589). Walking on elevated boards also occurs at this time, and improves continually until age 5 (1694).

Skipping and jumping skills develop at about 2-1/2 to 3 years, and improve continually until age 6 years (110).

SENSATION AND PERCEPTION

Vision

Vision is one of the most complex sensory systems. Because it is one of the primary channels of communication between the child and his environment, the vision system has considerable influence on all developmental functions.

It is difficult, however, to determine the sophistication of the visual system at birth because of the problem of determining what the infant senses and perceives. There is an obvious sensitivity to light stimuli at birth as proven by a close correlation during the first 10 days of life between the intensity of light stimulation and a decrease in bodily activity (849), with the period of greatest sensitivity between birth and the 5th day (238). The reactions are strongest when the child is awakened from sleep. There is, therefore, some degree of accommodation to light stimuli during wakeful periods which, of course, diminishes during sleep.

The most primitive reaction to a moving visual stimulus occurs within 8 hours of birth (746, 1097, 1747, 1913), although the earliest evidence of actual visual fixation is found at 5 days (1097, 1699, 1883). It can not be determined if the first day responses to moving visual stimuli are tracking responses or reactions to changes in stimulus intensity.

Visual fixation and simple perceptual differentiation is found as early as 10 days after birth (1087, 1097, 1699). At two weeks of age some children (5%) can respond differentially to their mother's face and visually track a human form (120,918) although all children do not manifest this ability until six weeks of age (1304). It is impossible to postulate the causes for better tracking behavior than fixation to a stationary stimulus in the neonate. Whatever the cause, the differential behavior disappears by eight weeks (506, 1038, 1304).

Visual acuity also improves rapidly with chronological development. At one month of age (506) a visual angle of less than 40' of arc is indistinguishable but by six months this is reduced to 5' of arc. While visual acuity improves up to 6 months of age, there is no improvement during this time for near vision (5 to 20 inches)(506). This may reflect some developmental lag in convergence or focusing ability.

Measurement of intensity discrimination ability indicated a difference threshold of .12 foot candles at 10 days of age; of .02 foot candles at 20 days, which asymptates at .01 foot candles at two months (421).

The poor acuity for near vision and the relatively slow development of distant visual acuity may reflect an inability for accurate distance perception. Depth perception ability develops over the same period as visual acuity (1307) and may account for the reaching difficulties in infants (724). There is considerable evidence of the gradual development of the visual perceptual ability through the eighth month (500, 1827). Further evidence for lack of convergence prior to about six months is found in studies of binocular vision development (1097, 1825). There is additional evidence that until about 5 months, binocular vision does not occur consistently. Generally one can conclude that the sensory aspects of the visual system are functioning adequately by 6 to 12 months of age; and, from this period on the visual abilities of the child are dependent upon the learning of perceptual cues.

Differential reaction to stimulus complexities antecedes perceptual differentiation and occurs as early as 3 weeks (216) with increasing complexity preferred with increasing age (501, 1038, 1672). In one experiment, infants of 3 weeks fixate longest with a 4-square board; at 2 months with a 65-square board; at 3-1/2 months, the longest fixation is to a 576-square board, (501-1768). Between 3-1/2 and 6 months of age, the preferences shift from the checkerboard to both a woman's figure and a human face (1768). This trend for preference of complex stimuli continues into the school age period (143, 263, 1176, 1297) although a desire for symmetry enters into the preference after 6 months (143,1038). At the early ages (up to 6 months) it is also found that shape is more critical than color in visual discrimination (1672, 1673). None of the studies on visual complexity up to 6 months age have determined if the increasing preference for stimulus complexity is related to the increasing perceptual ability, or whether it may be attributable to the parallel development of visual acuity.

Color Discrimination

Responses to color, as compared to gray, are found as early as 3 months (945, 1696). The relative preference for colors from early development until age 7 years is red, yellow, blue and green (576, 1254, 1696). After this age, blue replaces red as most popular (945, 1696).

Recognition of the preferences for what have popularly been termed bright colors led to the suggestion that the responses were not to the colors themselves but to their respective brightness. This was investigated with children between 5 and 7 years of age (341). Results substantiate that discriminations are determined significantly more often by brightness than by hue.

Form Discrimination

Discriminations between simple forms can be elicited as early as 4 months (1543, 1673) but generally the differential perception of form is not elicited until two years (1260, 1627, 1628, 1629, 1817). By 3-1/2 years, the child can use form to discriminate complex stimuli although any background patterns confuse the discrimination (655). The average child is about 4 years old before he can consistently use form in an abstract context (1291). The development of this ability is basic to letter identification which, of course, leads to reading and writing ability.

Size Discrimination

The two year old has a threshold of size discrimination between 2 and 2-3/4 inches, which reduces to 1-3/4 inches at 30 to 36 months, and 1/2 inch at 4-1/2 to 5 years (1865). It must be emphasized that these are visual discriminations and the absolute value of size is meaningless to the child until he is about 5 years old. At this point, the cognitive aspects of "large" and "small" develop.

The functional use of the three dimensions (color, form and size) is best seen, however, in the interaction between these three dimensions. When children are required to discriminate between stimuli on the basis of one of the dimensions, a preference pattern has been seen related to age factors.

The first valid two dimensional discrimination shows a preference for form (219). This preference is found in approximately 85% of 2-1/2 year olds. Color preference begins at about age 3 years, reaching 75% between ages 4 and 4-1/2 (336, 337, 339, 342). By age 6, however, form was again predominant, and reached 90% of adult level (923).

Caution must be used in utilizing these findings in a specific situation, as three other factors influence the form/color relationship, and should be considered in evaluating ability in discrimination of the three dimensions. They are: 1) the degree of stimulus familiarity; 2) specific form and color cues; and, 3) the degree of inter-dimensional differences.

One study (1260) found that there was a strong use of color (97%) in discriminations prior to age 5; however, it was determined that the discrimination was a function of specific preference for the selected color stimuli. The color was seen as a specific interstimulus cue, used without recognition of a color dimension as such. When this was controlled, there was a sharp decline in color-use, giving way to 75% use of form. In studying kindergarten children (821) it was found that the choice was dependent upon the specific form used. Form was used 100% to discriminate paper cut-outs of a boat and a man; 75% of the time, for geometric figures. Color, however, was unanimously used to discriminate various dresses. The choice was also dependent on the degree of difference between the dimensions with the choice made along the dimension which showed the most prominent difference.

The research reviewed indicates form is used as a primary stimulus cue for visual discrimination except for a short period between ages 4 and 5 years. This temporary shift may not be a change in visual perception but, rather, a function of interest increase in color due to the acquisition of color naming ability. Ability to identify colors is seen at around four years; and learned, generally, by age 5 (1126). The new importance attached to the colors as they are named is shown in the fact that before age four, color-object relationship is not seen in children's painting. Colors are chosen for contrast simply because of their proximity to the painter. Objects begin to require specific colors by 4 years, concurrent with the color naming. It is at about four years of age that colors gain predominant importance, and the peak is reached at 4-1/2 years. Color interest may, then, be seen as a function of the importance which colors gain when they are named.

Figure-Ground Discrimination

The development of this ability is basic to the later perceptual organization necessary for reading skills. While there is considerable evidence of differential responses to stimuli of different visual complexities (216, 501, 1038, 1672, 1768) in the infants, evidence of perceptual organization does not occur until age four. A study of orientation abilities in children from 3 to 8 years (1528) found that three year olds were unable to discriminate lines at 45° angles to the left from similar lines leaning to the right, while older children could do so. Studies of the perceptions of drawings of common objects in various stages of completion showed that from four years on children are capable of identification as good as that of adults (614, 645, 646, 834).

A more complex discrimination task consisting of a variety of partial triangles in varying degrees of completion showed that children from 1st and 2nd grade were able to identify the inverted figures in 76% of the cases, while pre-school children could not (415). Children under four generally are unable to achieve closure to any degree, although this ability develops by age seven (1591). The ability to identify visual stimuli independent of orientation develops about age seven (226). Between the ages of three and six years, children increase their accuracy in identifying upright photos from 70% to 90%. During this time, the ability to identify those photos in an inverted position remains absent, and does not reach 50% until seven years.

Studies of figure/ground relationships indicate that about 1/3 of four year olds can differentiate familiar parts of a whole, and 90% of eight year olds achieve this (1798). The integration of parts into a whole is a more difficult task and is not developed until age nine (456, 1274) although object familiarity influences this ability somewhat. The latter is shown with ambiguous figures (457) where 86% of the four year olds and 100% of the five year olds could perceive a butterfly, but only 7% and 12%, respectively, could perceive a face hidden within this figure. Using the standard figure wherein the outline of a vase can be seen as two facial profiles, 76% and 100% again saw the vase, while only 3% and 28%, respectively, identified the faces. It is also found (611) that overlapping figures are significantly less difficult to identify than embedded figures. Geometric figures in an embedded position are unperceived until six years. At six years, 12% of the children can identify them, and at eight years, 25%. Overlapping figures are perceived by 38% of the four year olds; 70% of five year olds; 88% of six year olds, and 100% of seven year olds. It is also found that embedded geometric figures are easier to find than realistic figures. Comparing the ability by age the following is found (643, 676, 1466, 1467, 1470):

Age	% Geometric Identified	% Realistic Identified
4	40	10
5	80	40
6	100	50
7	100	90

Summary

The visual development can be summarized into two discrete phases. First, the development of effective sensory skills to permit complex discrimination, tracking, and improved acuity. This phase reaches an asymptate by 6 months.

The second phase is the development of perceptual skills, which is a continuous process. Perception of depth and distance, various dimensions and figure/ground organization all progress through the age range that we are here considering. As discriminations become increasingly fine, there is increasingly greater need and dependency on a conceptual framework around which to organize the discriminatory information. Sensation thus leads to perception which, in turn, demands cognitive structure within which to develop.

Audition

The ability for sensing auditory stimuli is evidenced in the fetus, which responds reflexively to intense auditory stimuli (538). The neonate responds to auditory stimuli at birth with a startle response (170, 221, 1810, 1937). The neonate adapts very rapidly to the auditory stimuli. This adaptation results in a significant decrease in response (361, 769, 1702, 1937).

Pitch discrimination during the first few days is very gross. About 1/3 of infants respond differentially to pitch discrimination between 400 and 1000 and 4000 cps (98,221,789). Valid pitch discrimination is not apparent until about 1 month (221, 789, 939). By 2-1/2 months of age pitch differences of 11-1/2 tones on a musical scale can be discriminated. This improves to a difference of 5.5 tones by 4 months, and to about 3 tones by 5 months.

The ability to localize sound develops almost at birth (1874) with definite visual localization to sound sources by the second week (170). The ability to localize sound sources within the plane of the ear is complete by six months (302). If the source is moved into another plane, localization ability is not completely developed until 1 year. At this stage the child has developed his auditory sensory abilities which are now utilized for the development of auditory perception. Unfortunately, there have not been any definitive studies on children's development of auditory perceptions such as identification of complex sounds related to the environment.

The development of these skills is achieved slowly and with wide individual differences. As late as six years, some children have difficulty making qualitative judgments on the basis of pitch and make them, rather, on the basis of intensity (1221, 1388). The complex interaction of intensity and pitch, as in voice inflections, require considerable experience and are part of the cognitive and social development process.

SOMESTHESIS

Taste and Smell

Responses to different gustatory stimuli is found on the first day (880, 1718a). Because of the difficulty in evaluating the responses and the interactive effect of different stimuli, valid threshold data is not available. Essentially, one may conclude that children of all ages differentiate the four basic taste modalities: sweet, sour, salt and bitter.

Taste receptors, unlike other sensory end organs, are more widely distributed at birth than in later life. At birth taste buds are found on the hard palate, part of the esophagus, and the tonsils. Later they are found only on the tongue. This is one of the few changes toward a reduction in function with development. This reduction in sense organs is complete by years, and may account for the greater reaction of young children to "strong" tastes.

Olfaction sensitivity has been found to increase greatly during the first two days of life (1104). On the first day a 60% solution of asofoetida (a foul smelling gummy substance) was necessary to elicit a response. By the second day a 30% solution was sufficient, and a 17% solution by the fourth day. Similar patterns were obtained with acetic acid, phenylothyl alcohol and anise oil (467).

Temperature

A sensitivity to temperature change was found in children from two to four days old (362). Children from four to nine days old had warmth thresholds between 50° to 60° centigrade, and cold thresholds between from 5° to 23° centigrade (880), with foot and leg areas showing more sensitivity to temperature change than head or hands.

Generally, the temperature sense is functional in infancy and does not develop further except for the conditioning of reflexes to hazardous conditions (e.g., hand on hot object).

Pain

Pain thresholds vary with the area of the body that is stimulated, the head being more sensitive than the legs between birth and 12 days (1605). Sensitivity to electrical stimulation led to a general pattern of response similar to that evoked by mechanical pain producing stimuli (1105). Sensitivity increases most rapidly immediately after birth and slows its increase progressively during the second, third and fourth days.

The findings suggest that the neuro-anatomical aspects of pain are developed in the neonate. The further development of pain responses are a function of learned associations, and are a part of cognitive, social, and personality development.

Pressure

Pressure is correlated, as regards differential areas, to sensitivity to pain. Sensitivity is developed more slowly than the other somesthetic senses. Tactual stimulation elicited responses only about the mouth during the first eleven days (962). From twelve days to six months general excitation to stimulation with cotton is observed. It is not until 3-1/2 to 4 years old that a very light stimulus evokes a response. Tactual stimulation response ability is not fully developed until age six (136, 574).

There are differing degrees of sensitivity in the hand which are correlated to hand dominence. Beginning with age six and continuing into adult age groups, the non-dominant hand is more sensitive (574). Thumbs are more sensitive than forearms. Knowledge of this sensitivity is important in teaching children to discriminate textural and form differences. Tactual sensitivity is sufficiently well developed by age 7-1/2 to aid children in identifying through tactual senses familiar objects which have been disguised.

As sensory abilities develop to maturity, they interact to increase perceptual efficiency. The relationship between visual and haptic (touch) form discrimination is poor at ages three and four, becoming more stable by five. This intersensory utilization increases gradually, reaching maximum proficiency between six and eight years (3, 163). Visual-kinesthetic and haptic kinesthetic relationships are much less efficient and do not level off until between ages ten and eleven.

Comparisons of dominence between visual and haptic modalities indicated that when forced to use haptic sensations, kindergarteners differentiated stimuli on the basis of texture rather than form. When visual discrimination was made, use of form was, of course, preferred to texture. Third graders, however, made significantly greater use of form with both kinds of sensory input (1416).

All of the sensory abilities, whether individually or relationally used, function to discriminate between stimulation from the moment of birth on. As the child develops, the sense modalities interact and, then, are modified perceptually. Eventually, the child's perception of the world is modified by his cognitive abilities.

LEARNED RESPONSES

Patterns of Sleep

As age increases, daytime sleep decreases (369a, 1771). (See Figure 4.) There is a decrease in night sleep as age increases until about age four, at which time there is a leveling off period until about 5-1/2 years (404, 547, 1475).

In nursery school children, mean ñaptime ranges from 17 to 65 minutes (295, 1579). Pre-sleep activity increases with age from 27 minutes at three years to 38 minutes at ıour years, and 40 minutes at five years (369a, 1475).

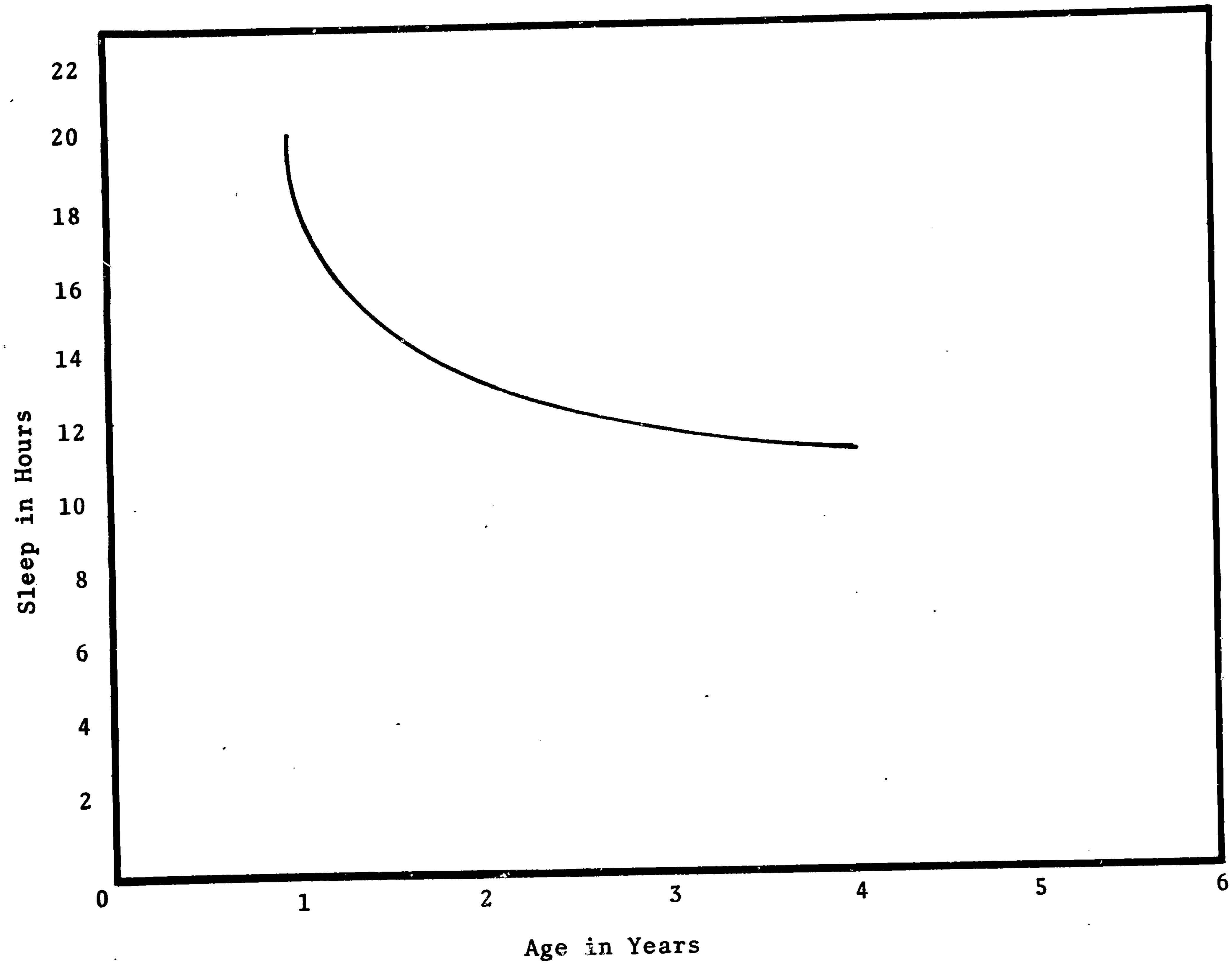
Eating Behavior

Eating patterns develop rapidly after birth through two years. After the age of two, food intake and eating patterns are culturally determined. A child's normative pattern can be predicted only with knowledge of his cultural, social and ethnic environment. There are, however, certain representative stages in the eating behavior of children.

About twenty-four hours after birth, the neonate will eat seven to eight times daily. Food intake at about one month is

Figure 4.

TRENDS IN SLEEP BEHAVIOR



equal to eighteen ounces, and at two months thirty-six ounces. At this age non-liquid foods can be substituted for bottle feeding. The infant can swallow food that is placed in his mouth; although he is unable to manipulate the food from the spoon by himself. With a great deal of spilling, this child is able to drink from a cup.

With less spilling, the six-month old will swallow once or twice from a cup and can take food from a spoon. His food intake is twenty four to twenty seven ounces daily, eating three to four meals a day.

The nine month old infant distinguishes and shows preference for certain solid foods. He begins to chew with lateral movements, and eats three times daily.

By twelve months, partial finger-feeding is possible and the infant is able to hold a cup. Between fourteen and sixteen months, the infant attempts to spoon feed himself, sit through meals, and hold his own cup. Spilling is greatly reduced. The child can pick up his spoon and feed himself at each meal at around eighteen months.

The child begins to differentiate food tastes and textures, distinguish among brands, consistency and colors, between eighteen and twenty four months. During this period, he develops the ability to grasp a spoon with his thumb and index finger, and he no longer requires constant attention at meals.

The quantity of food intake fluctuates greatly from thirty months on; by seventy-two months there is a large increase in appetite requiring many snacks.

Generally, the child of thirty-six months is able to eat well by himself and with others.

Writing and Drawing

Both writing and drawing are motor representations on paper, and, therefore, similar behaviors. Although for the adult, writing and drawing are distinct, for the child both are visual displays which employ gross organization regardless of previous training. Writing and drawing are antecedent to later written language ability.

The process of learning to draw is independent of the child's racial or economic origin. Children of primitive and sophisticated societies employ the same trial and error methods in the development of this behavior (1590). Children will begin a gross contact with the paper at ten months and employ a unilateral action at eleven months. Rubbing behavior with the dominant hand begins at one year, and there is a progression to a stroking behavior by fifteen months (37).

Writing begins at the right hand bottom of the paper at two years of age. By three years, writing is from the center to the bottom right corner. Writing from the center or top center is accomplished by five years, while writing from the top is seen at six. By seven years writing begins from the top left hand corner (37).

At two years, scribbling behavior is frequently observed. It is considered a natural and meaningful activity. Even in early scribbling, there is some primitive knowledge of figure-ground relationship. Scribbles are not randomly arranged but form definite patterns in the center, left half, or the right half of the paper. Twenty basic scribbles which make use of vertical, horizontal, diagonal, circular, waving and dotted lines have been identified. Seventeen major placement patterns have been recognized. These patterns are not forgotten but continue to emerge as the child's art develops (951).

One popular scribble ranges loosely over the paper on a diagonal axis leaving two corners empty. An equally popular scribbling looks like an arch, and another involves the use of up to two-thirds of the paper, leaving the rest blank (951). Later, scribbles are used to make people's hair, give smoke to chimneys and clouds to the sky. In fact, spontaneous scribbling is the foundation for the development of later shapes, designs and pictorial representations (951).

Following these first levels of development, implied shapes, using a variety of strokes, emerge. Only an implication of shape is seen, and there is no line of boundary. Around three years, outlined shapes including circles, triangles, squares, and other related shapes are drawn (951).

A further analysis (594) of drawing patterns includes the following sequence of stages: 1) the appearance of circle drawing (drawn from the top counter-clockwise) at eighteen months; 2) clockwise drawing, starting from the bottom of the circle, between thirty-eight and sixty-six months; and, 3) a return by older children (sixty-six to eighty-four months) to the technique of the youngest children.

Improvement in the ability to draw a square is also a function of age. Initially, a separate line is drawn to one continuous line. Children who use one continuous line have a tendency to draw the left side downward, and then continue in a counter clockwise direction. The tendency for all ages (eighteen to eighty-four months) is to draw the horizontal line from left to right, if the child is right handed, and to draw from right to left, if left handed (594).

The ability to draw a diamond shape is a function of increasing age. At three years, the ability is present but development is minimal. Not until eight years of age is development in this ability considered proficient. The formation of a diamond is most frequently made by a downward movement rather than an upward movement. Right handed children draw from the right to the left, while the reverse is true for left handed children (1486).

Preferences for rectangles become more similar to adult preferences as the child grows older (2 to 5 years). Preferences are seen as corresponding with age in a linear fashion (1769).

The implications of shape are different for the child than for the adult. The adult may see in the circular shape a variety of symbolic meanings, but to the child the circle is merely a pleasing shape. Waht may appear to the adult as odd shapes mixed with random scribblings may represent to the child a familiar environmental object (3).

The design stage is the next level of sophistication in this learning pattern. For the first time, shapes are put into structured forms. This behavior is noted from the time children draw shapes in outline form. Using more than two shapes, the number of combinations for the child is almost unlimited. A cross may be seen inside of a triangle, for instance. The dominating factors in children's art at this time are shapes which emerge in a balanced ratio (951).

All of the previous abilities (scribbles, placement patterns, shapes and designs) are utilized in the pictorial stage which occurs between the ages of four and five years. This stage can be divided into two parts: the early pictorial and the later pictorial. Human figures, houses, animals, and trees appear in the early drawings but later drawings are more clearly defined and, therefore, are more easily recognized and identified by adults (951).

In the early pictorial displays, the child is interested in the creation of structures pleasing to him. The early drawings of the human figure may appear strange to adults because the bodies may be characterized by a ball-like shape, or arms may jump out from the head; the child does not necessarily care whether or not the drawings resemble the similar environmental objects. What appear to be drawings of people to the adult may be the child's representation of some kind of animal. The child is working for something new and original within the forms he has previously utilized (951). Persuading the child to draw real-life objects as they appear to the adult may not be helpful to the child, and may even destroy his pleasure and pride in the creative act (951).

When the motor and cognitive capacity for creating structure and form has developed, letters and words can be constructed. The symbolic language structures can be taught and the child can begin conventional written communication.

Dressing Behavior

The growth in ability to dress oneself is to some extent a function of the particular environment within which the child is taught. Proficiency develops in a general relationship to fine motor coordination; however, it is also dependent on maturation. Preliminary development of self sufficient dressing is seen in the 6 month old infant's ability to remove his booties. Ability to remove pants occurs around the first birthday. At 1-1/2 years, zippers can be unzipped. Dressing ability grows rapidly during this age period. By age 2-1/2, a majority of children can completely undress, and, haphazardly, accomplish self dressing (590). Individual differences are great at this age however.

The great majority of children are able to completely dress and undress themselves by 4-1/2 to 5 years (See Fig. 5) (590,970).

TRENDS IN DRESSING ABILITY

Figure 5.

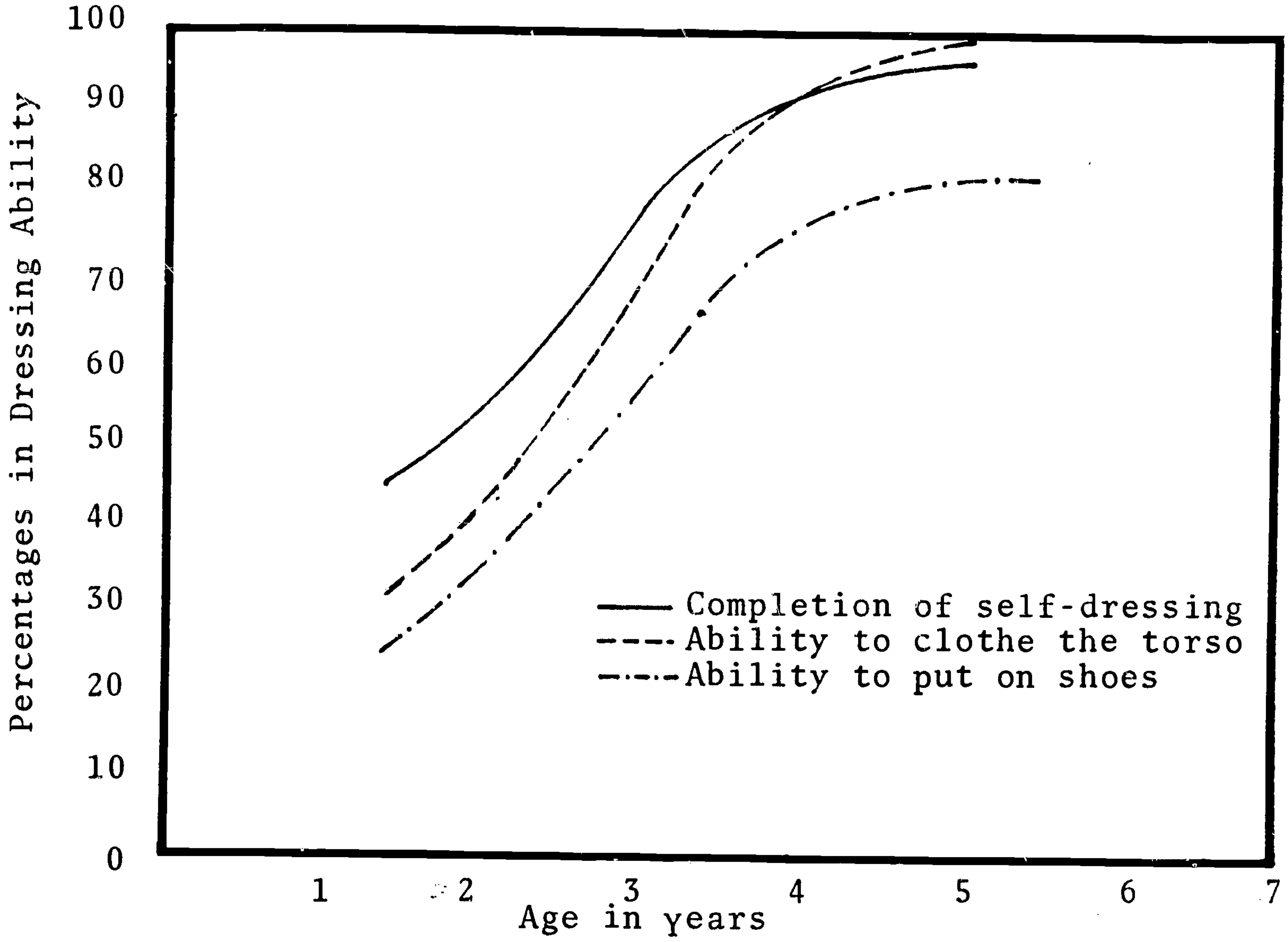
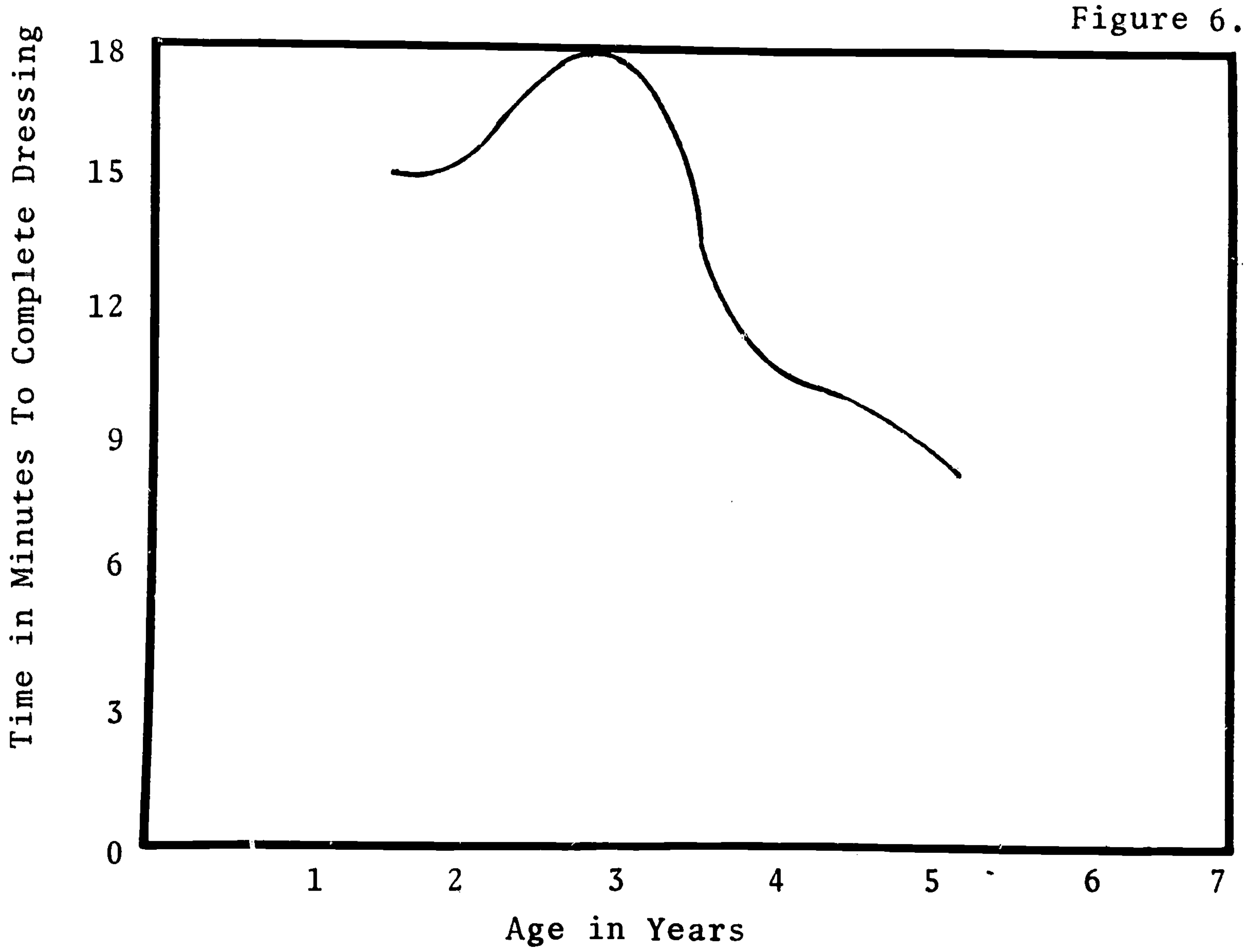


Figure 6.



A beginning ability to tie shoes may be seen as early as two years. A completely functional capability does not develop until between five and seven (590, 970).

Dressing ability depends on motivation as well as ability. Resistence to self dressing is noted until between the ages of 2-1/2 to 3 years. After this period, dressing ability becomes a socially valued possession. This motivational function in dressing development is reflected in the amount of time required by the child to complete the task (See Figure 6) (828,970).

SECTION III - COGNITION

Cognition has its basis in the development of sensation and perception. As the sensory modalities transmit increasingly more complex stimulus patterns to the child they are modified by it through perceptual processes. The perceptual processes are a function of experience, and very rapidly become so complex that they require organization and conceptualization; this leads to the development of cognition. An example of the beginnings of concept formation can be seen in visual discrimination. Differential discriminations are made first on the basis of two, and then three dimensions.

There is considerable controversy regarding the variables on which concept formation is based, however. Four factors which must be considered are maturation, physical experience, social interactions and the orderliness of the development process. The first of these is taken for granted. The second, while contributing, is not adequate by itself because some physical stimuli are illusory. Social interaction has been inadequate by itself because of experimental evidence which reveals an inability to teach concepts prior to developmental readiness (530).

The orderliness of the developing process whereby successive functional conceptual structures are produced is not age specific, and identifies only a general order of development.

The development of cognitive abilities has been discussed in the literature with emphasis on both the process and the content of cognition.

Process of Cognitive Development

Considerable research has been conducted to investigate the process of cognitive development, without attaining significant agreement between authors. Reviewing the many ramifications of the problem has led to the conclusion that cognitive development can be divided into four steps: 1) ability for intra-modality organization; 2) ability for inter-modality organization; 3) ability to recognize, organize and generalize inter-modality similarities and differences into groups or classes; 4) ability to utilize modalities as abstract concepts.

Intra-Modality Organization. This first phase of cognitive development has the sensory/perceptual abilities as its antecedent. In its simplest stage, this reflects the ability to discriminate objects in a single modality such as the size and color discrimination studies reported in the section on vision. At ages 2-1/2 to 3-1/2, an 8% ability to classify objects by common attributes (e.g., two or four legged animals, as well as several other functional classes) is found. Between 4-1/2 and 5-1/2 ability increases from 25% to 61%. Following this age break, the increases tend to level off (895).

When differentiating between the ability to identify on absolute and relative scales, it is found that size differentiations ability on comparative basis is complete at two years. The ability to be comparative in the discrimination and use a relative scale developed at a much later age. (146, 1852). This stage of concept development is independent of verbal abilities. Conversely, it must also be emphasized that apparent verbal generalization at this stage is merely labeling, and not abstract concept verbalization.

<u>Inter-Modality Organization</u>. During this stage of the development of cognitive structures the process of correlated differentiation and generalization begins. As conceptualization develops, this interaction between discrimination and grouping is initiated. Young children, for example, are better able to discriminate minute differences in stimuli than adults (1551). At this stage of conceptual development the child still focuses on the perceptual details, while adults, with their complex conceptual systems, generalize. Obviously, then, conceptual ability must develop as an increasing inability to discriminate between all stimuli, and organize them into some grouping. These trends develop aroung the fourth to fifth year of life. Relationships between stimulus dimensions begin to

form with color/form relationships among the first to interact. Making use of manipulation as well as visual stimulation (964) it is found that 4, 5 and 6 year olds are better able to discriminate among two-dimensional than among three-dimensional stimuli. Four year olds find manipulation an interference to the discriminations. Five year olds find it of assistance; and, six year olds perform adequately with or without its help. The four year old child just developing the inter-modality organization ability finds any extraneous stimuli interfering; while for the five year old, functioning in this second phase of cognitive development, the cue is an aid. Size discrimination is a simple concept and develops early, but transposition requires the utilization of the size modality in relation with form. Several studies (9, 1711) found the earliest indication of this ability at about 4, with general mastery at about 5-1/2. These studies also show that the child's ability at this stage of development does not differ significantly from adult performance.

Further studies of relative size (791, 1776) indicated that two year olds are totally unable to choose the "middle-sized" from three objects. There is some developing ability in this task at three years of age, with general accuracy achieved between four and five years. It is further indicated that form and color variations in the stimuli have no effect during the 2 to 4-1/2 year old age period. This reflects the ability of these children to organize inter-modality stimuli and utilize only the relevant. The second stage of cognitive development is, therefore, the ability ot organize and discriminate between different modalities.

Organization and Generalization Between Modalities. The third stage of cognitive development is the one of greatest interest to the educator and behavioral scientist. In this stage, the child develops the ability to generalize concepts. This ability is just preliminary to the development of abstract concepts.

One of the modalities developing during this stage is the generalization of verbal concepts. One of the ways in which his environment is structured throughout the child's life is the verbalization used to assist him in identifying that environment. In the prior stages of concept formation, language was used only for labeling, or identifying; in this stage, language begins to be used in organizing the environment.

Conceptual ability functions within a rather simple structure until there is a good functional use of word symbols (1882a, 1882b, 275a). A more interrelational function is of greater accuracy, however. Early sentence use has been recognized at two years of age. Between 2-1/2 and 3 years of age, a functional language ability is developing. Correct language structure (more difficult than functional ability) is, in fact, practiced at 42% of adult ability by age three. Although a three year old child can understand commands in terms of differential behavior required by those commands, he can not coordinate objective directional meanings with their appropriate motor behaviors until between four and four and one-half (1133a), e.g., a green traffic light does not in and of itself command a subject to "go" until that age. Ability to learn conceptual discriminations increases greatly, with or without the aid of verbal identification, from age three to age five (1857). At ages between three and five years, for instance, items such as a disc, pencil, book, purse, screwdriver, cylinder, and Ivory soap are readily categorized as either a "plate" or a "stick". By age five, however, there is a hesitancy to so readily group these objects in that way (1866).

Conversely, verbal development has distinct patterns paralleling cognitive development (1020). Three year olds are able to identify a size variable in a discrimination task, but do not mention it as necessary to accomplishing the task. Among four year olds, however, 25% spontaneously verbalize the principle during the process of accomplishing the task and 40% are able to state the principle when questioned after the task is completed. A total of 85%

fall into one or the other of these groups at five years of age. Six year olds perform similarly, with 64% spontaneously stating the principle.

As soon as this stage of generalization in cognitive structuring is reached (ages 5-1/2-6-1/2) a distinct superiority is found in those who learn generalized verbal concepts over those who simply learn verbal labels of identification (1706). While verbal ability is of assistance in conceptual growth, this third cognitive stage must be developed before verbalization can be used in concept organization.

The specific way in which stimuli are classified is an important variable in this stage. Nursery school children prefer to classify objects by similarities when a comparison is made (162) yet, when individual identifications are made, evidence of previously unexpressed class and function concepts are exhibited. This apparent preference for conceptual categorization by similarities may in turn influence the order of selection, and the learning of different conceptual dimensions (1729). Kindergarten children, for example, are able to understand a general conceptual class (i.e., their schoolroom student body) with sub-classes ("boys" and "girls") contained within it (447). Grouping by functional operation instead of by formal similarities is difficult until the third grade, however.

Among first graders, this developmental growth is found to result in early reflective tendencies which then tend to produce inductive reasoning processes (927). This reasoning is observed to contain response uncertainty.

By second grade, analytical thinkers are easily differentiated from non-analytical thinkers (1347). Analytical thinkers function more slowly but are not impaired when forced to respond rapidly to conceptual examination. Non-analytical thinkers, forced to respond more slowly, become more analytical. Essentially, the child who has reached this stage of cognitive development possesses the basis for the learning tasks required in school situations.

Abstract Concepts. This is the ability to organize concepts into abstract classifications without any specific stimuli impinging on the child. This stage of development usually occurs in the primary grades and is beyond the developmental levels considered in this study.

Content

Although the determination of the process of cognitive development in the child is difficult to identify, the structure as reflected in the content is more readily determined.

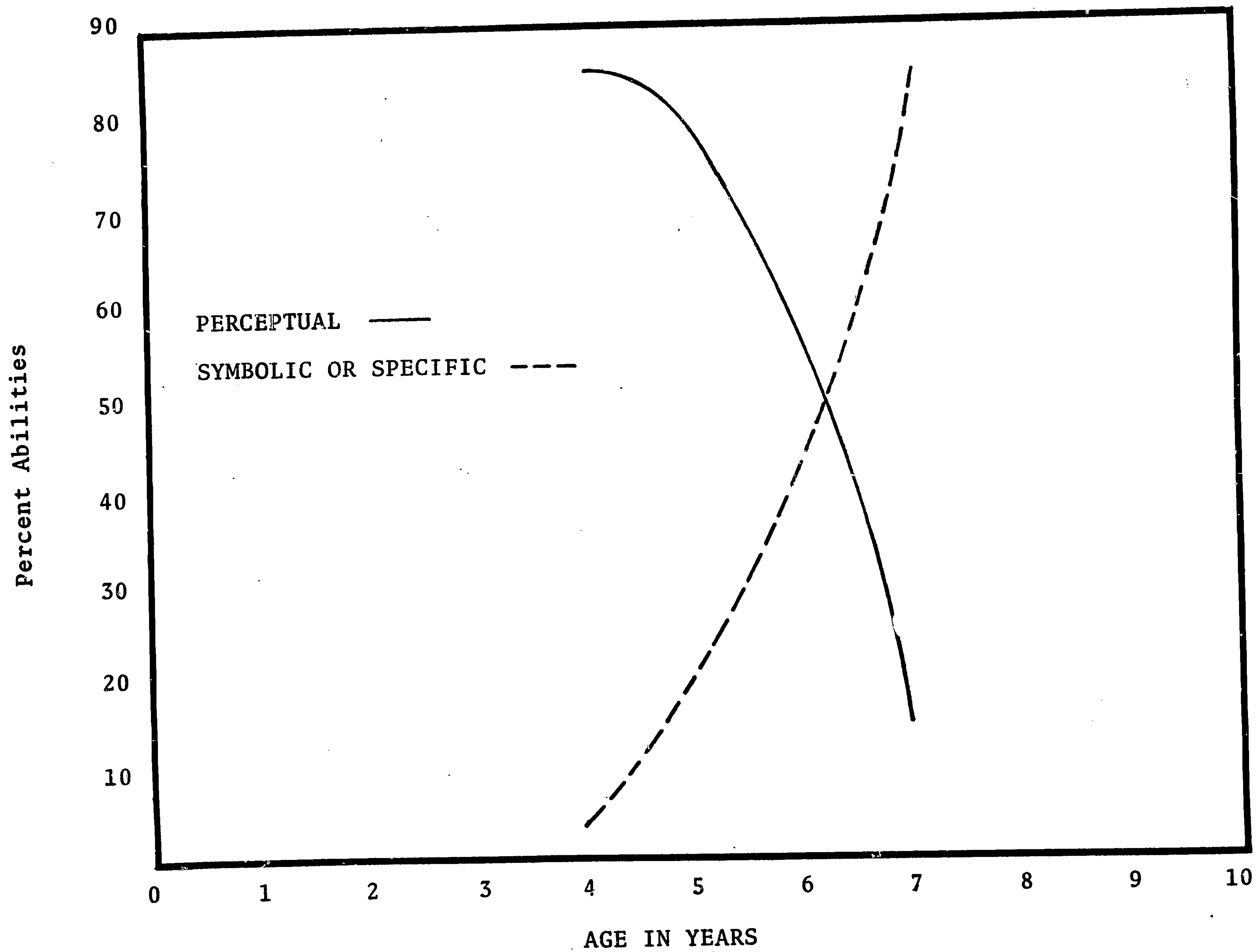
A variety of conceptual evaluations, loosely termed conservation, have been produced or stimulated through the work of Jean Piaget. These have attempted to identify specific stages in the understanding of abstract qualities of such concepts as size, weight and volume. Piaget found understanding of these material attributes beginning around 8, 10 and 12 years, respectively (530). The affixing of age-rated abilities, however, is dependent on the degree of proficiency demanded in order to satisfy each experimenter's personal definition of conservation. Jan Smedslund, for instance, requires a logical or semi-logical explanation before he acknowledges the acquisition of conservation concepts. Jerome S. Bruner requires simply the ability to indicate equivalence behaviorally. Bruner, therefore, dates this acquisition earlier than does Smedslund (702).

Actually the concept under consideration is related to the third stage of cognitive development when several modalities have to be organized, and specific concepts generalized. This, for example, occurs when the child develops the concept that volume is constant, independent of its shape; or that weight is independent of size. That is, different objects of equal size may differ in mass and, therefore, weight. It follows that one should consider this development of the ability to conceptualize order across modalities as constancy.

The shift from the second cognitive process level (intermodality discrimination ability) to the third level has its beginning between five and six, and is reflected in Figure 7 (1431). There is considerable variation in the ages at which different experimenters report the development of specific cognitive abilities. These differences are apparently due to

Figure 7.

TYPES OF EXPLANATION GIVEN FOR CONSTANCY



definitional variations (455) Piaget's work is essentially an age-related evaluation of conservation of substance equivalence while experimental studies lately have evaluated a conservation and substance identity.

The one consistent result has been that intelligence and experience are insignificant as compared to developmental levels (513, 533, 1635a, 1907).

<u>Size, Weight, Volume</u>

Accurate size constancy judgments can be made between five and six years (323, 454, 487), while the concept of object roundness is evidenced at age three (1109). Rotation of the object is not understood until after age five (296). This would indicate that abstract size judgment develops closer to six than to five years. The ability to compare weight differences of between two and three ounces begins about age four, but the ability to judge weight independent of volume does not develop until eight to ten years. Concepts of volume are beginning to be understood at age nine (1120). All of the constancy abilities are evidenced one to two years before the child can verbalize an explanation for the response (446).

<u>Prediction</u>

Investigations of the development of predictive concepts of probability in children show that five year olds are just beginning to develop predictive ratios, but are unable to change the pattern of response as the simple ratio was varied (185, 768, 1920). A tendency to respond to events individually instead of in relation to a pattern, as well as a tendency to alternate responses in an effort to "be fair" or "take turns" are evident (349, 686, 703, 910, 1333). This ability at age five to six is still in the second phase of cognitive development. It is not until much later (ten or eleven) that the generalized concept of probability develops and, even then, training and specific experience assists the development (349, 686, 1715).

Number Concepts

Ability to conceptualize and use abstract numbers is one of the most complex of the developmental areas (684a, 776a). The ability to name numbers and count objects develop at ages three to four (1599), but this is simply verbal labeling, and does not reflect any cognition of numerical relationships.

Ability to count ten objects from various groupings is not seen until age five (486). Moveover, this ability is not varied by socio-economic level. At age five and above, however, verbal teaching of rules is of assistance in conceptual growth (124). By age six, there is a general ability to compare quantities by their number, and gather objects by number as they are seen in a standard group (446, 1110, 1906). Ability to gather objects by a verbally required number instead of by matching a standard is a later development (1906). Generally, children under age five understand little of quantitative concepts, while children over seven years approach full understanding (810). By ages six and seven, experience of the reversability of quantitative manipulations is an asset to understanding (1829). An understanding of economics and money begins development between ages seven and eight (370). By second grade (ages seven to eight), a more sophisticated ability to manipulate numbers in addition, subtraction, multiplication and division is developed (710). As an abstract concept of quantities develops and becomes manageable, so do a variety of related concepts. Ability to evaluate proportions is in the process of development during the sixth year (627). Another of these concepts is the judgment of length [length has been found to develop prior to area, contrary to Piaget (125)]. Adequate use of equalities of length occurs at around eight, and includes the ability to perceive illusions of length (530, 1093, 1303, 1637).

A third concept dependent upon accurate usage in quantitative development is the ability to understand time. The child's use of time-oriented terminology is noted in the simple "now" at twenty-one months, the time of day at age seven, and the year and day of month, at eight years (36). It is not until about age seven, however, that an actual appreciation of time concepts is seen. Judgment of the duration of thirty seconds is not accurate until age eight (641). Abstract concepts such as thinking, vision, names and dreams are perceived as concrete reality until ages five to six. The

The concrete level of concept utilization shifts to a mediation from realism (age 7-8) in that the child can differentiate the concepts from the person with whom they are associated, but they remain concrete entities. The third generalized level of cognition, when these concepts are not changeable and manipulated, does not develop until age ten (1396, 1397). Concrete terms develop in a similar pattern. Between ages 5 and 6, reasoning develops from animistic and artificial origin concepts to a naturalistic idea of internal dynamism. From six to eight years, this dynamic quality is externalized. After age eight, the static qualities of material are understood (371, 1396, 1397). Some of the specific concepts are obviously influenced by experiential and environmental factors (1335).

The development of religious conceptions follows the growth observed in other abstract areas. A denomination is first seen globally. At between seven and nine, individual practices and functional aspects of the religion are the essence of the concept. The denomination is identified by its peculiar belief content beginning around age nine (450). Moral reasoning and development, however, are not indicative of correlated internal value for justice. Moral development is greatly influenced by the environmental situation (183, 743).

Environmental Influence

The influence of environment on cognitive development is difficult to evaluate because of great individual differences. A distinct difference in language skills is found between different socio-economic classes (892). This factor, considered in conjunction with the mediating effect of language in the development of the third level of cognitive (generalized) development, would lead one to anticipate delayed cognitive development in children with lower language skills. The delayed cognitive development would also influence performance on standard "Intelligence" measuring instruments and explain why traditional indices of intelligence favor children reared at home rather than those institutionally reared (619, 1443). Obviously, this rating will change significantly as the child changes environments, as has been proved (468, 1871, 1885). It can be concluded that the essential development of the cognition abilities to discriminate, organize and generalize between and within modalities occurs within the age range of this study. The ability of children to use cognitive capabilities in problem solving requires the development of abstract reasoning (1001, 1170). Many authors label early discrimination abilities as the ability for problem solving, e.g., at nine months, only twenty percent are able to rotate a bar to obtain a toy, and at one year 83% are able to achieve the solution (1491). The ability to solve intermodality problems is often labeled as abstract concept use (241), but is merely an operation in the second stage of cognitive development. Ability to solve problems of retention and transfer of training occurs in first graders (47) but is only the third level of cognitive development.

Complex problems which require abstract concept development, such as double alternation problems cannot be solved until between ages eleven and twelve years (800). Ability at problem solving requires the fourth level of cognitive development and is beyond the scope of this study, which is limited to the preschool child.

MEMORY

Memory of conceptual areas is necessary to manipulation, redefinition, and use of those concepts. It is important to distinguish between recall and recognition; recall is much more difficult (4a, 838).

In the infant, memory span increases from a one minute period at one year of age to an eight minute period by fifteen months (788a, 832a). The two year old is capable of achieving a seventeen minute memory span.

Most preschool children are able to remember concrete items (e.g., object locations) for three days, and many are able to recall locations up to a one-month period (1626a). The material to be held in memory is itself a determinant of recall skill: pictorial materials are significantly easier to remember than verbal materials until about age nine (428a).

In a test situation the preschool age group when offered various unfamiliar items is able to remember or recall: approximately five digits, four concrete words, three abstract words, or fifteen syllable from a sentence. They are unable to recall digits in reverse order (838).

Complicated recall tasks can usually be achieved accurately by eight year olds.

Intelligence is related to accuracy rather than to capacity in retention (1513a). Memory is aided, during short periods, by the use of reward and conceptual labels (147).

As age increases, there is an increasing tendency to use paradigmatic categorization (1152). Subjective organization of memory units begins development at school age, but is not fully realized until young adult years (1049).

SECTION IV - COMMUNICATION

ORAL COMMUNICATION

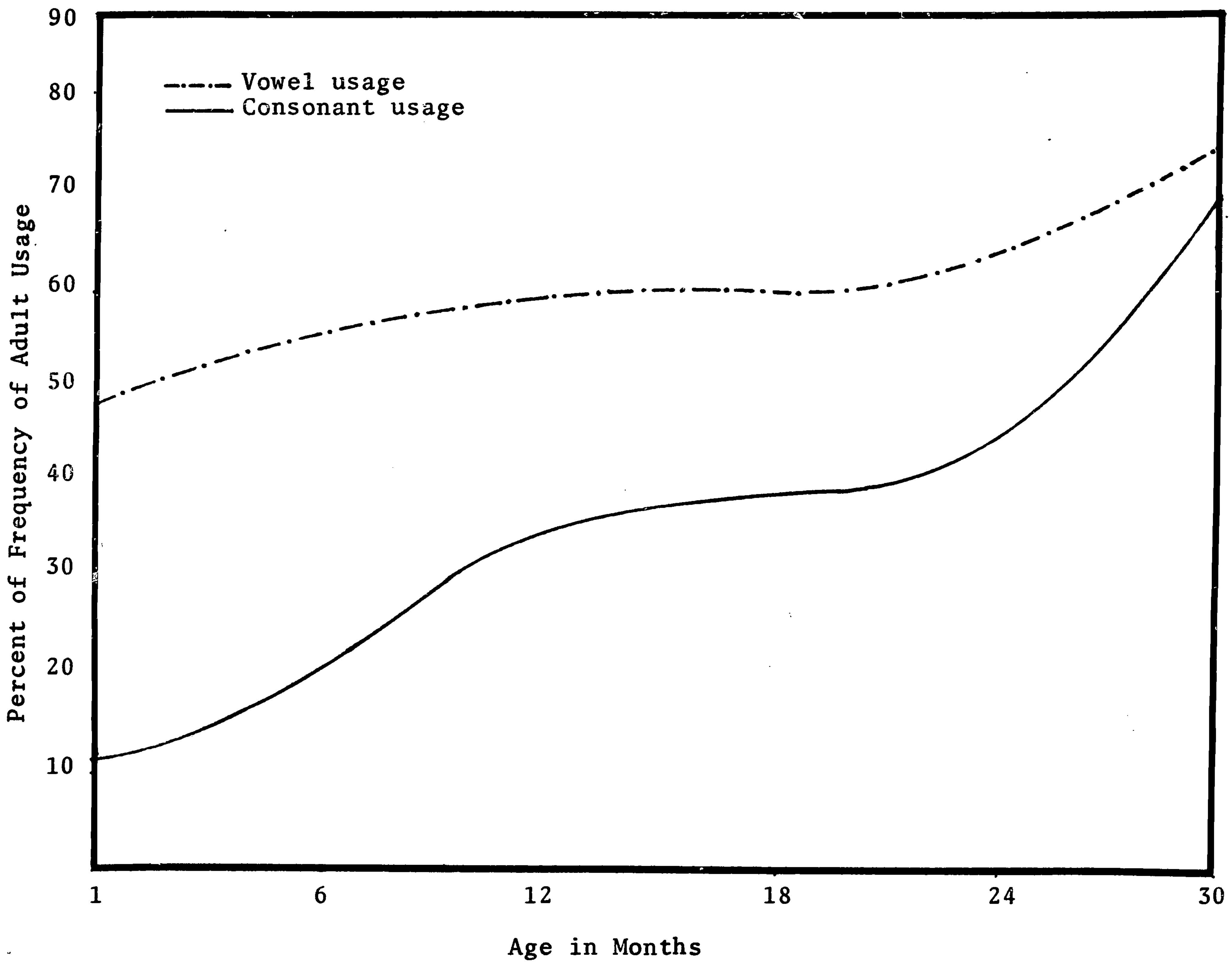
Structure and Content

The consonants heard during the first 30 days of life include: 'm' in conjunction with 'a', as in 'ma' (at); 'n' as is 'nga' (nat); 'g' as in 'gah'; 'h' as in 'ha' (at); 'w' as in 'wah' (at); 'r' as in 'burn' (very slight sound); and, 'y' as in 'yah' (at). Vowels heard include: 'o' as in 'owl'; 'e' as in 'feel'; 'oo' as in 'pool'; 'a' as in 'an'; and, 'a' as in 'father' (relatively rare). Voice, grunt, differential cries for pain, hunger and discomfort, and small throaty voices are heard during this same period (170, 1185, 1312).

Beginning at birth, 50% of the vocalizations heard are vowel sounds; and, by age 2 months this figure has climbed to 72%. The front consonants (dental/labial) begin at about 6 to 8 months, and may be connected, in some way, with the erruption of deciduous teeth. Up to the age of two the vowel sounds develop from the front to the back and consonants develop back to front (1186). From one month to six months they climb slightly; climb again to a higher level at one; remain at this level from one to two; and, then rise sharply from two to two and a half (See Figure 8) (851, 852). At this time it appears that the child's vowel and consonant usage percentage patterns are similar to adult vowel and consonant usage percentage patterns. A separate analysis of the vowel sounds in terms of percentage of adult usage is recorded in Figure 9 (856, 857).

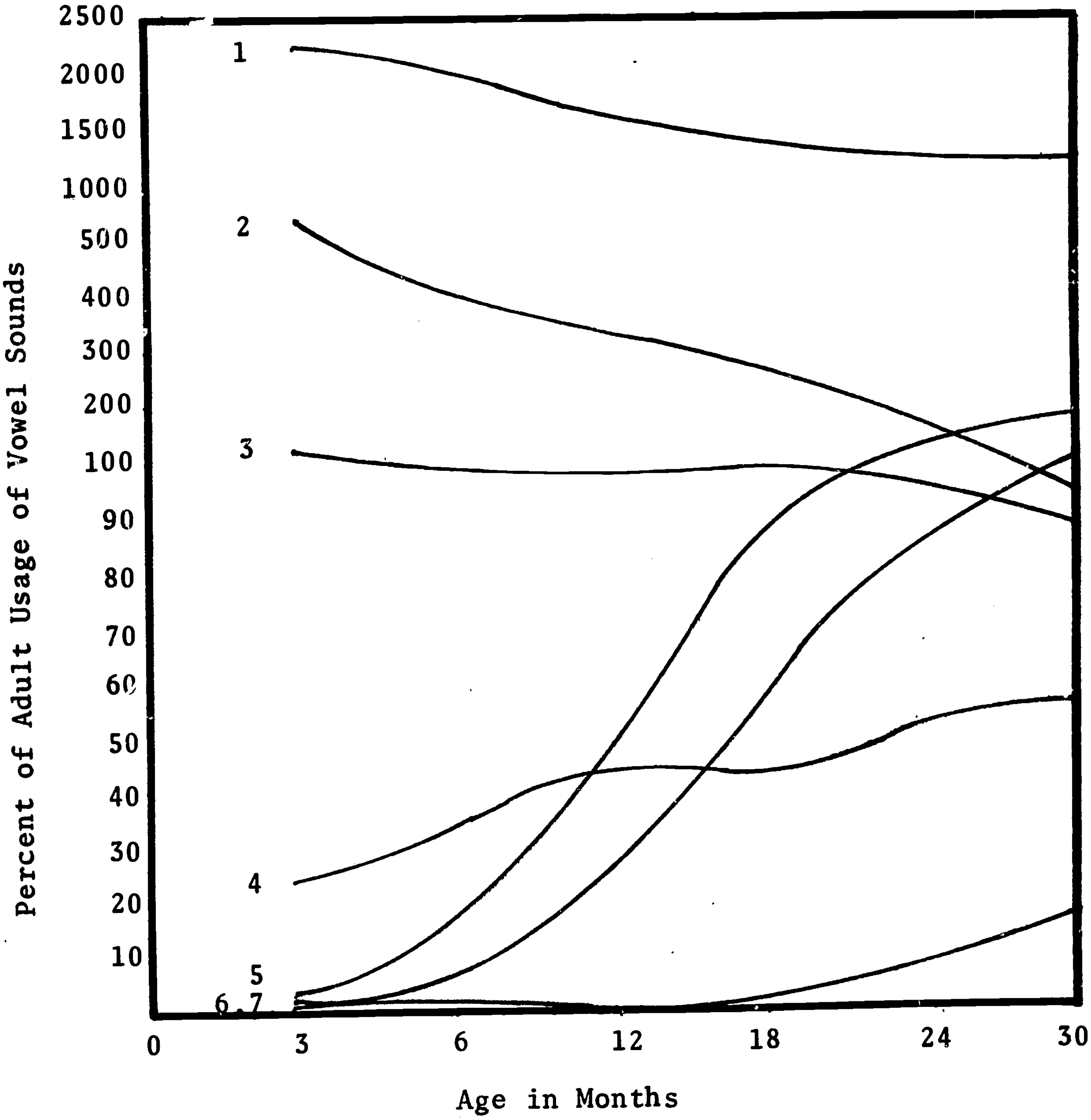
DEVELOPMENT OF VOWEL AND CONSONANT USAGE IN THE INFANT

Figure 8.



INFANTS' USE OF VOWEL SOUNDS

Figure 9.



1. u as in "up"
2. e as in "let"
3. i as in "hit"
4. a as in "fat"
5. e as in "meet"
6. o as in "go"
7. a as in "ago"

The consonant-type/vowel-type vocalization rate increases gradually from 2 to 8 months; jumps from 8 months up to a year; stabilizes from 1 to 1-1/2; and, then rises again from 1-1/2 to 2-1/2 years. The consonant-frequency/vowel-frequency vocalization rate shows the same pattern just described, with both ratios making approximately the same absolute gain during the 3 to 30 month period. The consonant-frequency/vowel-frequency ratio increases with age in a pattern similar to that of percent of adult usage of vowels and frequency.

The earliest vocalizations of the infant contain many more vowels than consonants. In terms of percent of adult usage, both consonant and vowel usage show similar patterns, but the consonant usage rises dramatically from one month to two and one-half years (especially between two and two and one-half), and is about equal to percent of adult vowel usage by the time the child is two and one-half (851, 852).

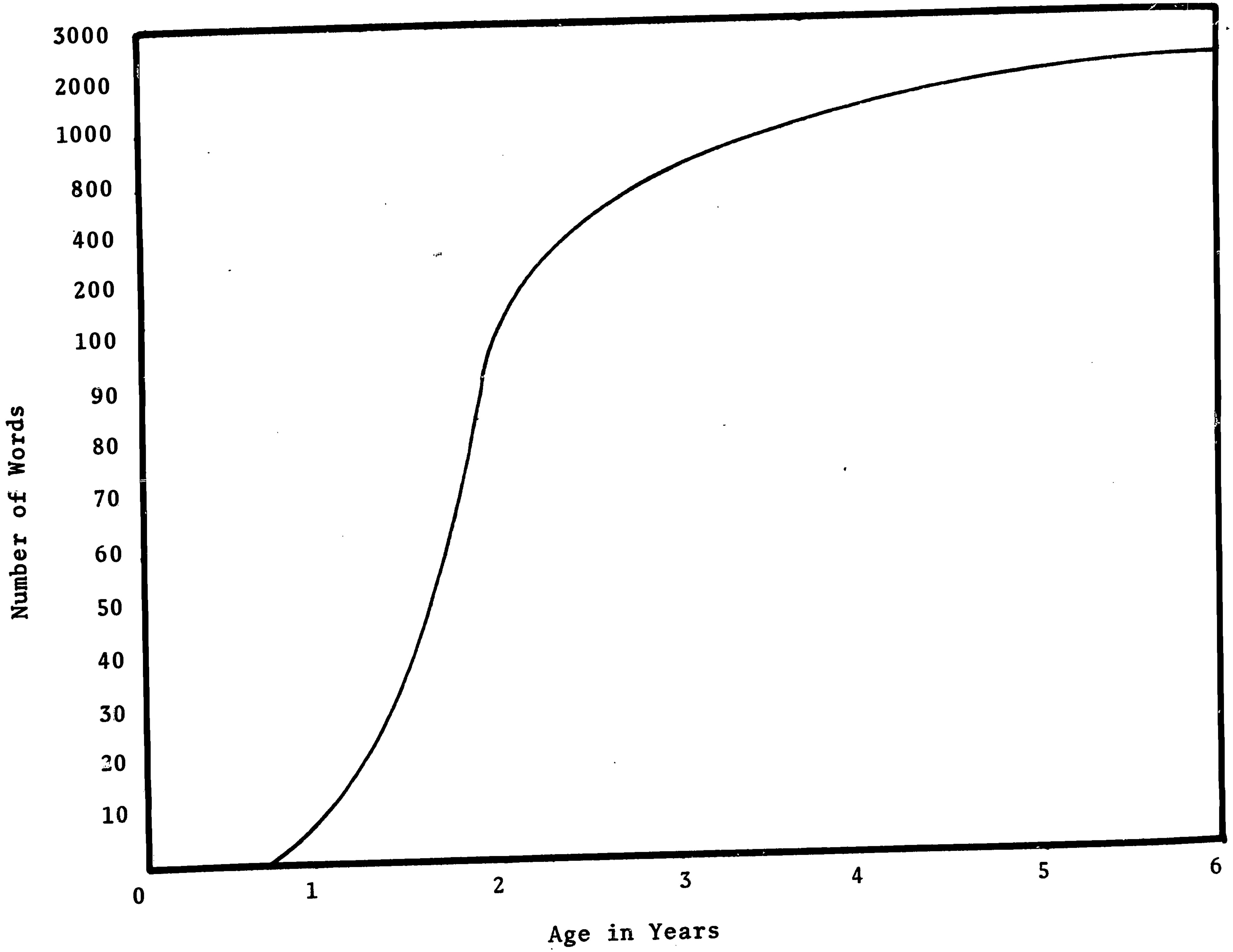
Phoneme types (mean number) go from 7.4 at one month to 27.2 at two and one-half years. No sex differences are found, and by 29 to 30 months, children are able to produce about 77% of adult speech sounds (851, 852).

Vocabulary

Vocabulary develops rapidly from about 9 months to 3 years with the largest gain occuring during the 1-1/2 to 2 year old age period. After three years there is a decline in the rate of vocabulary development. Figure 10 shows this pattern of development.

Figure 10.

DEVELOPMENT OF VOCABULARY



There are some sex differences, favoring, in most cases, girls, in vocabulary usage (1554). Girls excel in length of response, quality of responses (i.e., word combinations and sentences), and mean number of different words spoken. Boys have a lower percentage of incomplete responses (523, 1554). These sex differences have been noted among nursery school children (523).

Mean sentence length increases with age, and sentence development has discernable stages: 1) single words at 13-20 months; 2) early sentences at 21-29 months; 3) short sentences (3 or more words) at 29-36 months; and, 4) a transition stage (5 or more words) at 36-54 months (1183, 1185, 1922).

The following table reflects the stages of speech development (584, 1185).

EARLY DEVELOPMENT OF SPEECH

Developmental Stages	Approx. Age in Months
Responds to vocalizations	1
Different vocalizations distinguished	1 - 3
Cooing behavior begins	2 - 4
Vocalizes two syllables	2 - 3
Self-initiated sound play occurs and several well-defined syllables are vocalized	4 - 9
First imitative word occurs	10 -11
Initiation of words; says one word	11 -12
Says two or more words	11 -17
Joins two words	18 -19
Uses words in combination	19 -24
Uses first pronoun, first phrases & first sentences	22 -23
Uses simple sentences and phrases	23 -24
Uses pronouns, past tense, plurals and repeats six syllables	30 -36
Uses one or more descriptive phrases	48 -50
Repeats four digits and speaks with non-infantile articulation	60

When repeating a model sentence previously spoken by the mother, children tend to omit passive inflection, auxilliaries, and prepositions, but they retain meaningful content. For example: Mother: "Baby is in the highchair". Child: "Baby highchair". (229c). Use of determiners, numeratives and corresponding pronouns increases with age, but the proportion of these to total words remains constant from 2-1/2 to 4-1/2 years. The usage of "A" increases (3-1/2 to 4-1/2 years) as the frequency of adjective-descriptive phrases increases (274).

Use of declarative sentences increases rapidly until age three, then levels off. Interrogative and imperative sentence usage increases until about four years,until by age eight their usage decreases to approximately 8% and 3%, respectively (590, 1753).

Clarity of articulation develops very early, so that at age one, 50% of the child's simple words are understood by strangers. By two years of age the child, using a 2 or 3 word sentence, is 80% intelligible to strangers (1817). By 18 months the child is already experimenting with voice pitch, and the flow of speech. The child of two years resorts to strong repetition, and the use of various sentence types. Normal voice control and central inflection occur at three years; and high volume and whispering are common by the age of three and a half. The child of four and a half is able to employ his own style of communication and expression as tools of his personality (1245, 1427).

Language Usage

The use of correct language structure does not imply that awareness of the meaning of the words develops concurrently. The development of language meaning parallels conceptual development. Visual color discrimination ability has been shown at below age two (275A) but careful investigation revealed that the child was discriminating absolute stimuli rather than using color as a concept. In the same way, at this age many words are used as labels and this must not be interpreted as reflecting verbal concepts development. Several studies have found that growth in vocabulary does not correlate directly with the development of concepts related to that vocabulary (1819, 1866). Conceptual vocabulary growth develops rapidly from between 3 and 5 years. Generally, verbal labeling precedes concept development which is followed by correct concept verbalization. Between 3 and 5 years, for example, items such as a disc, pencil, book, purse, screwdriver, cylinder, and Ivory soap were identified as either a "plate" or a "stick". By age 5, however, there was a hesitancy to readily group these objects in the above manner.

This age is also the most significant phase in the development of identification-classification abilities. At ages 2-1/2 and 3-1/2, there is less than a 10% ability to class familiar objects by common attributes (e.g., two or four-legged animals) although the child labels correctly. At this stage of development many labels are personal, such as "doll", indicating a personal possession rather than a class of objects. The comprehension of verbal concepts develops to about 40% of language used by age 5, but does not reach 90% until age 9. It is, therefore, important not to interpret verbal language as reflecting meaning.

Correlation Between Oral Communication and Mental Age

Word fluency is more closely related to mental age than to chronological age, and appears to have some predictive value from the age of five (605). Study of language acquisition and its relation to IQ and other measures of general ability at both six months and eighteen months indicated significant sex differences in the prediction from speech development of intellectual abilities three to five years later. Future performance of the girls was more accurately predictable than was that of the boys (523, 1280). The best indices for speech improvement appear to be number of words per sentence and mean number of errors per sentence.

Socioeconomic and Cultural Differences in Language Acquisition and Usage.

Studies of children 18-72 mos. old found those in the upper socioeconomic group (children of business or professional parents) more precocious in language development than children whose parents were farmers, skilled laborers or members of lower socioeconomic groups (1264, 1654, 1656, 1658). This is to be expected because early exposure at least assures an adequate vocabulary even before cognitive verbalization.

Studies of bilingualism in preschool children indicate that children from bilingual homes are not advanced enough in either language to begin school, when compared to a group of monolingual children. It is also noted that the bilingual child is significantly poorer in vocabulary development (1656, 1658).

WRITTEN LANGUAGE

The antecedent of written language is the motor development associated with scribbling and drawing which are discussed in the physiological section.

A four year old child can print the first and second letter of names, and make marks for the rest. At five years the child can color within lines, draw outlines and simple forms and, by five and a half years can print his own name. At age six he can print capital letters. The child of seven can print sentences (about two lines), and at eight years write or print all letters and numbers accurately (590). Because of the earlier development of the motor skills associated with writing and the reinforcement of manual activities, it is found that the child is able to learn to write at an earlier developmental stage than he is able to learn to read.

General Reading Ability and Reading Difficulties

Learning studies involving reading show that requiring the child between 3 to 8 to make an oral discrimination response is significantly more effective in his learning to read than is permitting a non-oral response (1857). Between 5 and 6 years visual discrimination pretraining of a word list facilitates the actual trial discrimination if the pre-trial stimuli are identical or similar to the task stimuli (1290). During this same age period, any kind of pretraining which forces attention on each letter is less likely to lead to subsequent reading errors than training which allows the child to identify words on the basis of single features (1555). This is confirmed by memory studies which show that up to age 8, children have considerable difficulty in retaining verbal images. Adults, on the other hand, retain words better than pictures (428A).

Experiments in motivating first graders interest in reading (1387) reveal that children who experience a daily session (30 minutes) of planning and executing reading activities: 1) take more books from the library; 2) mention reading more often in a free response interview; and 3) answer more reading oriented questions on the "reading interest inventory" than "only taught to read" control group.

SECTION V - SOCIALIZATION AND PERSONALITY

In this section we consider those aspects of the environment which have a significant effect on the developing child. It is generally agreed that personality development is related and is synchronous with language, cognitive, visual and neuromuscular development. The development of the socialized being involves many variables including age, physical development, family structure, parental expectations, emotional expression, and peer-group relations. This section states the effects of these variables on children from birth to eight years. Older groups of children will be mentioned but only in an attempt to make more explicit the meanings of behaviors at earlier points in time.

The presentation of data has been primarily atheoretical in nature. Interpretations have been made when it has appeared to the authors that the implication from the research is so strong that it deserves clarity in statement.

The first discussion, the family, emphasizes the effects of structure, the expectations of parents, and the developmental correlates of responsibility and independence. The next part discusses in some detail the principle behavioral components in socialization. The development of affective expression is specified with particular interest given to the expression of aggression, fear and anxiety.

The next discussion presents and summarizes research on roles, motivation and discrimination. The final part investigates the peer group, school, and ethnic and cultural differences. Also included is a summary of some of the problems that children may encounter in these social settings.

THE FAMILY

Aspects of family structure which have been investigated include birth order, ordinal position and spacing between siblings. These incidental variables have an impact on the growth and development of the child. They are not, however, to be considered without reference to the attitudes and expectations that characterize the family structure. The closer examination of attitudes and expectations leads to a more explicit conceptualization of the wide range of child behaviors.

The composition of the family affects the development of language, interests, intelligence, sex identity, attitudes and responsibility.

In investigating language development, it is found that first-born children are able to verbalize more articulately than second-born children. The greater the spacing between children, the more accurate the articulation appears to be. Stuttering behavior is related to conflict and jealousy, resulting from age and sex differences in the family. The amount of stuttering is not only related to frustrations but to the child's opportunity or inopportunity to verbalize their frustrations (998).

Sex role identification is also related to family composition. Boys with a slightly older sister tend to be somewhat sissified. In a similar manner, girls with a slightly older brother are rated as "tomboyish" in comparison with girls having an older sister. Neither "tomboyishness" nor "sissiness" occurs when the gap in age between siblings increases. These observations suggest the impact that siblings may have on the sex role identification of a child (997).

The Primary Mental Abilities Test results reveal higher scores for children with male siblings than for children with female siblings. This may indicate that older brothers, because of their activity level and aggressiveness, enrich the home environment. Older brothers may be providing a significant degree of stimulation for intellectual development (993).

The interests of children also appear to be affected by siblings. More specifically, the ordinal position and the spacing of siblings influence the range of the child's interests. Second-born children appear to have a wider variety of interests than first-borns. With the child of broad interests, there is usually found to be a wide age difference between that child and a brother or sister (993).

Even when the spacing between siblings is minimal, first-borns are the better planners in the family. It may be that first-borns, necessarily assuming more responsibility, must, because of the necessity, excel at planning in order to maintain their role in the family (993).

It is also reported that with children ranging in age from two to eight, first-borns with an opposite sex sibling are healthier than children with a same-sex sibling. With second-born children, however, the sibs of the same sex are healthier than those with an opposite sex sibling (996).

Children with a male sibling are less sensitive than those children with a female sibling. Children with an opposite sex sibling, and either a younger or older sibling by two to four years, receive a higher rating in self-confidence. An attitude of cheerfulness favors children whose siblings are dissimilar in sex. Second-born boys display a greater number of nervous habits than second-born girls; and, second-born boys display a greater tendency to become angry than other sibs (997). Girls with a sibling within two years of their own age are judged to be friendlier to adults than boys are (995).

In general, boys are more active, angry, quarrelsome, insistent on rights, and less cooperative. They indicate a greater tendency to provoke other children by teasing, and a greater tendency to respond to fear and frustration. In contrast, girls are more obedient, more tenacious of purpose, and more responsible and affectionate (997).

Specific characteristics of the family structure appear to have an effect on the children's preschool readiness. Important variables to the child's school readiness include family income level and the presence or absence of a father in the home (1142). If adult availability is low there is an increase in attention seeking responses. Where parental absence occurs, there is also a greater number of responses emitted to the opposite sex parent.

The Perception Of The Parents

Investigations of a child's concept of mother (354) indicates that mothers are more accurately portrayed in terms of their functions in the home than in terms of physical appearance. Few four year olds distinguish mother from father in their drawings.

Five year olds use sexually appropriate clothing in their drawings, and mother is pictured as smaller in size than father, but larger than children. Mothers are often drawn in the center of the family in group drawings, and different colors are used when drawing mother alone than when drawing her in a group scene (354). Five year olds discriminate readily between their own and other children's mothers.

At six years, the child's perception of mother is accurate. Mothers are regarded as more nurturant and less punitive when compared to fathers. Fathers are regarded as stronger, but also darker and more dangerous. The six year old child labels himself as more like the same sex parent (921).

One study of rural public school children indicates that the ability to perceive the thoughts and feelings of other children is a function of age. Younger children (from six to seven) place more stress on external qualities such as appearance, home and money, and older children (around eleven years) place a greater emphasis on personality characteristics. The empathetic ability of children increases with age (437).

Observations of a group of children from three to five years suggest that the perception of racial differences and the awareness of color differences is present at three years, and is accentuated in the two succeeding years. Children from higher socio-economic groups perceive skin color in cognitive terms. The lower socio-economic groups perceive skin color in affective terms. Negro children respond in terms indicating that white is more desirable (1036).

The Perception Of Self

The development of self perception begins at six months when the child smiles and vocal zes at his own mirror image. At ten months, the child sits back and regards his total image. He calls himself by name at two years and at thirty months he says, "I want". He refers to himself as "I", and others as "You", also at thirty months. At the age of three, he will say "I need" and "I want"; and, call men "man" and, women "lady". The extension of self can be seen at four years; the child may brag, boast, or criticize.

There is an adequate conceptualization of abilities at five years, and the child defines self in abstract terms, e.g., "I am five". The six year old feels all-knowing, possessive of belongings, and wishes to be called by name.

At seven, the fear of identity loss appears. The seven year old also dislikes the new, and will, for example, refuse to have his haircut. There is recognition of himself as being distinct and different from others by age eight (590).

Indications are that the development of self, as exhibited by verbal behavior, changes as a function of age. The eighteen month old child, for example, largely ignores other children; his chief activities are motor, and "no" is his favorite word. Generally the child's reactions are elicited by himself (40).

Three months later, however, adult-directed verbalization deepens, even though there remains an impersonality with other children. Three months following, in the nursery school, there is a verbalization of social relations with the teacher. The child is responsive to the teacher and approaches other children (40).

By two and one-half years solitary activity has decreased. Because the chief interpersonal relation with other children is in the acquisition or protection of objects, there may be personal aggression (40).

For the first time, child-to-child relations equal or exceed child-to-teacher relations at the age of three. Verbal responses to others play a leading role in behavior. Possessions are no longer the center of the child's interest, and consequently, there is less violence to other children (40).

At four years, verbal behavior is almost exclusively with other children. Interactions with the teacher are few, and the four year old may adopt a tough masculine role. Heterosexual friendships are strong and jealousy may be freely expressed in these relations (40).

The target of verbalizations starts with self or the teacher, and slowly progresses until most conversation is with contemporaries at the age of four.

Observations of children between the age of five and six indicate that boys with high masculine identification are reared in relatively permissive, non-punitive homes. Fathers of these boys are warm and accompany discipline with praise (1306).

As we have seen, family conditions influence the child's perception of the world and the self. Self identification is not in terms of age or size, but in terms of sex and position in the family. The family promotes a feeling of safety. These feelings of safety and self-acceptance are necessary to selection and development (1168a).

Parental attitudes of ambivalence, punitiveness, restrictiveness, and/or low internal self-esteem have been found to correlate with deviancy in boys ranging in age from two to eight (451). Observations of nursery school children indicate that when parents are divorced, acute anxiety, depression and the inability to control anger may result (1030).

The attitudes and behavior of parents toward children are, indeed, a factor of great importance in the development of the child. Thus, the question, "What are the expectations that parents hold, and what are the consequences of failing to meet these expectations?" is a vital one.

Parental Attitudes and Expectations

On the average, six months is expected to be the period of breast feeding. At nine months, weaning to a cup is expected to occur, and completion is anticipated by one year. Apparently, a near majority (50%) of parents expect bowel training to start at one year and become completed around eighteen months. Completion of bladder control is expected at two years (66).

Parents expect the child to assume chore responsibilities from three years to six years of age. Aggressive control is expected at five or six (427).

Five general categories of misconduct have been outlined. These are: 1) violation of rules; 2) assults on other children; 3) breaking or damaging of property; 4) misconduct toward adult leaders; and, 5) miscellaneous (427).

Misconduct in first grade boys is generally focused around the breaking or damaging of property. Girls are frequently cited for misconduct associated with the breaking of rules. This sex difference, however, disappeared by the third grade. Both the home and school environment are found to be related to the type of misconduct and the explanation for it.

The time of day during which children are disciplined is related to age. For three year olds, discipline problems are likely to occur at 8:00 a.m., noon, or 4:00 to 8:00 p.m. There is no increase in behavior problems on Saturday and Sunday. For six year olds, disciplining occurs at the same times, but falls on every other day. The largest number of discipline problems occurs during the evening from 4:00 to 8:00 p.m., with peaks on Wednesday, Friday, Saturday and Sunday. At nine years, problems in disciplining occur every four days with no time peaks, but day peaks of Monday, Tuesday, Saturday and Sunday (60).

As the child grows older, frequency of parental actions involving discipline decreases. It appears that parents expect their children to take responsibility for their actions and for themselves at different ages. Training for responsibility begins at an early age. It is felt that responsibility should be administered in terms of ability at a given point in time (147). It is suggested that children should be given responsibility by practicing responsibility. This means that responsibility is an educational experience and that the child becomes capable of taking responsibility by actually planning, participating and evaluating activities. The implication is that by having responsibilities the child learns about responsibilities (147).

Training for responsibility and experience in assuming responsibility must be adapted to the individual child. The developmental level is, thus, of prime importance in the assignment of responsibility. Being aware of the child's normative development is not sufficient knowledge, however, and it is suggested that the parent and the teacher need some intuitive knowledge of the particular child. The parental figure may be unsuccessful in making demands of the child if a task is beyond the child's capabilities (147). It is important that the child have an understanding of what is expected of him. The child needs clarity in instructions and sufficient knowledge to know when the task will begin and when it will be completed (147). The child needs guidance from adults. Sharing of responsibility with parents or teacher may also give the child a feeling of companionship and belonging (147).

Children require the trust and respect of adults if they are to learn adequately the nature of responsibilities. If the child is in an atmosphere of trust he will come to define himself as a trustworthy and capable person. Adults must believe that the child is capable, responsible and improvable.

Adults must expect and accept variability in learning and performance by the child. Some error is to be expected. The overemphasis of errors in a child's task performance may result in a further reduction in task efficiency and persistency (147).

The attitudes and behavior of adults in regard to responsibility influence the child's development of responsibility. Too much responsibility can do serious harm to the child.

The criteria are the child's reactions to the responsibility itself. Destruction of fun, sympathy, and spontaniety must not be the result of the child's acceptance of responsibility.

In the early childhood years, tasks such as feeding himself, tending to his own toilet needs, washing, dressing, brushing teeth, and combing hair seem appropriate. After six years, the child is competent enough to assume responsibilities for bathing, changing underwear, selecting garments, and remembering his personal schedule. Many parents assign the responsibility of handling money at this time.

The school age child may be expected to make his own bed, clean his room, attempt simple cooking, and take responsibility for his own animals.

In summary, through the family the child can learn responsibilities. However, the responsibilities given to the child must be meaningful. They must be part of the life of the child. Responsibilities administered should give the child the feeling that if his participation had not been present, the task would have been incomplete.

THE FAMILY AS A SOCIALIZER

In this part we discuss principle personality variables in the developing child. These behaviors are the result of the state of the organism, interpersonal relationships in the family, and increasing age. Dependency is a fundamental state of the infant, but overprotection by the mother will prolong dependent type responses and delay independent behavior.

Potential aggressiveness is always present because of physiological characteristics of the organism, but frustrating and punitive interpersonal relationships can increase aggressive responses and, thereby, arrest the development of persistency and determination. Initially, fears are reflexive reactions, but they may become accentuated and unrealistic and, thereby, damage their reality value.

Specific discussion will include the early interpersonal relationships, dependency and aggression, and affective development, in that order. Finally, conditions and problems in these areas will be presented.

Interpersonal Relations in Infancy

In the first two months, the infant returns the glance of an adult by smiling, and is quieted by a touch. From two to three months, the child returns the smile of an adult, cries when an attending adult leaves, and may act disturbed when approached. From three to four months, the child responds to an approaching adult by babbling and cooing; response of displeasure is elicited when the child loses the glance of the adult. At four to five months, the child is quieted by caressing and may show signs of disturbance at the sight of certain people. Attention seeking by babbling, stretching out hands toward an adult, and crying when adults cease their conversation are all observable from 7 to 8 months. A striving for attention through bodily movements is seen in the eight to nine month old infant. Offering an object to an adult, pulling on the clothes of an adult or imitating the movements of an adult with a plaything are seen from 9 to 10 months. Finally, at 10 and 11 months some play activity occurs (242).

In the response of infants to other infants, it is noted that at 4 to 5 months one child observes and smiles at another child. At 8 to 9 months, one child cries if another receives attention. Offering a toy to another child is also observable at this time, as is a babbling response at the presence of other children. At 9 to 10 months, a child will imitate the movements of another child. Play activity and striving for the attention of other children by babbling occur at 10 and 11 months. During this beginning play period, ill humor is elicited if another child moves away. At 12 months, an infant will set aside a toy to turn toward another child (242).

DEPENDENCY

It would seem obvious that the fundamental state of the neonate and the growing infant is one of total dependency on an adult, usually the mother. The infant cannot feed, clothe nor bathe himself. These responsibilities must be met by the parents. At the same time, the parent aids in the development of independence. Previously, we have been concerned with the development of independence through the acceptance of responsibility. Here, we are concerned with the characteristics and correlates of dependency and over-dependency in children.

Between the ages of nine and thirty-six months, over-dependency is not the result of bad weaning or poor toilet training, but a rewarded behavior resulting from discontinuities in socialization (215).

There are a variety of behaviors between the ages of 28 and 74 months that are positively related to over-dependency, and negatively associated with achievement. These behaviors include nail biting, overeating, asking for a bottle, talking like a baby, drooling, licking and wanting to be fed (719).

From ages three to four years, a majority (58%) of the child's behavior is classified as dependent; at six years there is a reduction in dependent behavior to 42%. The amount of adult contact from three to four years is slightly greater (54%) than contact from five to six (42%). (1006).

With children from 50 to 66 months, it is observed that a boy's warmth is positively correlated $r=.5$ or better, on this and other paragraph data with the rewarding of independent behavior by the mother. A positive correlation is also found between the punishment of independency and a boy's disobedience. With girls, the punishment of independence is positively related to aggression toward the mother and negatively correlated with a girl's warmth. Also, with girls, a positive correlation is found between parental restrictiveness of independence and fantasied aggression towards others or towards oneself. Rewarded dependency for girls is positively correlated with dependent behavior in girls (982).

In comparison with other children of the same age (six to nine years) highly dependent children are equal to the other children in judgmental situations but are significantly less likely to take chances based on their judgments. It is maintained that a key characteristic of dependent children is their frequent inability to display risk taking behavior.

The interruption of dependency leads to aggression (80). Withdrawal of nurturance results in greater motivation in task completion than constant nurturance, especially with girls (750). In rating children from six to ten years, and again rating those children in adulthood, it is found that passive withdrawal and emotional dependence remain constant. Correlations are higher for girls than boys (922).

The growth from dependency to independency is a slow process of learning, the speed of which appears to be determined by developmental level, parental attitudes, contacts with peers, and individual ability. Experimentation indicates that independence, like responsibility, is learned through interpersonal relationships over a period of time.

AGGRESSION

It is interesting to note that anxiety is frequently the end product of punishment, and that punishment frequently follows the expression of aggression (899a).

Resistent behaviors at 6 months include clinging, crying, and non-responsiveness. At 10 months the child will withdraw his arm from parental contact. After the first year, and until the beginning of the second year, the child pushes toys away, turns his head away from the mother, screams and struggles, and makes slapping movements. In the second year, a child will burrow into the mother with his head (1076).

Destructiveness, possessiveness and general aggressiveness may be the result of the maturation of "primary drives" (222f). These behaviors appear in the last half of the first year. Girls have the most intensive resistive reaction in the first two years, but this sex difference is reversed shortly after two years (1833).

Environmental variables can promote and sustain the quantity and quality of aggressive acts. For children from two to five years old, aggression results from a desire for another child's property (54). A number of children (40%) with below-average socioeconomic backgrounds and below-average IQ ratings respond aggressively in a desire for another child's property. A similar response to property is found in 30% of the children with above average IQs and socio-economic levels (54).

Investigation of the child's position in the family (994) shows that first-borns emit more aggression, are more emotionally tense, more uncooperative, and more expressive of anger (994).

It is indicated that in the oldest child there is a correlation between the mother's hostitity and the child's disobedience and physical aggression (760).

Using factor analytical method, findings show negative correlations between superego strength and hostility, ego strength and hostility, and a positive correlation exists between parental harshness and a child's hostility (409).

Children between 24 and 60 months frequently express aggression in group play by grabbing materials, demanding materials verbally, or by rejecting verbally. A minority of the children use name calling and physical attack (693).

Using live models, films, and cartoons, one is able to shape aggressive behavior. Through social reward the quantity of aggression can be increased. It is also noted that children who observe a model that is reinforced for aggressive behavior will display more imitation of the model's behavior than children who observe the model punished (80).

Observations of preschool children reveal that aggressive films will produce an increase in aggressive behavior. There is an increase in non-verbal aggressive behavior in kindergarten children when the children's verbal aggression to dolls is reinforced (1112).

Frustrating conditions are considered one of the most prevalent antecedent conditions to aggressive behavior. In preschoolers, aggression increases under frustrating situations (399). The frustration of dependency also increases hostile reactions (80). Physical punishment, presumably frustrating, increases the quantity of aggression (899a).

Although there may be individual differences in the capacity to feel and act aggressively irrespective of environmental conditions, the stimulation, increment and constancy of aggression is a behavior modifiable by the environment. Through the imitation of models, through punishment and frustration, and through an environment that rewards aggresiveness, hostility and anger are nurtured and maintained.

AFFECTIVE DEVELOPMENT

Although the physiological correlates of affective expression have been investigated rather intensely, this study focuses on identification and characteristics of emotional expression at different periods of development.

Generalized excitement is noted at birth; at three months distress, excitement, and delight are observed. Fear, anger, and disgust are observable at six-months; elation and affection for adults develop at 12 months. At 18 months jealousy and affection for other children appears. The expression of joy is seen at two years (222e).

Freshmen, psychologists, medical students and nurses have identified reactions of anger, hunger, fear and pain in infants shortly after birth (1603, 1604). Grimacing, pleasure, anger and displeasure have been observed in 9 month old infants.

Observations of affective reactions in 9 month old children do not appear to be "chance" reactions. Infants' reactions have been labeled grimacing, pleasure, displeasure and anger (659). Pleasant and unpleasant responses are recorded in children from eight to sixteen months of age . These responses are unconditioned to any specific stimuli (215).

Findings reveal more affectionate responses in children from two to five than aggressive responses. In this same age period, there is an increase in verbal and physical aggression; boys are more aggressive; girls are more affectionate (1833).

In first-borns more anger is displayed and a defeat creates greater upset than in later-born children. These first-borns are motivated less by sympathy and praise than later-born children. Regardless of the sex of the first-born, second-borns behave more like first-borns than do later children (995). Males five to seven years old are more active, expressive of anger, exhibitionistic and uncooperative. Females are obedient, responsible and affectionate (995). It is noted that fear reactions to loud noise resemble a reflex response, e.g., jerking hand movements, etc. (1810). Using a loud noise as an unconditioned stimulus and pairing this with a white rat, it is possible to condition a fear reaction in a 10 month old infant. This fear may be transferred to other white and furry objects in the environment (1845, 1846).

The most common fears vary with age. Noise stimuli produce most initial fear reactions. Later, fear reactions to sudden, unexpected movements and lights are observed (883).

Fear of animals is noted at two, but less tangible phenomena provoke fear reactions from three years upward. These phenomena include fear of imaginary creatures, darkness, and being left alone (883).

Some fears disappear with maturation; others apparently do not (882). Those which disappear include noises, strange objects, unexpected movements, and strange looking people. Retained fears include fear responses to animals, imagined or remote dangers, superstitions, and anxiety resulting from personal failures and shortcomings (882).

Why some fears are retained is a matter for speculation. It is possible that the child's fears may be unwittingly reinforced by a parental figure. Insight into this question is provided by evidence indicative that the mother's and child's fears tend to be correlated. Children (ages two to six) and their mothers have indicated fear of storms, strange insects, deep water, and certain animals (e.g., snakes) (715). The fear of snakes continues to develop as the child matures. Children under three years of age show no fear of snakes. Children three years to eight years however, respond to snakes with wariness or guarded reactions (906).

Investigations show that some children attack a fear arousing situation with caution and slowly work to success, but some withdraw and solicit others to do the task (894).

From five years onward, the school setting assumes a role of great importance for the child. Frequently children fear that they will not be promoted (583). Also, at this age level, some children (19%) are afraid of ghosts or ther supernatural agents (268).

Findings reveal fear scores correlate positively (r=+.30) with I.Q.; the relationship is most marked at the youngest age level (r=+.53), twenty-four to thirty-five months (1307).

At six years some children fear that someone is hiding under the bed. There is a fear of being lost, a fear of the woods, and the elements: fire, water and thunder. Children are fearful that mother will be harmed, or that "something" might happen to her. During this same period, children are brave about big hurts, yet fear splinters, cuts and blood. Children also may interpret shadows as ghosts; fear war, spies, and burglars. They worry too about not being liked (241).

Around the eighth year, there is a decrease in fears. There are fewer worries about acceptance. No longer is there a fear of the water and there is less fear of the dark (41).

Initially, fear reactions are characterized by reflexive behavior but, as the child grows, these become learned reactions. Different fears emerge at different times, and some fears that were not present at an earlier age develop later. Initial fear responses are concretely oriented but, as the child grows older, the fear becomes less concrete, more ephemeral, and directed more by imagination and social demands.

Anxiety , a feeling of uneasiness or apprehension, is related to fear but anxiety is less tied to specific, concrete objects and fear is object oriented.

Examination of anxiety, phobias and fears in children reveals that the majority (80%) of anxious children have had unfavorable birth conditions, whereas a minority (40%) of the non-anxious have. A number (31%) of anxious children are from broken homes; only very few (5%) of the non-anxious are from broken homes (403).

With children from two to five years, acute anxiety and similar behaviors have been noted in children whose parents have been divorced while the child was attending nursery school (1198).

Although broken homes may provoke anxiety reactions, parental attitudes and dispositions are involved in the child's feelings of uneasiness and discomfort. With children from five to eight, it is indicated that mothers who are relaxed and easy-going have children who are placid and controlled. A mother's general stability is also positively correlated with the child's placidity. Mother's hostility to father correlates negatively with the placid and controlled boy, and mother's degree of even-temperedness is positively correlated with the placidity of both boys and girls (917).

Two important patterns in motor behavior are expressive of anxiety: 1) scurrying back to the loved object; and, 2) freezing of mobility (1270). In institutionalized children a sustained rhythmic activity is observable. Examples of the latter include a rocking and bouncing activity. The latter reactions may be attempts at self-stimulation in what is obviously a stimulus-deprived environment, rather than expressions of anxieties (1270). Reactions such as these have raised the question of whether stimulus deprived conditions increase anxiety, or whether the institutional conditions tend to initiate self-stimulation. With a more adequate definition of anxiety, future research may answer this question.

With isolated and anxious children, it is suggested that anxiety exists as a result of anxiety-arousing conditions, i.e., strange adults, strange buildings or rooms (1835).

Sex differences in anxiety are found in the school setting. In first and second grades, girls are more anxious than boys. There is no sex difference in "test anxiety", but there is a marked difference in general anxiety level (1055).

Problems and Deviation

With children from twenty four months onward there are indications that the age of the child is negatively correlated with the total number of disturbances and is positively correlated with the average duration of disturbances (568).

Acute anxiety, depression and impulsive anger have been observed in children whose parents were divorced while the child was attending nursery school (1198).

It is reported that children from autocratic homes tend to dominate their companions more readily than children from democratic homes. They also are less considerate of their peers. A major benefit of democracy in the home is in influencing the child's self concept in regard to self acceptance and self confidence (899a).

The most frequently reported deviant behaviors occur in negro children from six to seven years of age. There is some indication that this deviant behavior occurs as a transient developmental phenomenon in many school-aged children (1042).

One of the earliest abnormal child behaviors under investigation has been that resulting from maternal overprotectiveness. Excessive protectiveness includes behaviors such as continuous companionship, prolonged nursing care, excessive fondling, sleeping with the child long past infancy, refusal to allow the child to do things for himself, and waiting on the child, etc. The child is treated like a baby, and self-reliance is not encouraged. Overdependency and an overly optimistic attitude that care and protection can always be expected are examples of anomalies that result from over protection (1775a).

Other problems which develop in children may be the result of maternal rejection. Maternal rejection behaviors include having no time for the child, unfavorable comparisons with siblings, verbal punishment and nagging, scolding, failure to support the child, and failure to display interest in the child. The child's reactions to this behavior can include a resentment toward authority, rebelliousness, feelings of inferiority, indulgence in self-pity, discouragement, unrealistic self-evaluations, and feelings of persecution (1741a).

THE ROLE OF LEARNING IN SOCIALIZATION

Roles refer to those behaviors that are expected as a result of a position in a social group. Status refers to the priveleges that accompany certain roles. Status accompanies, and is a consequence of specific roles.

At 18 months findings show that in comparison to boys, girls use words first, emit simple crying more often, have more withdrawal reactions, respond with more intensive emotional reactions, but are less clinging to mother (1076).

Sex differences in eating and sleeping behavior are noted for boys and girls from two to four years. Indications are that girls spend more time arising in the morning, exhibit more nervous behaviors at dinner, and have less sleep in a twenty-four hour period than do boys (1142).

Findings also show that boys become aware of sex appropriate behavior sooner than girls. Children of working-class parents become more aware of sex patterns sooner than middle-class children. With all children from three to four years regardless of sex or class, there appears to be an incomplete recognition of sex differences. From four to five years this situation changes, and there is almost perfect recognition of sex differences. From five to eight years, there is a correct identification of sex differences (1447).

Cross-cultural comparisons show that masculine roles, and other expected masculine attributes, include achievement and self reliance. Females are most frequently expected to be nurturant and responsible. These comparisons indicate some cross-cultural conformity to our own expectation of appropriate sex roles (95).

With preschoolers, findings indicate that parental expectations of sex-typed differences promote the more personal orientation of the female to the environment and the less personal orientation of the male. It is noted that girls draw more people and mention persons more often in their verbalizations than boys do at the same age (658).

Between the ages of three and five years, observable differences in sex role preferences can be seen. Findings indicate that four year old girls are more feminine than three year old girls, and four year old boys are more masculine than three year old boys (755).

Investigation of the ability to take the role of another shows that by three years, half (50%) of the children can take the role of the parent or the experimenter. By four years, however, a majority (75%) are able to adequately take the role of another (531).

It is demonstrated that boys from five to seven years are more active, angry, and exhibitionistic; girls are more affectionate, obedient and responsible. Male or female first-borns are more upset by defeat, and cannot be motivated or spurred on by sympathy. These children are also considered more emotionally intense. Children with an older brother or a younger sister are more confident and popular than children without an older brother or a younger sister (999).

In a wider age range (three to eight years), evidence indicates that males prefer to complete a task previously failed and females prefer a task with which they have been previously successful (353).

Imitation

Imitation refers to an action that duplicates the action of another, more or less exactly, with or without intent to copy. Early imitative behaviors are seen in children below a year in age. At one month, children can imitate an "a-yoo" sound. By the second month, laughing and smiling can be imitated. At 5-1/2 months, tongue protrusion and withdrawal action, definite sounds and words, coughing, and "da-da" may be imitated. At six months the child can imitate an electric horn sound or a clacking noise made by the experimenter. At 11 months "bow-wow" can be repeated and the child can wave "bye-bye". At 14 months a child can imitate smoking behavior and, at 21 months, the child imitates a parent reading the paper (1809).

Experimentation has indicated the relationship between peer imitation and task familiarity. Task imitation of a model will occur if that model is sufficiently aware of the task, and has had previous experience with the task (50).

In investigating the relationship between modeling cues and imitative responses, it is shown that the imitation of a novel choice will occur if the model has received positive reinforcement for that choice while being punished for the popular choice. Punishment of a popular choice does not lend to imitation of the novel choice. Thus, reward for the novel choice and punishment for the popular choice will promote more imitative responses than merely punishing the popular choice.

There are suggested age differences in relationship to the reinforcement variable. First graders appear to be more affected by vicarious punishment and by vicarious reinforcers administered by an adult, while third graders are more responsive to vicarious rewards and to autonomous reinforcement exhibited by a peer (91).

With preschoolers, observational findings show individual differences in the acquisition of an "imitating habit". Older girls (5 years) and younger boys (4 years) imitate adults significantly more often than younger (4 years) females and older males (5 years) (1197).

Evidence shows that kindergarten children who have a leader perform more accurately in a problem solving task than they do without a leader. Male leaders in this age group are more effective in producing imitative responses on specific problem solving tasks than females. On these same tasks, boys also show more improvement than girls (1516).

Imitation is also related to aggression. Findings reveal that aggression can be increased when there is exposure to an aggressive model. It is feasible to assume that other child behaviors are related to imitation. The relationship between fear and imitation offers a quantity of unexplored research possibilities.

Discrimination and Reward

This section deals with the detection of differences in the environment under various conditions of reinforcement. The concentration of the research in the area is primarily concerned with reward effectivity at different ages and schedules of reinforcement that most effectively increase responses. Discrimination learning is dependent upon the type of reward, and a highly valued reward maximizes the probability of a correct response (202, 203, 1616).

Investigation shows that children between 5 and 6 years of age are able to learn two types of discrimination tasks more rapidly when they can choose their own reward than when candy is the only reward given (203). Discrimination learning is facilitated by reward (candy) rather than reproof, token, or light flash (1760). With 4 to 8 year olds, when the reward in discrimination tasks involves a light plus a bean that can be traded for candy, more learning occurs than under reward conditions of light plus candy, light plus promise of candy, or light only (1759).

When a charm is used as a reward for children between 2-1/2 and 5-1/2 years, a majority are better able to discriminate between a smooth triangle and a sandpaper colored circle (1376).

Findings reveal that verbal reinforcement is effective in increasing responses in children from three to five years but is ineffective with children from eight to eleven years (1196). It is shown with four to six year olds that "wrong" is a stronger negative reinforcer than "right" is a positive re-invorcer (1251). With children from six to ten years materials are rated as the most effective reward incentive with verbal reward less effective (1902).

In regard to the order of reward effectiveness, investigation shows that no reward and "wrong" are more effective for eight and nine year olds than either "right" and "wrong", buzzer and no reward, or "right" and no reward (1252).

Findings indicate that positive reinforcement after 23 months effectively conditions a child to select specific form from a form discrimination board (1628, 1629).

Reward and punishment are most effective in teaching discrimination of cardboard boxes by color and size. Reward and punishment is significantly more effective than reward only where the mean age of the children under investigation is 70 month (203,205). When second graders are tested in probability learning there is an increase in correct responses with an increase in the increment of units of reward (204). A short visual deprivation period (15 minutes) reduces the reinforcing effectiveness of later visual stimuli with children from five to eight (1712).

In the examination of the effectiveness of differing reinforcement schedules, it is observed that for first graders a reinforcement schedule of 70:30 gives a stable high response (1517). Evidence indicates that with four to six year olds the magnitude of reward makes an insignificant difference in response increase, but that a fifty percent reinforcement schedule is superior to a hundred percent schedule (236, 17). An inverse relationship between correct response and age is found with 33% and 66% reinforcement for children between three and ten years. No response/age relationship appears with a 100% reinforcement. Previous reinforcement schedules affect later responses to different schedules (1715).

Training of free operant responses by 50% candy reinforcement is superior to 100% candy reinforcement. Moreover, children from three to six years receiving 50% reinforcement maintain a higher response level during the extinction period (540).

Findings confirm that an intermittent, fixed (50%) ratio reinforcement schedule achieves a higher speed response than does a 100% reinforcement schedule. This 50% reinforcement schedule is significantly more effective in kindergarten children than in preschool children (1540) but is effective as early as three months of age (202). Five to seven year olds make more correct responses in a three-choice learning task than children from nine to thirteen years of age if all children receive intermittent reinforcement (1856).

In summary, discrimination is a function of reward, but reward value is dependent upon age. Continuous, one hundred percent reinforcement is inferior to intermittent reinforcement schedules.

Motivation

As early as one month the motivational strength of the hunger drive is positively correlated with the frustration reaction to increasing bottle withdrawal (1158). By two years goal directed behavior is evident, and a child will find a way around a barrier in order to reach a desired object. This behavior is not seen at eighteen months (31).

Women are more effective than men in motivating children three years of age (1707). When non-nurturance is combined with nurturance, a child's motivation to learn a particular task is increased substantially. Non-nurturance combined with nurturance has a greater impact on girls because girls apparently learn faster (750).

With preschoolers there is evidence that a high incentive group (jewelry and pennies) makes more correct responses in discrimination tasks than a low incentive group (pennies and washers). The members of a high incentive group are motivated to discriminate more accurately because of the valued reward (116). Four year old children, however, tend to select tasks at a difficulty level which will maximize their achievement(1585).

Material reward, and not just affection, is a particularly good index of a child's achievement behavior in these tasks (354).

Personality variables also interact. Those which characterize three to five year olds of high task-orientation include leadership, good peer relationships, mood swings and good socioeconomic ratings. The last two variables are further correlated with more positive feeling, passive hostility, and disagreement (701). All of these are characteristics of the highly task-oriented preschooler.

First grade children choosing between delayed and immediate rewards are more likely to choose the delayed rewards if they can work for them. These children overestimate the value of the delayed object if they have to wait for it. This is not true if they can work for it (1246).

First graders who are high or low in persuabilility display more than average aggressive motivation. Highly persuasible subjects have a smaller aggressive/conflict ratio than children who rate low in persuasibility. Low persuasibility is associated with an overly aggressive orientation; high persuasibility, with a defensive need to inhibit strong aggressive motivation. Medium persuasibility is associated with a relative absence of aggressive motivation and inhibitions against aggression (1513).

Conflict from the environment evokes a maximum of approach behavior in first graders. Conflict is perceived as a novel stimulus, and, consequently, evokes curiosity and approach (1663).

Modification of Responses

Deviant behavior emitted in five to six year olds is inhibited in relation to the timing of punishment. Early punishment, i.e., presenting the aversive stimulus at the time deviant behavior is initiated, is superior to late punishment.

With early punishment the majority of boys and girls do not continue the deviant behavior. With late punishment, however, a near majority of the deviant behaviors will continue to occur in the boys (50%), and a number (30%) will be observed in the girls (1831).

Social isolation in first and second graders is modifiable through reinforcement. Social isolates with anxiety respond more positively than social isolates without anxiety (1839).

With the use of positive reinforcement, e.g., attention, regressed behavior can be changed to more normal behavior within a two-week time period (741).

OTHER AGENTS OF SOCIALIZATION

Play, Popularity and Interests

Play for children can become a refuge from the family or an accommodating aspect of the child's socialization. In play, as in the family, the child learns the values and attitudes of his culture. Play enables the child to form friendships and recognize the social expectations of a group. Stimulating resourcefulness and independence, play requires the full use of the child's emotional, intellectual and perceptual abilities.

Full information value is demanded of the senses; judgment and reason are demanded of the intellect; acceptable affective reactions are demanded by the peers.

With the emergence of cooperative play, the child is faced with new expectations. Recognition is desired and the drive for group status becomes a cue which launches a variety of new behaviors. New interpersonal relations are established which aid the child in the development of self esteem and lead to a more comprehensive definition of himself.

Although a cry becomes the child's initial reaction to the world, very shortly after birth a smile can be elicited. At two months, an infant smiles in response to an experimenter's smile and laughing is imitated (1809). At seven months, pat-a-cake movements can be observed; and, at 11 months the child will imitate an experimenter's smoking. Feeding a doll, waving "bye-bye", and winking occur at thirteen months. At eighteen months the smile/laugh ratio is ten-to-one, while two years later the ratio is three to one.

Shortly following the first smile, the child is frequently seen tactually and visually examining his body (595). At 18 months the majority of the child's verbalizations are directed toward himself (40). The child smiles most frequently at his own gross motor activity: and, two months later finds amusement in the verbal and social activities around him (31). At 18 months there is solitary play. Six months later parallel play begins. During parallel play, the child can be observed reaching out to hold or hug another child (590).

At the beginning of the second year, play is frequently with a younger sibling (999). Generally, the child has a maximum of five playmates and, for the next four years, this number of playmates will remain relatively constant. The acquisition of playmates is more highly correlated with mental age than with chronological age (1342). Mental age and chronological age are inversely related to rigorousness in play activities for children from two to three years of age (497).

Sharing may occur shortly before the third year at the same time cooperative play emerges. At 3-1/2 years, when group play is spontaneous, some children are excluded from play activities. At this age children may also display a tentative attachment to members of the opposite sex (590).

At four years, sharing may be restricted to a special, same-sexed play group. A few months later, play begins to involve both sexes (590). Popularity and social acceptance in play are significantly associated negatively with dependency (1163). Girls hold higher sociometric scores than boys, but there is no sex difference in social acceptance (1182). Indications are that boys generally initiate conflicts in free play which may explain the girls' higher sociometric scores (1180).

Popularity is related to social activity and facilitated by creative assistance with good social relationships (720, 1100). Mutual friendships tend to be correlated with IQs, and first-forns are more socially successful than later-borns (188).

Although a child's interests change, the preferred play item for boys from 15 months to five years is a toy car. Girls in like age ranges prefer a doll (2).

Five year old children enjoy cutting out or pasting. They are fond of working on a specific project such as a store or a boat. These projects have day-to-day interest carryover, although a year earlier follow-up play activity is not observed (589).

At five, dramatic play is in full development. Makebelieve situations are created and assignment to roles occurs (1156). Plastic materials, toy animals, housekeeping materials, and large transportation vehicles are some items of interest to the five year old (1806). At this age, a child may play a game requiring patience. Use of rules and competicn are common (241).

At six years there is a refinement of motor activities. Specific skills and techniques are learned; and, organized games are the rule. Marbles, dominoes and magnet sets are all popular toys at this age (1775a).

The School

Indications are that the developmental readiness for school varies with pre-teacher effects, family income, and the father's presence or absence in the home (1142).

Sending the child to public school at an early age is of questionable value. It has been shown that normal-aged first grade children are superior after a year in scholastic achievement to a matched group of younger first-grade children (277).

In a comparison between early-age kindergarten children of above average intelligence and normal-age children of average intelligence, the normal-age, average intelligence children achieved higher test ratings in both performance and adjustment at the end of the school year than the younger, previously higher-scored children (1861). Gains in the IQ scores of nursery school children have been noted after one year of fairly extensive contact with teachers. The average gain in test scores is seven points. However, these increases do not quite reach standards necessary for statistical significance (1382).

In the nursery school setting, girls are more socially perceptive, and display more positive attitudes towards life situations. High socioeconomic backgrounds are also indicative of superior social perception in nursery school children (490).

In the nursery school setting children take twenty minutes to fall asleep and nap seventy seven minutes. Outdoor play averages about two hours and fifteen minutes. The children generally do not have difficulty controlling elimination during the day. Ninety nine percent remain dry during naptime (1192).

General readiness for the first grade is also dependent on the characteristics of the home environment. Negative correlations exist between low warmth, highly sex-restrictive mothers, and readiness for the first grade (1272). If there is a great deal of over-attentiveness in the home there may be infantile and withdrawn behavior in the school (762).

Girls spend a greater proportion of their time in irrelevant activity. The doll corner elicits the greatest proportion of complex social interaction with boys engaging in more associative activity and girls in more cooperative play. The clock area is most frequently occupied and the book area the least occupied. The game area is the most mobile, while the block area has the least number of children moving in and out (1613). School equipment is classified as feminine; dangerous animals are classified as masculine (917).

In the nursery school the three year olds make fewer contacts with other children and more contacts with adults; six year olds make fewer contacts with adults and more contacts with children. Although there is a decline in dependent contact with adults, this decline in three to six year olds is a gradual one (1719).

Generally, primary school children draw larger than those in elementary school. Figures with positive value gain in comparative size, but negative figures get smaller. For example: in figure and house drawing, a Santa Claus figure would be larger than figures of Halloween witches (1589).

Nursery school children in the middle socioeconomic class exhibit more general aggression, more verbal aggression and are generally more active than lower socioeconomic class children. In the school setting both lower and middle class children express aggression by testing the teacher's limits, misusing school objects, and/or interfering and making threats to other children. Physical aggression against other children is found in both the middle and lower class groups (179).

The child's ability is modifiable by the environment and specific abilities and skills can be developed and improved. Certain abilities are, however, a function of age, and subject to individual differences.

Musical Ability

Homes of nursery school children have greater provisions for musical impression and expression than the homes of kindergarten children. There is some suggestion that musical ability is not dependent on intelligence but increases with age. Older children inevitably perform better on tests of musical ability (684). For children between three and four years, the ability to keep time increases as the number of beats approaches one beat per second. A simple majority (51%) of five year old children are able to keep time by hand, as opposed to a ninety percent ability in adults (885).

The ability to carry a melody increases in the average child with age during the three to six year period. Children who are exposed to richer musical environments show a greater and an earlier ability to carry a melody than those children from poor musical environments (425a).

Rhythmic ability is also a function of age. There are indications that a musically enriched home environment increases rhythmic ability as well as melodic ability. On tests of rhythmic ability, kindergarten children are superior to nursery schoolers, and nursery schoolers perform better than preschool children (1805).

Six year old children display the following abilities. They can identify melodic movements in terms of "up", "down", "same", "high", and "low". They can identify rhythmic patterns as "even" or "uneven", and, they are aware of harmonics. Six year olds have the ability to play simple rhythm, melodic instruments and they can associate the "high/low" concept with the "right/left" concept on the keyboard. They also associate line notation and melodic direction (137b).

Seven year old children recognize the presence of chords and reveal a sensitivity to the expressive value of loud and soft singing. They recognize the repetition of melodic and rhythmic patterns in notation, and in addition to identifying orchestral instruments, they display sensitivity in their choice of instruments for accompaniment. At this age, the use of notation as an aid to listening, performing and beginning creativity is noted (137b).

Eight year old children have a greater capability for learning meter, tone and rhythmic patterns than younger children, but, although musical ability increases as a function of age, specific abilities can be enhanced by a musically enriched home environment (1388).

Ethnic and Cultural Differences

Evidence indicates that at birth the functional development of the Negro in visual pursuit is more advanced than in the white infant (120). From four months to ten months Negro children show definite acceleration in gross motor behavior (1361). From ten months until three years this trend decreases, and by three years, both Negroes and Caucasians are equal on the Gesell tests as well as in height and weight. Generally, differences which exist between Negro and white children are in relationship to socio-economic status rather than race factors (1361).

Social

Skin color awareness in the Negro is present at three years, and is accentuated by five years of age. For both white and Negro children at this age, white is considered preferable to brown or black (1036).

There is an indication that Negro children from two to five years have a better-defined concept of their own group than other children (815). The development of the distinct idea of self as a Negro occurs in the child at about three to four years of age (309). From three to seven years of age, there is indication of a rapid development in racial discrimination in preschool children. Caucasian children tend to develop discriminations at a younger age than Negro children. At three years both groups have difficulty in making discriminations, but by the seventh year children are capable of making discriminations with ease (1713).

Regardless of race (Negro-Caucasian), performance ability at school age is not as much a function of development as of instruction. Formal operational problems can be solved by children (90% at five years) who do not manifest evidence of the concrete operational stage in thought. Differences in ability are dependent upon cultural level prior to experience (468).

There is evidence that different mental abilities exist in six to seven and a half year old children, and that variation in the patterns (kinds of intelligence) of intellectual expression is related to social class and culture. Differences in social class produce significant differences in the absolute level of each mental ability, but do not produce significant differences in the patterns among these abilities. Differences in ethnic and social group membership produce significant differences in intelligence test performance (1066). This is an indication of the environmental influences on such tests.

In coping responses to frustrating stimuli, there are no socio-economic class differences in children 36 to 50 months of age. However, middle-class children from 52 to 72 months of age tend to use substitute resources as a means of coping constructively with deprivation. In contrast, similarly aged lower-class children attempt to alter the source of deprivation. This difference in coping style appears to be related to the greater number of aggressive responses which are emitted by older lower-class children (61-72 months). Examination of the patterning of active coping and aggressive responses reveals that the highest percentage of aggressive responses in lower class boys involves the loss of a toy. Middle class boys are able to cope with the loss by suggesting a replacement of the lost object. The inability of lower class children to respond in a similar way may reflect a social class difference in assumptions about the availability of resources in the environment (1939).

A major differenciating characteristic between middle and lower class boys is found in the patterns of information processing ability. A most important discriminating component is general language ability. This component produces one of the greatest differences between groups and has the highest correlation with social class. Visual classification, the ability to classify or label visual input, is another distinguishing component (1541).

Superior performance by upper status children on IQ tests reflects these differences. In addition, superior performance is due to greater familiarity with test item content. When given an opportunity to gain familiarity with test items, lower class kindergarten children reduce the performance deficiency between the two groups (346).

Differences in ability occur as a function of cultural and social level as well as age. In the Head Start program where all children, regardless of previous cultural level are given the same materials and problems, differences in performance on standardized intelligence tests disappear. Performance discrepancies between similar age groups is clearly a function of previous stimulus conditions. When environmental characteristics are equalized, differences disappear.

SECTION VI - SUMMARY GRAPHS

The following graphs reflect the developmental sequences graphically. The specific developmental indices on the curves reflect behavior which contributes to the particular function, even though it appears to belong to a different category.

Curves placed on a particular graph also reflect behavior antecedent to the primary behavior. In Figure 11, for example, the curve for near visual acuity is shown, as this development is antecedent to the development of accurate reaching ability.

In utilizing the graphs with any particular child, the child's position relative to the ultimate ability should be considered; not his position relative to his chronological age. For any function, several curves are presented and one can compare the child's developmental level on these to determine if any facet is lagging and requires assistance. This approach will be of greatest assistance to the child, as opposed to merely attempting to compare his development to chronological age.

Figure 11. Fine Manual Dexterity.

This Figure exhibits the various influences impinging upon fine motor ability of the hand. This ability does not begin to develop until reflexive clinging responses begin to decrease. Note also that a beginning grasp does not occur until near vision becomes more accurate. Thumb/forefinger usage is dependent on the release mechanism that develops relatively late.

FINE MANUAL DEXTERITY

Figure 11

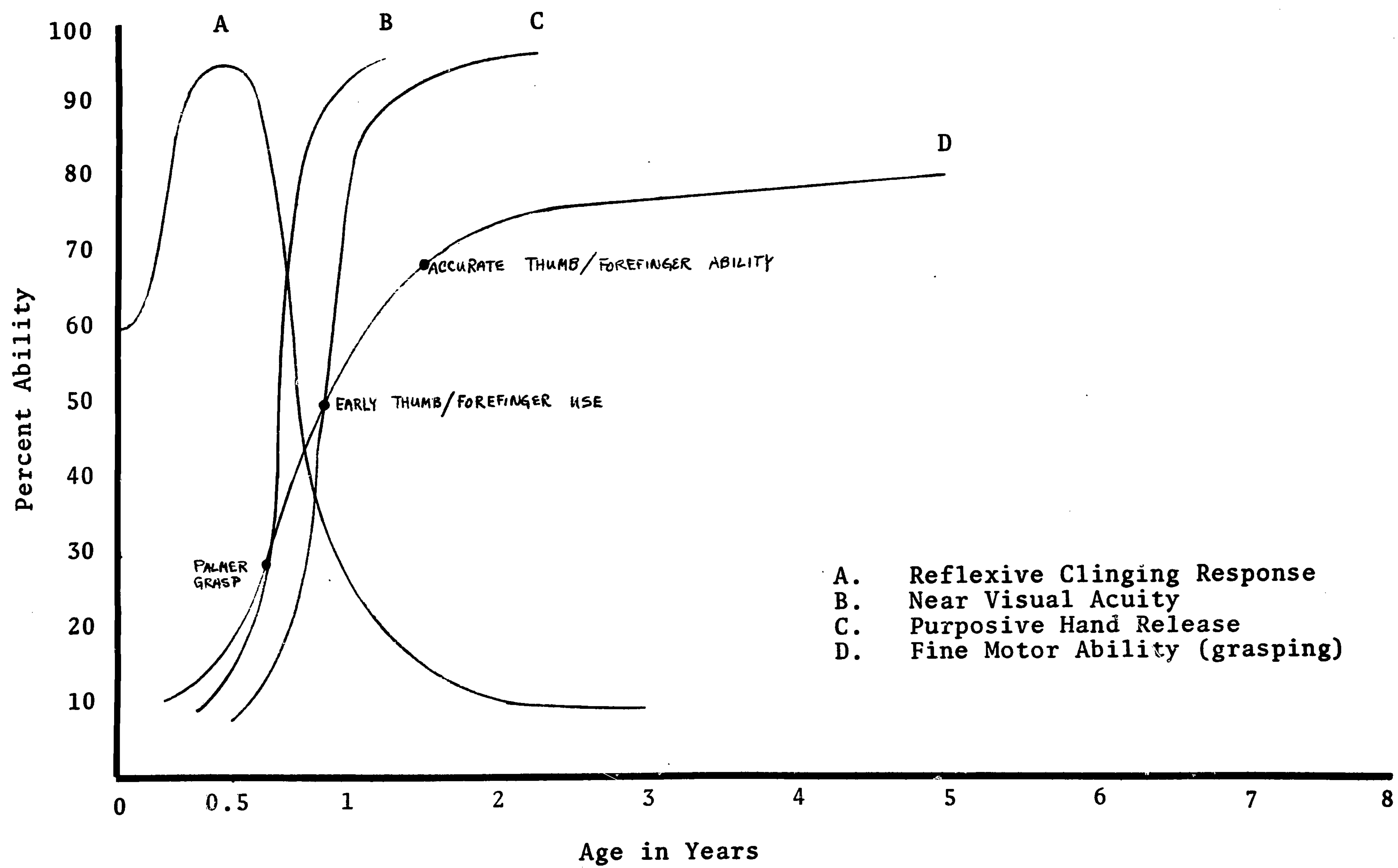


Figure 12 - Hand Manipulation.

Directed hand function begins to develop when fine motor abilities have begun to approach maturity. It is here that drawing begins. Writing ability does not generally develop until hand dominance becomes constant.

HAND MANIPULATION

Figure 12.

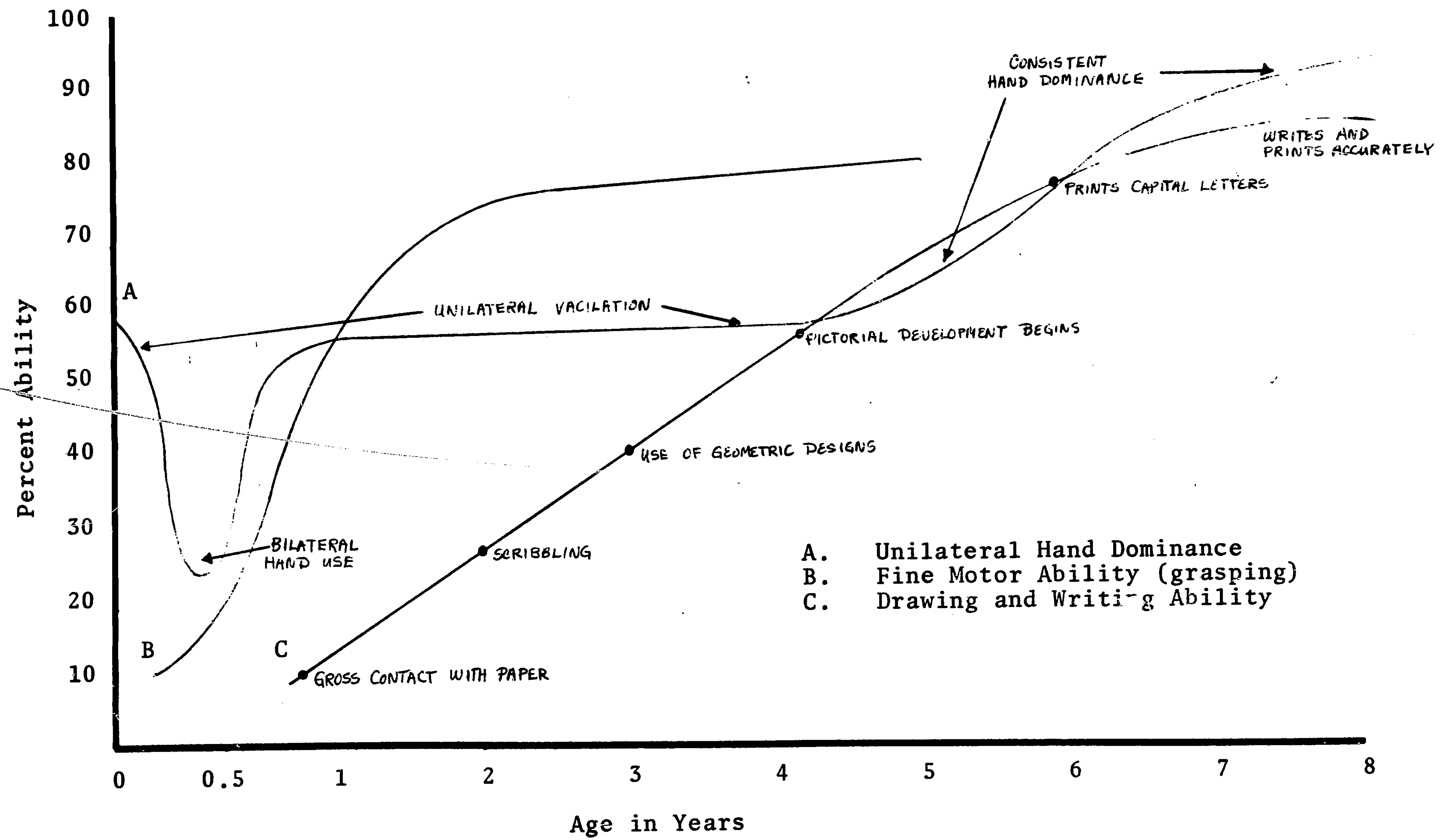


Figure 13- Locomotion.

Gross motor function begins earlier than does fine motor ability and develops more rapidly. Muscular development has to mature significantly prior to locomotion development. These abilities begin after the physiological reflexes have subsided. Elimination abilities are more individual than the curve indicates, but generally begins, like other muscular development, when reflexive responses are under more purposeful control.

LOCOMOTION

Figure 13.

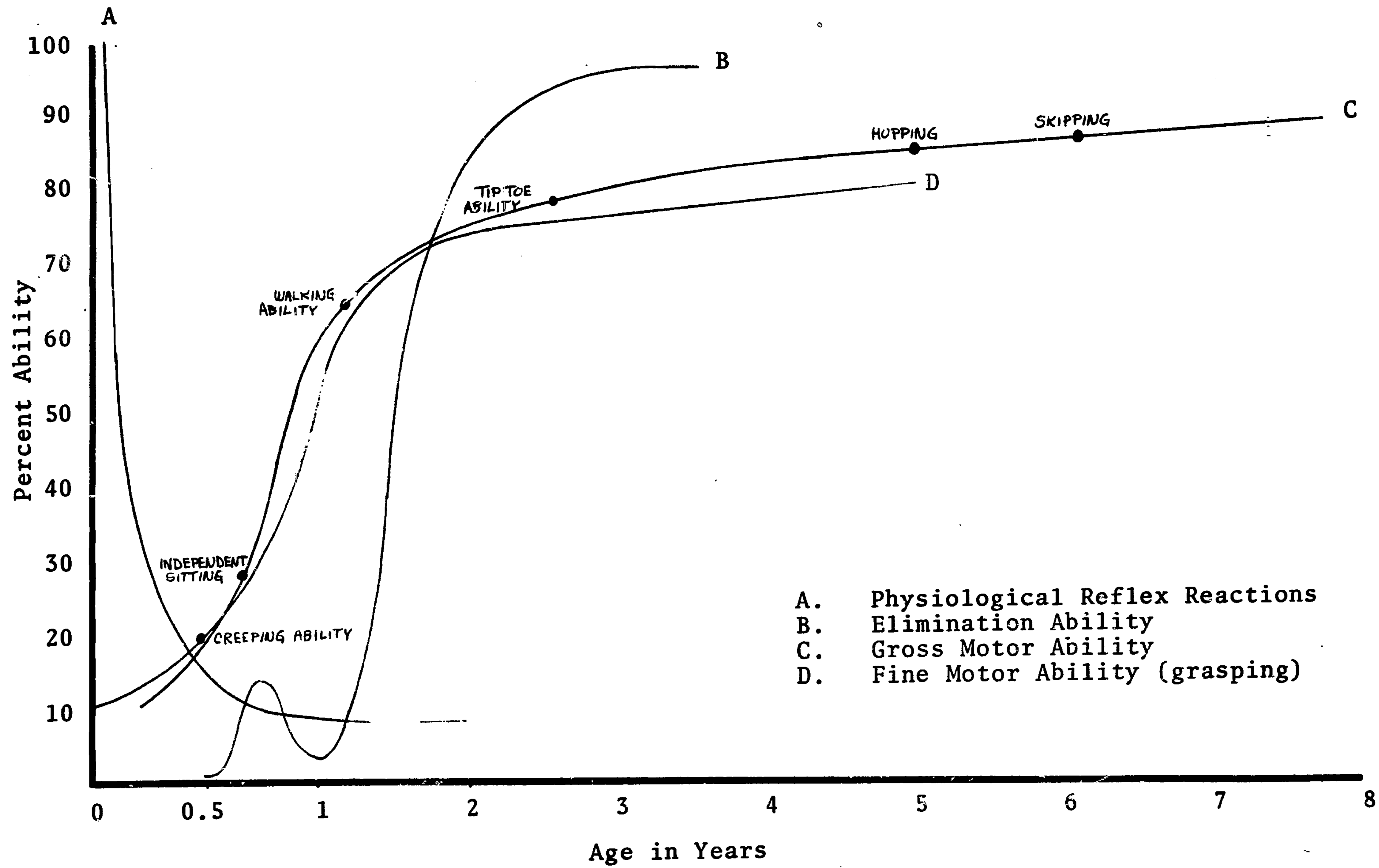


Figure 14. - Sensation

The basic sensory functions develop very rapidly after birth and later ability development is perceptual, not sensory.

The taste sensory function is a paradox in that it is better developed at birth and decreases with maturity. This is the "200%" ability at birth, noted on the graph. This factor should be considered in interpreting children's reactions to foods, because they are receiving greater sensory stimulation than adults.

Figure 14.

SENSATION

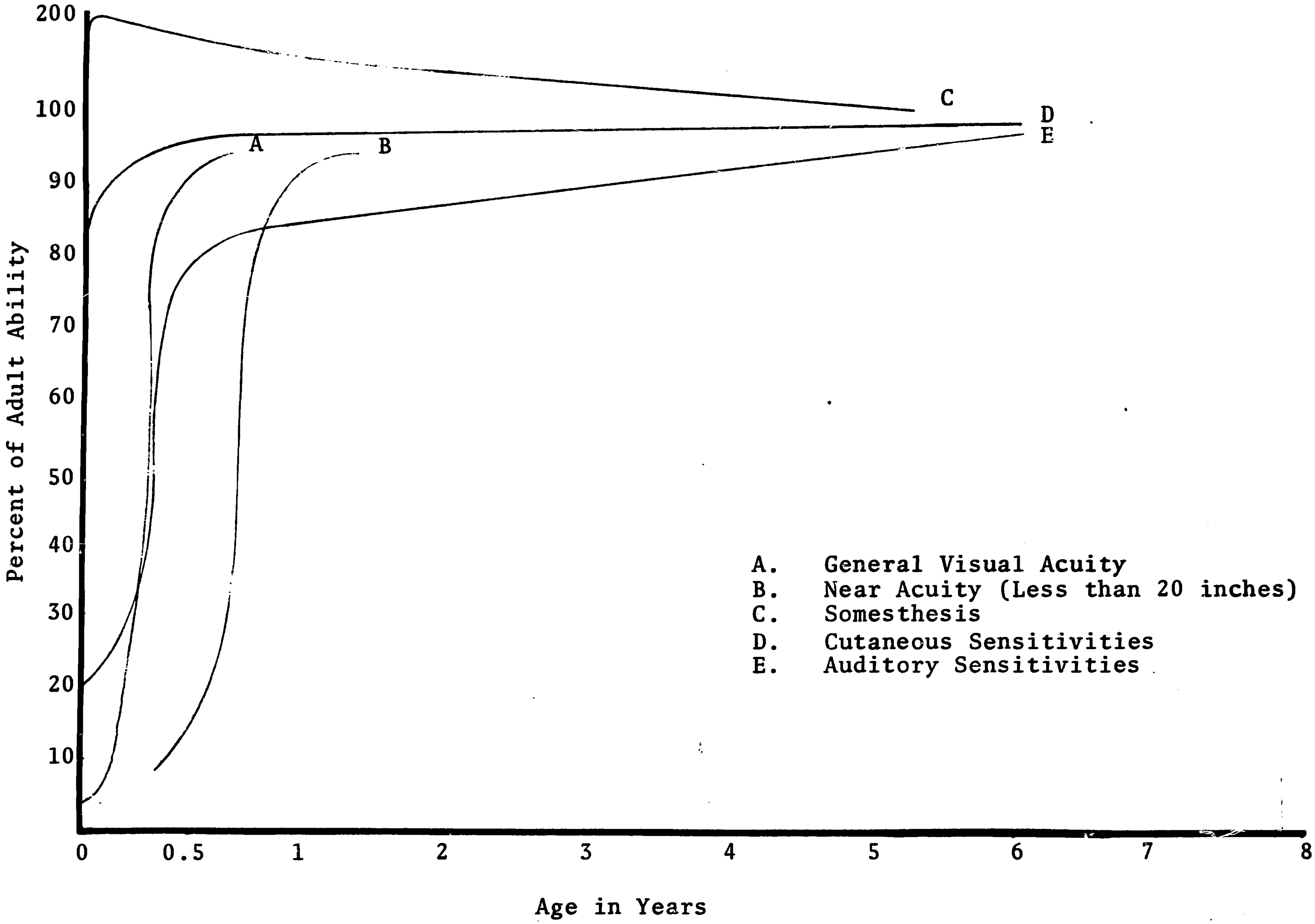


Figure 15. - Cognition

Cognitive development, although beginning as early as the second year with various discriminations, does not begin to accelerate until between the fourth and fifth year. At the beginning of the seventh year, a second growth spurt is developing in abstract reasoning.

Number concepts are related to an overt ability to discriminate and categorize, and increase rapidly after age five. The other concepts require abstract structure to fully develop.

COGNITION

Figure 15.

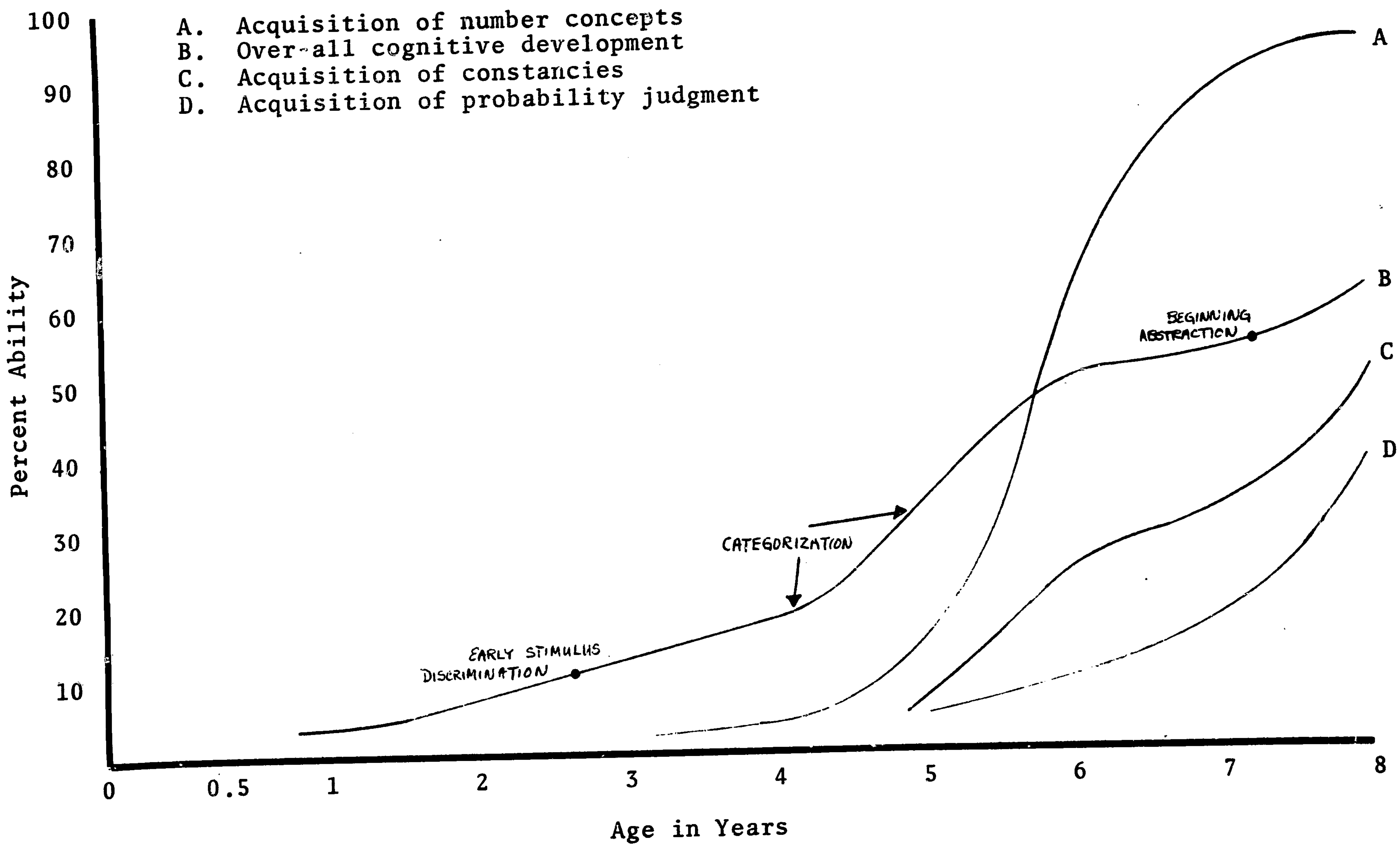


Figure 16. - Relationship between Speech Development and Cognition.

Cognitive growth develops simultaneously with verbal ability. It is not dependent on speech, but is assisted on every level by the coincidental development in that area.

Fears are seen to decrease as they become identified and categorized, decreasing in number to very few after these cognitive stages.

RELATIONSHIP BETWEEN SPEECH DEVELOPMENT AND COGNITION

Figure 16.

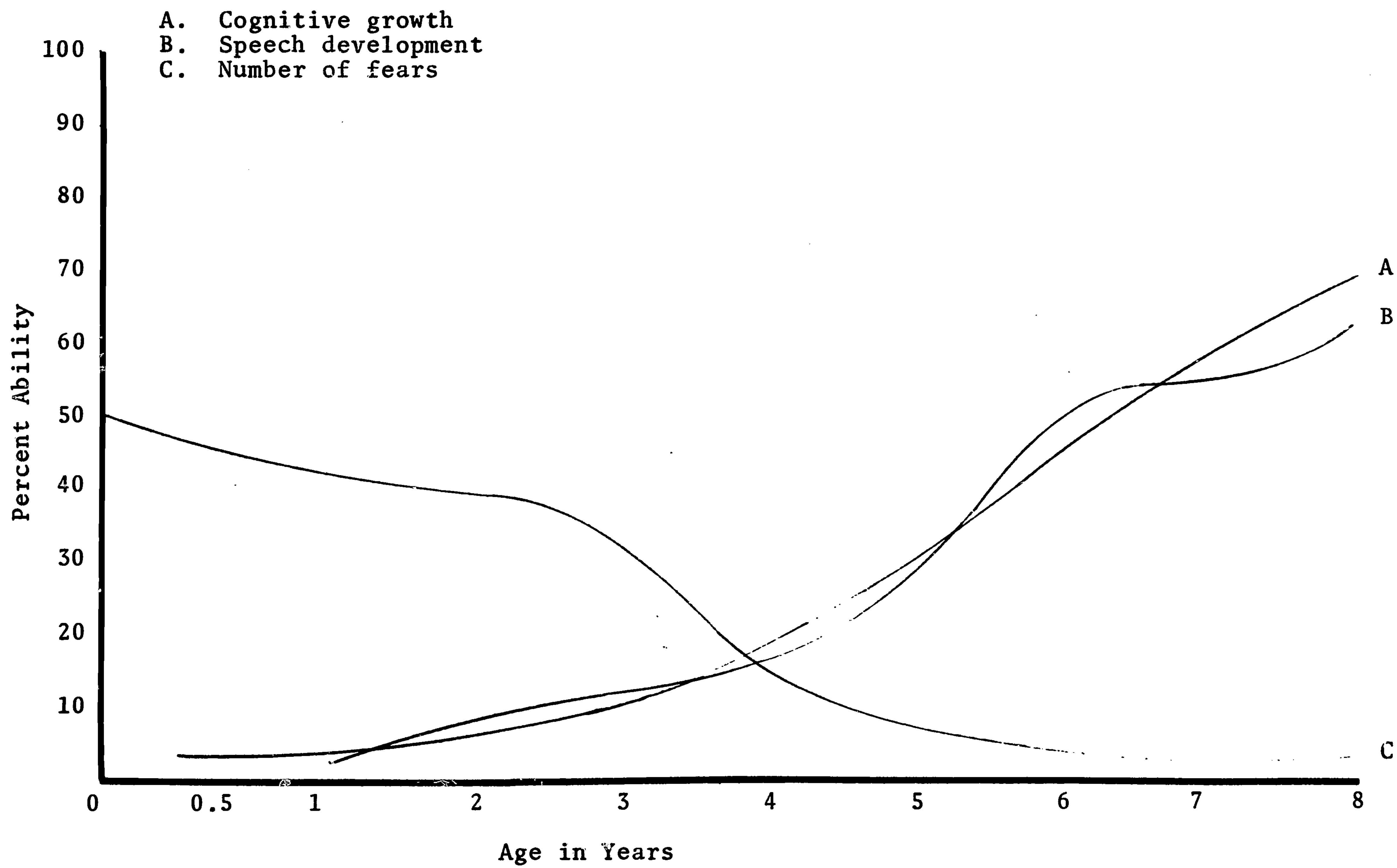


Figure 17. - Speech Development.

Ability to speak maturely develops from a beginning ability to produce meaningless vowel and consonant sounds. (See Figure 18.) These are gradually grouped into meaningful message units that culminate in accurate variations of sentence usage and complex communications.

SPEECH DEVELOPMENT

Figure 17.

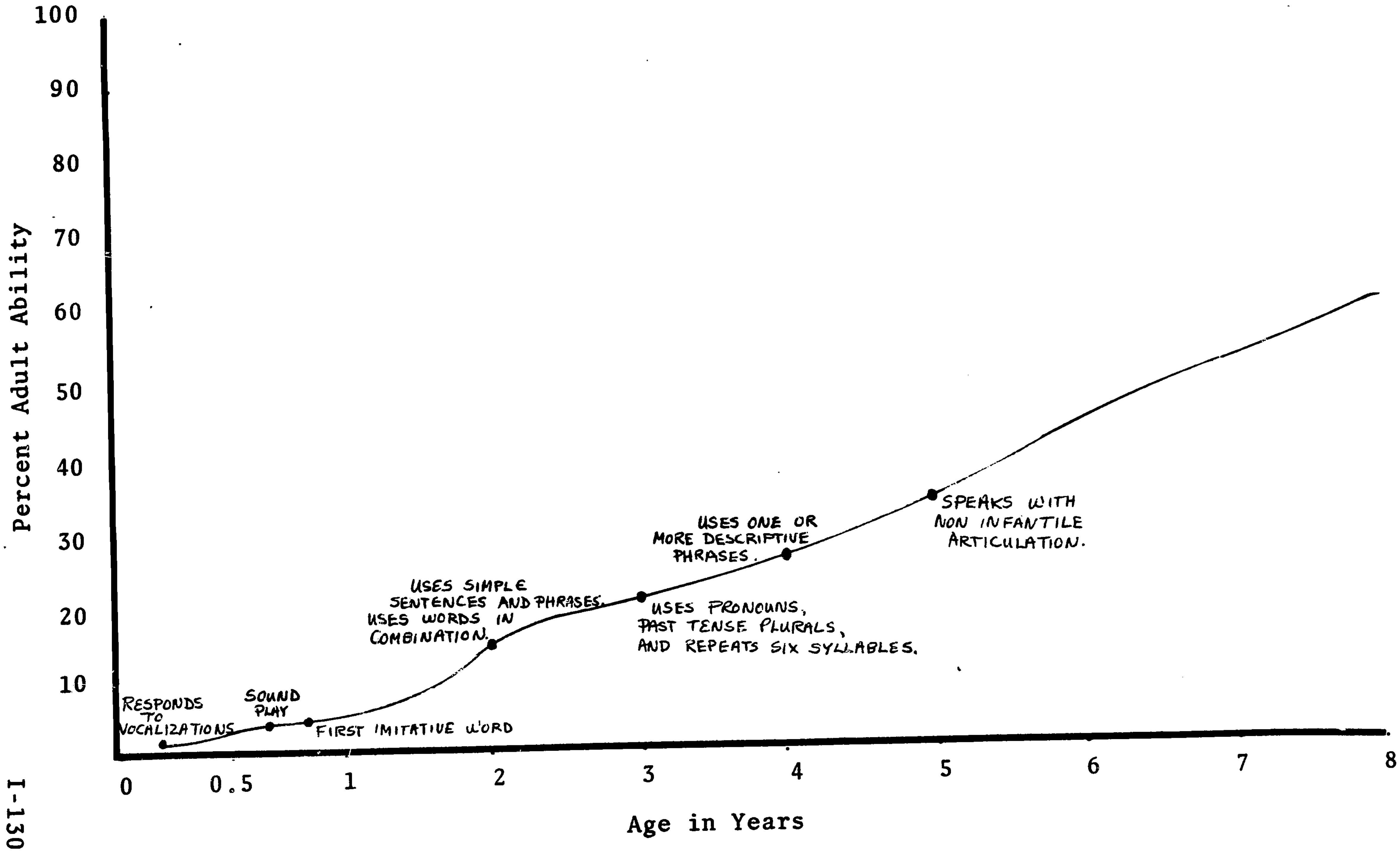


Figure 18. - Development of Vowel and Consonant Usage.

Vowel expression is much more clearly present at birth than is expression of consonants. By approximately two and one half years, this difference is non-existent. By age eight the child is approaching the same proportionate use of vowels and consonants as are found in adult speech.

Figure 18.

DEVELOPMENT OF VOWEL AND CONSONANT USAGE

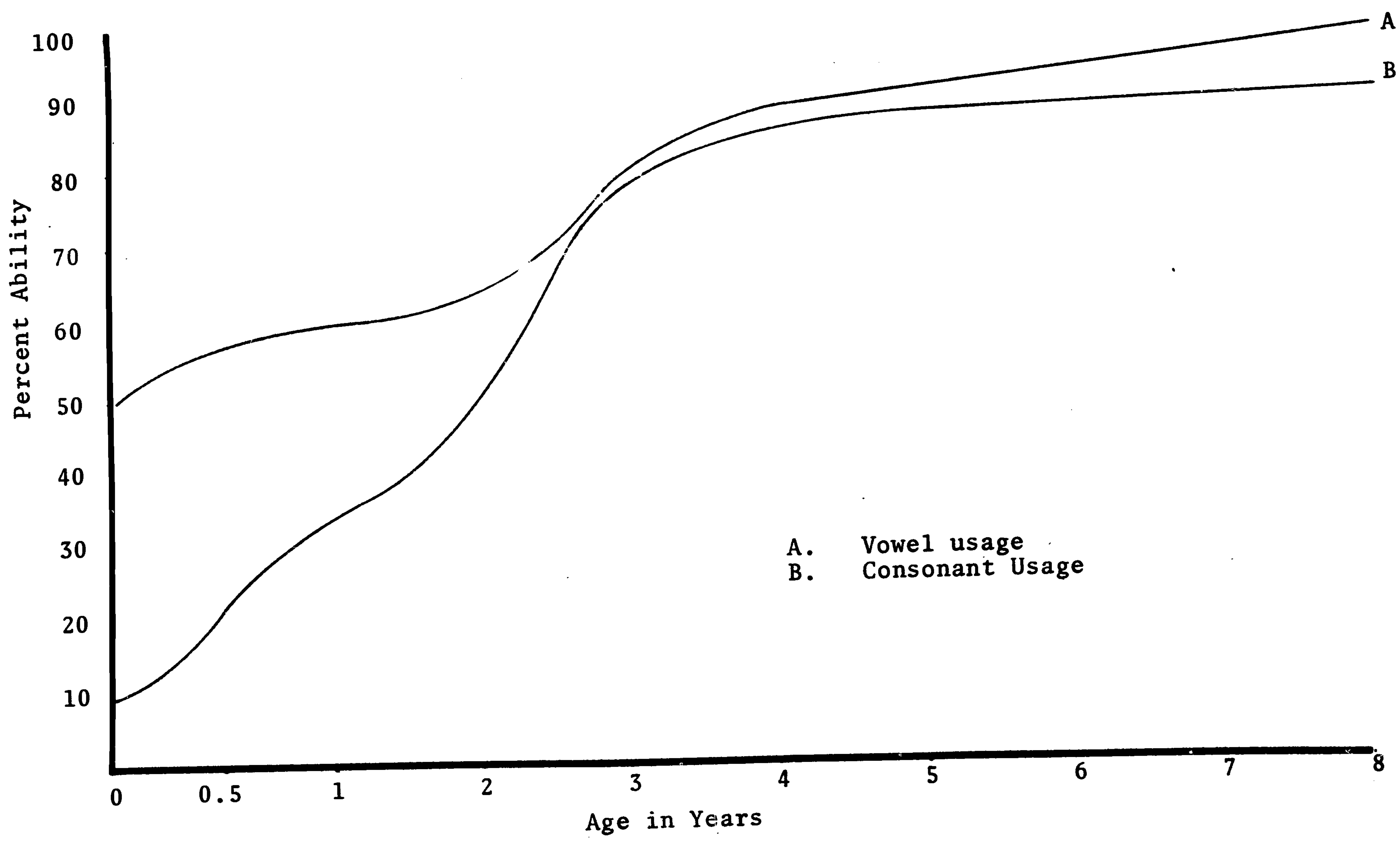


Figure 19. Socialization.

This graph shows the relationship between aggression over property, dependency, and the ability to take the role of another. Aggression increases at three years because children have not learned the relationship between their own and the property of others. As the child is able to identify with other children, the quantity of aggression decreases. The ability to identify, or take the role of another, is inversely related to the quantity of dependent-type responses. It would appear that taking another's role would necessitate peer contact and, thus, a decline in dependent responses to adults.

Finally, at one point, there is a marked relationship between dependency and aggression. Initially the child is aggressive with peers, yet emits a sizeable amount of dependent contact with adults. This is an adaptive measure that occurs because the child is faced with new expectations from peers and depends upon adults for assistance.

SOCIALIZATION

Figure 19.

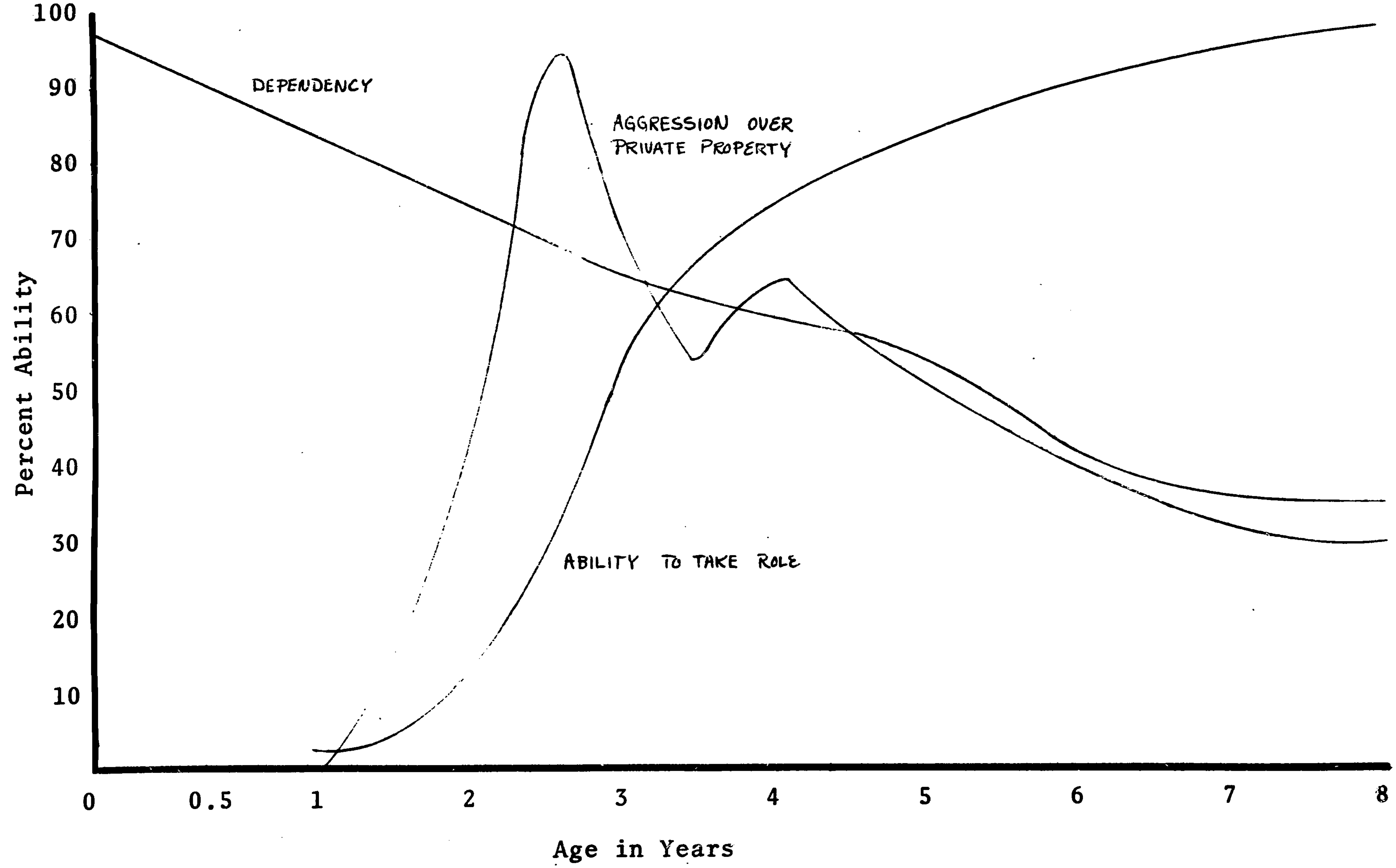
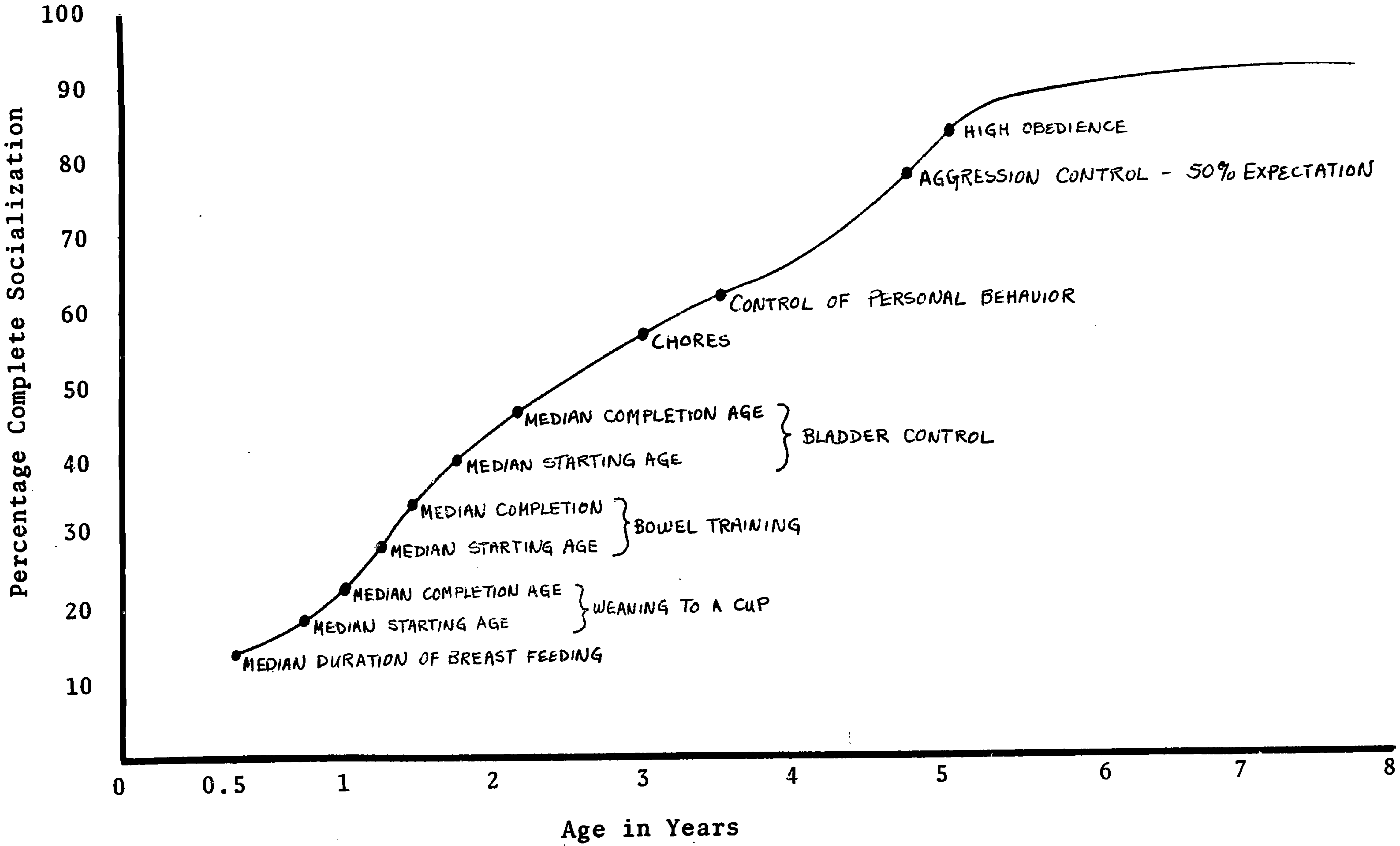


Figure 20.- Parental Expectations

This graph presents the cumulative evidence of a number of studies concerned with parental expectations. The point chosen for a particular expectation is that age at which at least 50% of adults studied specified the indicated expectation. Thus, the graph is solely an estimate of trends and is not an exact indication of all parental expectations.

PARENTAL EXPECTATIONS

Figure 20.

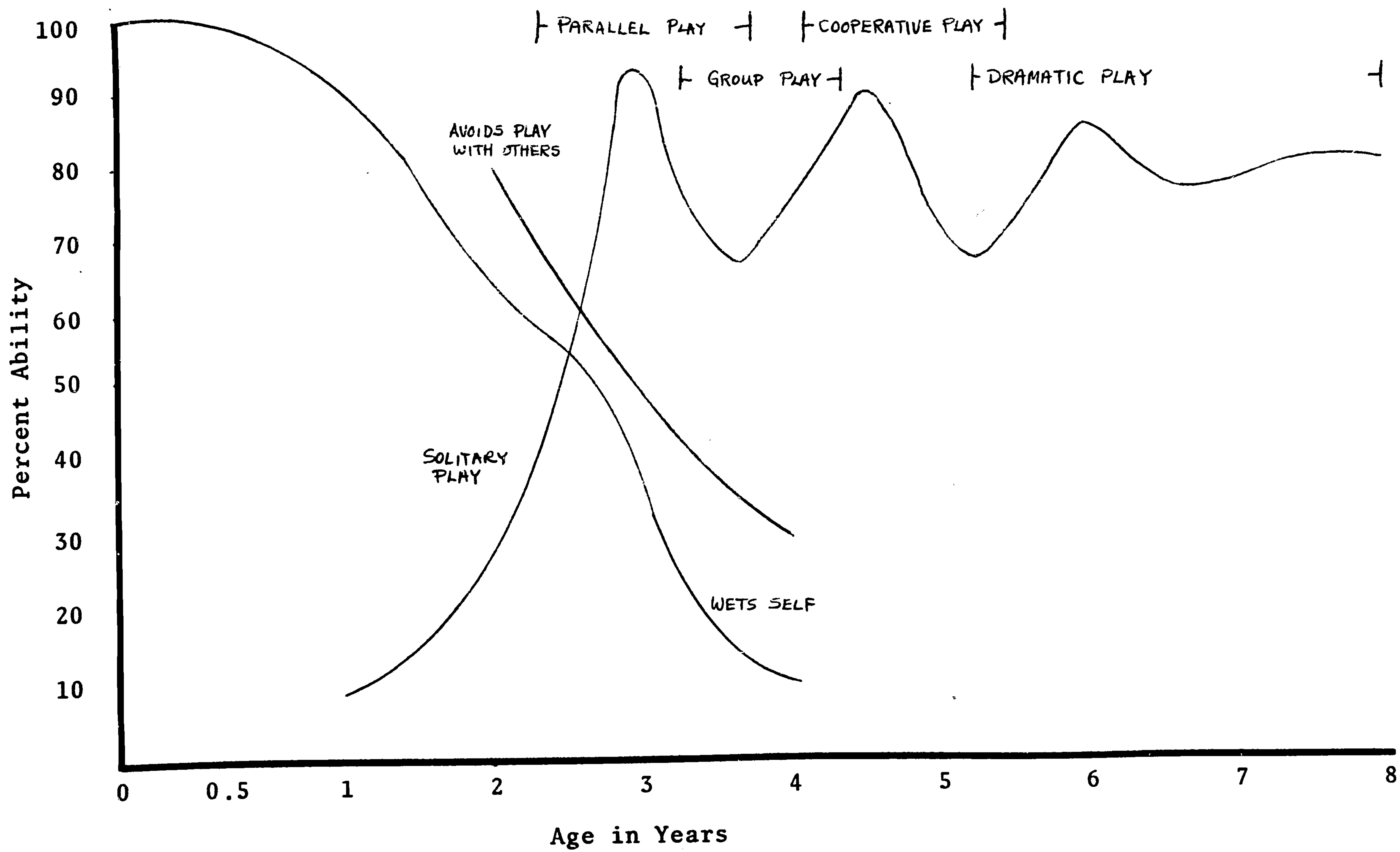


Figures 21 and 22. Social Interaction and Play Activities.

The development of play necessitates a decline in socially unacceptable responses. As the graph indicates, a small percentage of children wet themselves in the era of group play, and at four years only 10% of children wet themselves. There is a sharp drop in play avoidance at two years of age, and the child plays alongside other children (parallel play), but not with them (group play).

SOCIAL INTERACTION

Figure 21.



PLAY ACTIVITIES

Figure 22.

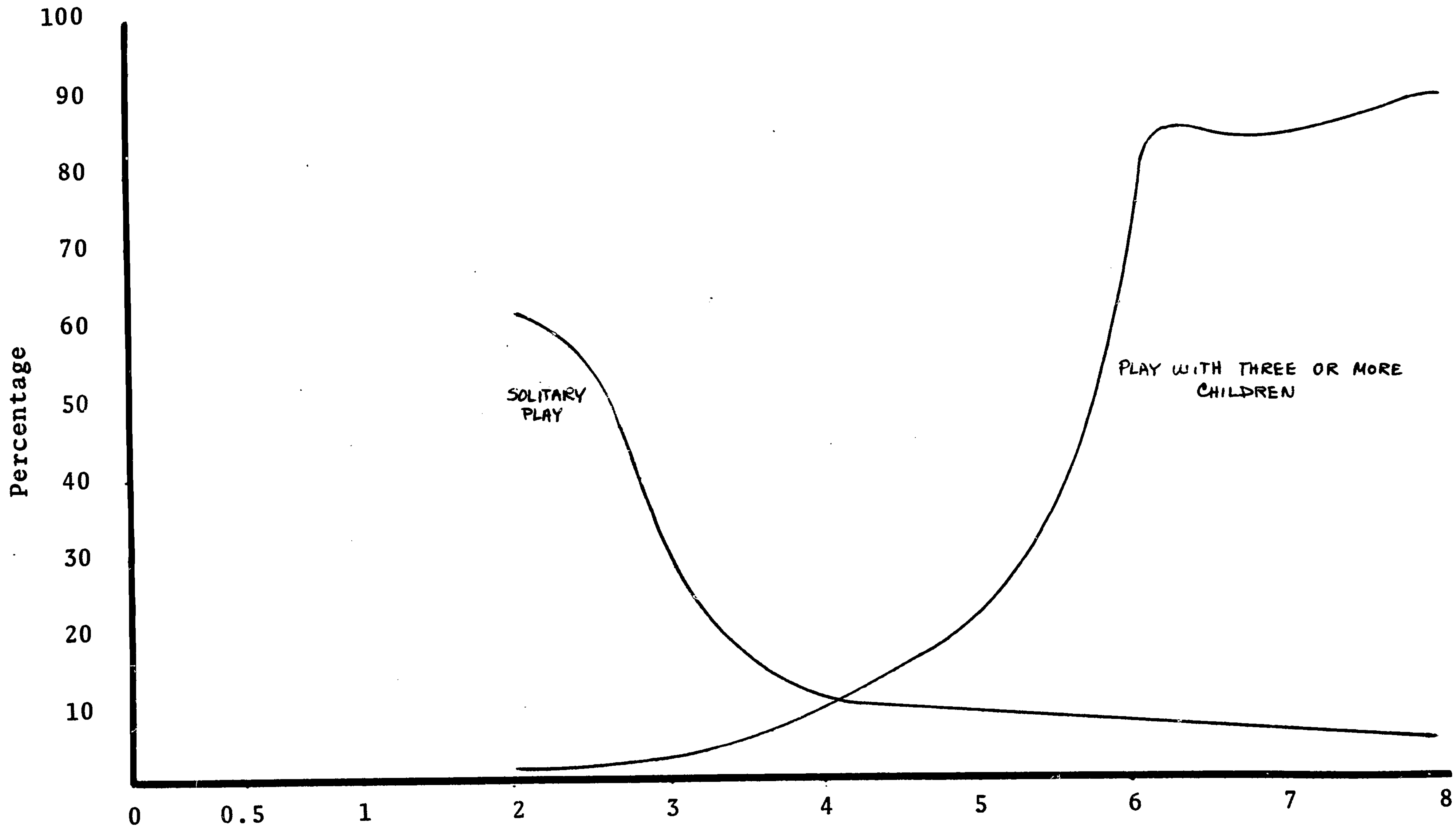


Figure 23. Temper Tantrums in Boys and Girls.

This graph illustrates the sex differences found in aggressive responses; boys emitting the greatest number of such responses. The most marked sex difference begins from seven to eight years. The twenty-five percent drop in female aggressiveness, as compared to a three percent drop in male aggressiveness, exists due to the females' greater understanding of her role as demanded by society.

Figure 23.

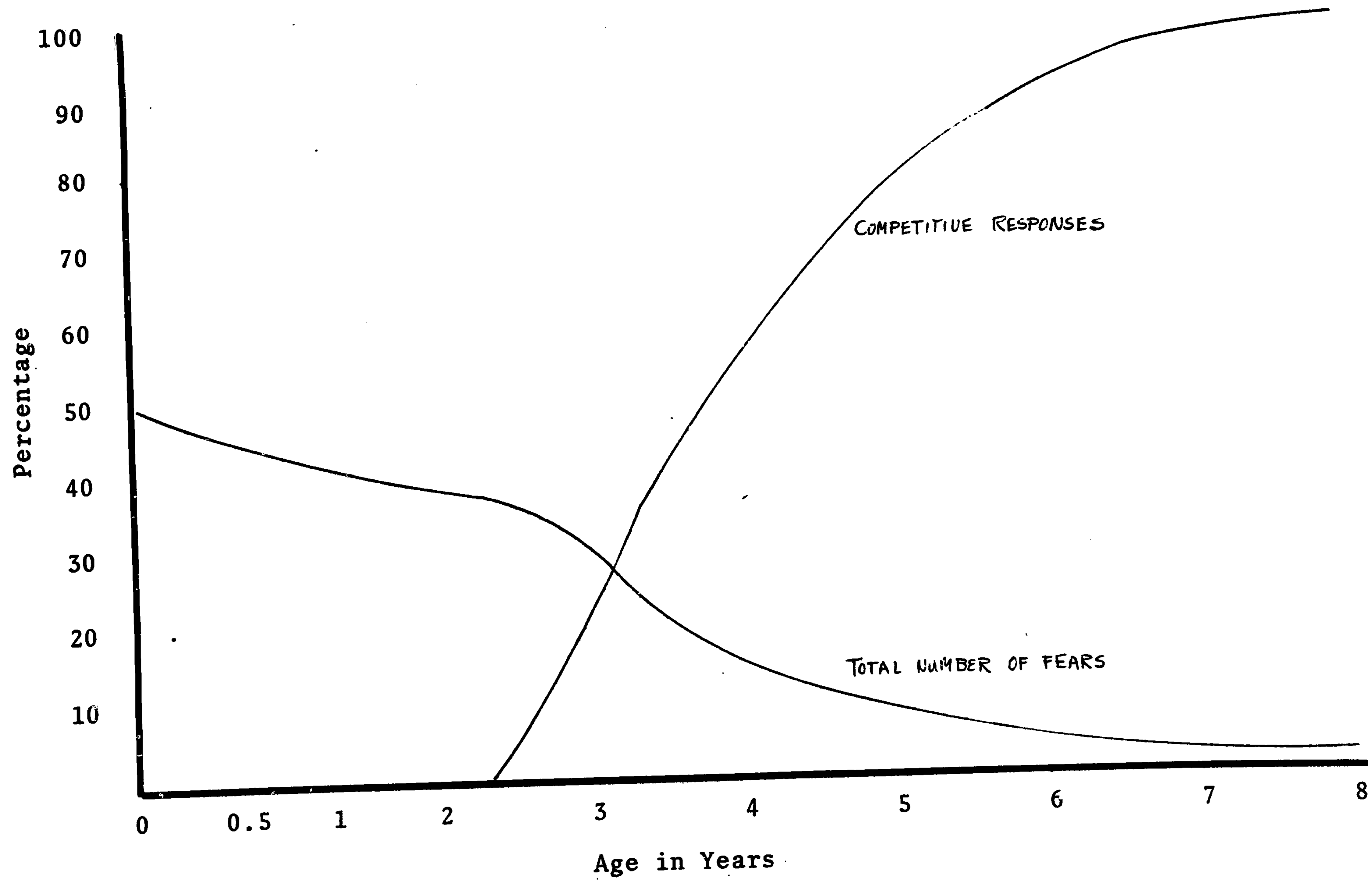
TEMPER TANTRUMS IN BOYS AND GIRLS

Figure 24. Fear and Competition.

As the total number of fears decrease there is a marked increase in competitive responses. This trend is partially due to the new social demands of peers and the school, as well as the increasing cognitive awareness and understanding of objects in the environment. Previous fears become understood and social demands, especially in boys, prevent their verbalization.

Figure 24.

FEAR AND COMPETITION



SECTION VII - SUBJECT INDEX AND BIBLIOGRAPHY

Subject Index to Bibliography:

The subject index references to bibliography number by subject.

SENSATION AND PERCEPTION

Sensation and Perception (General):
439, 1726.

Audition:
222a, 361.

Behavior in Relation to Audition:
92, 98, 436, 538, 734, 789, 1386, 1622, 1702.

Indices Related to Audition:
161, 221, 444, 939, 949, 1330, 1389, 1432, 1891, 1895.

Specific Age Factors and Differences Related to Audition:
891, 1132, 1221, 1274, 1874.

Thresholds and Adaptation in Audition:
302, 719, 789, 1124, 1259.

Behavior in Relation to Vision:
197, 322, 1085, 1553, 1727.

Other Indices Related to Vision:
32, 263, 460, 568, 876, 1080, 1087, 1252, 1514, 1913.

Age Factors and Differences in Relation to Vision:
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297, 332, 336, 337, 341, 342, 343, 561, 576, 806, 945, 1159, 1199, 1254, 1260, 1309, 1573, 1674, 1696, 1903.

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120, 421, 505, 506, 746, 747, 757, 849, 924, 1097, 1371a, 1545, 1646, 1699, 1747, 1799, 1883, 1905, 1910, 1929.

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469.

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136, 646, 647, 962, 975, 1048, 1348, 1493, 1622, 1691, 1718a, 1757.

Indices Related to Olfaction, Pain, Taste and Touch:
163, 362, 930, 979, 1105, 1330, 1494.

Specific Age Factors and Differences:
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NEUROMUSCULAR DEVELOPMENT

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Behavior in Relation to Conditioned Responses:
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Other Indices Related to Conditioned Responses:
215, 1157, 1449, 1544.

Specific Age Factors/Differences in Conditioned Responses:
1628.

Behavior in Relation to Instrumental Learning:
126, 160, 1103, 1363.

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COMMUNICATIONS

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165, 504, 948, 1197, 1253, 1305, 1408, 1818.

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162, 183, 399, 649, 650, 653, 737, 762, 787, 825, 1194, 1653, 1767, 1882b.

Indices Related to Environmental Influences:
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67, 402, 793.

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21, 278, 303, 625, 652, 957, 973, 1017, 1225, 1347, 1407, 1615, 1706.

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SOCIALIZATION

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14, 97, 374, 427, 516, 801, 867, 921, 922, 994, 1174, 1285, 1448, 1510, 1519, 1556, 1710, 1719.

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2, 562, 713, 730, 781, 813, 886, 992, 993, 996, 999, 1006, 1100, 1137, 1163, 1181, 1182, 1202, 1230, 1286, 1308, 1713, 1823.

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46, 610, 720, 747, 1130, 1143, 1814.

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38, 222d, 491, 734, 1149, 1428, 1833.

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Indices Related to Food and Play:
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PERSONALITY

PERSONALITY

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131, 134, 1090, 1535, 1703, 1719.

Sex Differences:
2, 15, 95, 132, 135, 189, 658, 998a, 1153, 1191, 1447, 1653.

MISCELLANEOUS REVIEWS AND THEORETICAL DATA

Miscellaneous (General):
45b, 59, 123, 187, 253, 291, 386, 441, 482, 551, 555, 671, 690, 691, 696, 705, 746, 751, 839, 840, 850, 868, 912, 916, 920, 941, 961, 967, 986, 992a, 1013, 1040, 1218, 1263, 1278, 1368, 1380, 1403, 1409, 1410, 1421, 1422, 1438, 1482, 1546, 1548, 1549, 1647, 1682, 1684, 1717, 1763, 1832, 1845, 1846, 1899.

Material Use and Description:
135, 643, 784, 1289, 1796.

Tests and Measurements:
210.

Descriptive Tests and Measurements:
137a, 175, 251, 1000, 1391.

Intelligence Tests and Measurements:
109, 419, 485, 559, 618, 676, 738, 987, 1762, 1775, 1870.

Physiological and Developmental Scales:
106, 111, 217, 313, 335, 439, 989, 1002, 1047, 1367, 1492.

Personality and Attitudes:
286, 328, 498, 984, 1450, 582.

Procedures:
58, 318, 1474, 1557.

Ethnic, Religious and Race Factors:
2, 6, 120, 308, 450, 452, 468, 619, 667, 892, 982, 988, 1003, 1032, 1036, 1045, 1180, 1361, 1383, 1484, 1582.

Familial Factors:
55, 117, 352, 665, 762, 817, 1272, 1480, 1884.

Health:
1192, 1572.

BOOKS

19, 21, 23A, 41, 51A, 58, 58B, 64, 65, 68, 88, 89, 90, 109, 111, 112, 137B, 142, 144, 154, 206, 212, 213, 229B, 233, 235, 237, 241, 268, 275, 275A, 285, 304, 330, 384, 388, 391, 400, 422, 466, 471, 476, 484, 530, 539, 542, 544, 548, 560, 569, 575, 583, 584, 585, 586, 587, 589, 591, 592, 599, 600, 601, 602, 631, 633, 664, 698, 716, 738A, 752, 764, 766, 773, 803, 811, 827, 837, 843, 845, 864, 865, 869, 885, 890, 899A, 926, 928, 950, 951, 971, 1014, 1019, 1034, 1035, 1046, 1057, 1077, 1081, 1082, 1083, 1084, 1094, 1115, 1126, 1134, 1140, 1145, 1156, 1167, 1178, 1224, 1229, 1231, 1234, 1261, 1284, 1287, 1298, 1299, 1300, 1301, 1302, 1304, 1307, 1322, 1349, 1353, 1355, 1394, 1395, 1396, 1398, 1399, 1400, 1401, 1404, 1405, 1411, 1412, 1414, 1415, 1420, 1434, 1458, 1531, 1537, 1542, 1571, 1575A, 1593, 1608, 1609, 1645, 1668, 1669, 1678, 1685, 1695, 1708, 1733, 1742, 1749, 1770, 1775A, 1775B, 1779, 1798, 1804, 1811, 1815, 1820, 1830, 1840, 1843, 1849A, 1916, 1940, 481, 543, 663, 897.

The following literature was reviewed but not included in the study because the material was either insufficient or dealt with age levels beyond the scope of the study:

16, 43, 63, 72, 73, 74, 76, 77, 81, 84, 104, 105, 119, 158, 159, 165, 174, 175, 189, 192, 218, 223, 231, 234, 248, 256, 259, 261, 273, 276, 280, 282, 287, 367, 376, 467, 474, 478, 495, 509, 535, 579, 620, 630, 637, 642, 644, 669, 698, 706, 749, 756, 819, 826, 877, 899, 931, 932, 946, 960, 981, 1023, 1024, 1025, 1028, 1050, 1055, 1061, 1069, 1092, 1093, 1101, 1107, 1127, 1128, 1131, 1135, 1167, 1171A, 1172, 1173, 1179, 1201, 1226, 1249, 1257, 1303, 1341, 1347, 1351, 1352, 1362, 1365, 1372, 1380, 1393, 1416, 1419, 1446, 1456, 1463, 1496, 1498, 1504, 1522, 1524, 1526, 1529, 1542, 1593, 1594, 1598, 1649, 1665, 1700, 1714, 1719A, 1727, 1737, 1738, 1775, 1789, 1797A, 1828, 1832, 1835, 1837, 1855, 1873, 1877, 1884, 1892, 1894, 1908, 1912, 1918, 1936, 1054, 1381, 1838.

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