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ABSTRACT

The annotated bibliography contains approximately 110 references (1969-1976) of articles related to the Sewall Early Education Developmental Program. Entries are arranged alphabetically by author within the following seven topic areas: social emotional, gross motor, fine motor, adaptive reasoning, speech and language, feeding and dressing and simple hygiene development. Citations usually include information on title, source, date and pagination as well as a brief annotation. (CL)

An Annonated Bibliography of Some Recent Articles that Correlate with the Sewall Early Education Developmental Program (SEED)

Janice Jackson

Thomas C. Flamboe, M.S.

FOREWARD

This bibliography was established in hopes that the early educators employing the SEED in their perspective programs can get a more in-depth look at samples of research that have recently taken place within the seven developmental categories on the SEED.

It is hoped that once the educator is "teamed" with the researcher, a more comprehensive view of the child can be gained. The research listed in this bibliography is only a small amount of the actual investigations going on across the country. Nevertheless, we feel that it is indicative of the trends and ideas existing in the early childhood field.

Special thanks to Ms. Janice Jackson, author and graduate in Speech Pathology at the University of Wyoming, for her undying efforts in researching, compiling, and writing this paper; and to Ms. Shirley Andrews for the many hours of painstaking perfection that she devoted to the completion of this paper.

We hope this bibliography assists you as it did our staff in preparing us to deal with the total development and education of the young child.

T.C.F.

The following articles may be located at the Libraries of the University of Wyoming, Laramie, Wyoming.

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SOCIAL EMOTIONAL DEVELOPMENT

A. Visual Regard

Brooks, J. and Lewis, M. Infants responses to strangers: Midget, adult, and child. Child Development, 1976, 47, 323-332.

Infants respond differentially, and at times with fearlike behavior, to unfamiliar persons. This study was designed to see how infants discriminate among strangers. Since it has been shown that infants respond differently to children and adults, the physical characteristics of persons used to make such differentiations were of interest. Facial configuration and height were systematically varied as four different strangers--a male and female child, a female adult, and a small female adult the same height as the children (midget)--each approached 40 different infants. The infants responded as if there were three classes of persons--adult, child, and small adult, suggesting that both size and facial configuration cues were used. Infants as young as 7 months of age reacted to the size-facial configuration discrepancy of the small-adult condition. (Authors' Abstract)

Carpenter, G. C. Visual regard of moving and stationary faces in early infancy. Merrill-Palmer Quarterly, 1974, 20, 181-194.

Many human newborns have the capacity to fixate and follow a moving stimulus visually and movement in the visual field has been shown to affect non-verbal behavior (sucking rate) of the human neonate. Furthermore, movement is reported to be important in eliciting smiles to the human face in older infants although data comparing stationary and moving presentation are not given in these papers. Few studies have investigated the effects of stimulus movement in visual response of human infants despite common acceptance that movement in the visual field is attention enhancing for infants.

Results from the few infant experiments involving visual response to moving stimuli generally support the attention enhancing effect. For example, five-month-old infants showed greater regard of moving over stationary female faces presented as color motion pictures; infants two to four months of age "preferred" a light which changed position within a matrix to one which blinked in one position, although no comparison with a non-blinking light was included.

But stimulus movement does not uniformly enhance attention. In testing the effects of speed of vertical movement on infants visual preference for a moving over stationary target (pairs of checkerboards) age-related preference for differing rates of stimulus movement were found. Further, seven-week-olds, the youngest tested, did not show attention differences between moving and stationary

stimuli at any of four speeds of movement. An attempt to elicit differential response to movement at seven weeks with additional subjects and faster speeds yielded only a promising tendency toward the movement preferences. Eight-week-olds, however, did prefer the moving stimulus of a pair at each of four speeds of movement. Another age-related movement effect was found for attention to stationary and moving (nodding toward and away from the baby) three dimensional faces studied developmentally during the first eight weeks of life. More regard of moving than still faces did not occur reliably until week four. Perhaps the nodding movement confuses the issue by bringing the stimulus into and out of focus for the very young infant whose capacity for visual accommodation may be limited. Absence of differential attention to moving stimuli does not imply inability to discriminate movement but does indicate that the single generalization that moving stimuli elicit more attention than stationary stimuli is unwarranted.

This study had three aims (a) to explore the effect of stimulus movement on the visual behavior of young infants using a horizontal movement in which stimuli, whether moving or stationary, were always in the same focal plane; (b) to observe changes in visual response to stimulus movement over the early weeks of life by use of a repeated measures design and (c) to examine the possibility that in the earlier study with Negro mothers, stimulus brightness might have influenced the differential response to mother's face versus artificial faces. In the present experiment this was tested by using Caucasian mothers and a Negroid and a Caucasian manikin. (Author's Introduction)

Emde, R. N. and Koenig, K. L. Neonatal smiling and rapid eye movement states. In Studies In The Competent Infants: Research Commentary. Stone, J. L., Smith, H. T., and Murphy, L. B. (Eds) New York: Basic Books, Inc., 1973.

Smiling in the first week of life has been described. Unlike later "social" smiling, it has been termed endogenous because no external stimulus regularly elicits it. Many mothers are convinced this smiling is due to "gas", but there is no systematic evidence supporting this common view. Wolff has observed such smiling to occur exclusively in drowsiness and the sleep accompanied by respirations.

In pilot observations of three cases, the authors discovered that such smiling occurred in bursts, could be seen predictably after feeding, and was associated with rapid eye movements. This study, the first of a series seeking to characterize neonatal smiling, had the primary purpose of systematically describing the smiling and its correlates under naturalistic conditions. A secondary purpose was to explore the usefulness or subdividing behavioral states of drowsiness, sleep, and sucking according to whether rapid eye movements were observed or not. (Authors' Abstract)

Fagan, J. F. Infants recognition of invariant features of faces. Child Development, 1976, 47, 627-638.

A series of five experiments explored the infants ability to discriminate among photos faces. The infants tendency to choose novel visual targets for inspection provides evidence of discrimination and recognition. Two initial experiments demonstrated the infants ability to discriminate among photos of adult male faces and among poses of the same man's face. In the third, fourth, and fifth experiments, some variant of a face that had been previously exposed served as the "familiar" target on recognition testing. The aim was to see if the infant was capable of identifying the variant of the previously seen face. Three examples of the ability to detect features common to two instances of faces were demonstrated: Features common to different poses of a man's face were recognized; infants responded to invariance in pose; and infants identified a face as familiar on recognition testing when another instance of that same-sex face had been presented for initial examination. Providing multiple instances of the same-sex face prior to recognition testing facilitated the latter identification task. (Author's Abstract)

Feinman, S. and Entwisle, D. R. Children's ability to recognize other children's faces. Child Development, 1976, 47, 506-510.

Facial recognition ability was studied with 288 children from four grades--first, second, third, and sixth--who also varied by sex, race, and school type, the last being segregated or integrated. Children judged whether each of 40 pictures of children's faces had been present in a set of 20 pictures viewed earlier. Facial recognition ability increased significantly with each grade but leveled off between ages 8 and 11. Blacks performance is significantly better than whites and blacks are better at recognizing faces of whites than whites are at recognizing blacks. Children from an integrated school show smaller differences recognizing black or white faces than children from segregrated schools, but the effect appears only for children of the integrated school who also live in mixed-race neighborhoods. (Authors' Abstract)

Haaf, R. A. and Brown, C. J. Infants response to facelike patterns: Developmental changes between 10 and 15 weeks of age. Journal of Experimental Child Psychology, 1976, 22, 155-160.

Infants at two age levels were shown six patterns which represented three levels of stimulus complexity and two types of organization, facial and non-facial. Ten-week-old infants showed a preference for the higher levels of complexity but acted as though they were oblivious to the type of organization which was imposed on the elements within the stimulus patterns. Fifteen-week-olds also showed increased attention to the higher levels of complexity. In addition, at the older age level differential responding was greater for stimuli which varied concomitantly in both facial resemblance and complexity (Facial Organization) than for those which varied only in complexity

(Nonfacial Organization). The present results agree with those of previous studies in suggesting that there is a change between the ages of 10 and 15 weeks in the dimensions which underlie infants' response to facelike patterns. (Authors' Abstract)

Maurer, D. and Salapatek, P. Developmental changes in the scanning of faces by young infants. Child Development, 1976, 47, 523-527.

Six one-month-old infants and six two-month-old infants each viewed three faces (his mothers, a strange woman's, and a strange man's) while his eye movements were recorded by corneal photography. The one-month-olds fixated away from the faces most of the time, and they looked at their mothers even less often than at the strangers. When they did fixate a face, they usually chose a limited portion of the perimeter. By contrast, two-month-olds fixated the faces most of the time, looked at more features, and were more likely to look at internal features, especially eyes. This scanning resembles that reported previously for two-dimensional shapes, although in some respects it appears unique to faces. (Authors' Abstract).

Waters, E., Matas, L., and Srouge, L. A. Infants' reactions to an approaching stranger: Description, validation, and functional significance of wariness. Child Development, 1975, 46, 348-356.

Reliable descriptions of infants' behavioral responses to an approaching stranger were made from video records. Subtle negative responses (wariness) were validated against heart rate acceleration and responses to mother approach and showed significant age changes. Behavioral aspects of wariness appear to serve a "cutoff" (coping) function for the infant, preventing all-or-none responses (crying) and facilitating subsequent reengagement of the stranger. Attention to both positive and negative responses, especially in the milder forms helps clarify inconsistencies in reported age of onset and frequency of "stranger fear". The role of data on infants' responses to strangers in formulating and integrated picture of development in the second half-year of life is discussed. (Authors' Abstract).

B. Socialization

Altman, K. Effects of cooperative response acquisition on social behavior during free-play. Journal of Experimental Child Psychology, 1971, 12, 387-395.

This investigation assessed generalization of a laboratory acquired cooperative response to an extra-laboratory setting. Forty, two-minute samples of each subject's interactions (friendly, hostile, association, and conversation) were taken during spontaneous play. Each day a different dyad was exposed to the experimental situation wherein subjects were individually reinforced for cooperative responses. Subsequently, twenty time samples were taken during free play. Associative play responses increased significantly following cooperative response acquisition as did associative play responses to

experimental partners. Three dyads did not acquire the cooperative response; however, two appeared to have acquired an incompatible response. In general, this study demonstrated that a social response, cooperation, learned in a laboratory influenced the nature and frequency of social interactions in a spontaneous play situation. (Author's Abstract)

Bloom, K. and Esposito, A. Social conditioning and its proper control procedures. Journal of Experimental Child Psychology, 1975, 19, 209-222.

In Experiment I, eight infants received response-contingent social stimulation, while another eight infants received response-independent social stimulation. Both groups vocalization rates similarly increased from baseline to stimulation periods and decreased from stimulation to extinction periods. In Experiment II, twelve infants were given continuous social stimulation (elicitation treatment) for one period, and, in a second period, stimulation was withheld for five seconds contingent upon each vocalization (omission treatment). Response rates were similar for both periods, and rates decreased when social stimulation was removed (mobile treatment). In both studies social stimulation increased vocalization rates and rate of responding was insensititve to the programmed contingency. There were, however, fewer "bursts" of responses with the negative and positive contingencies as compared with response-independent stimulation. (Authors' Abstract)

Nicki, R. M. and Shea, J. F. Learning, curiosity, and social group membership. Journal of Experimental Child Psychology, 1971, 11, 124-132.

Middle- and lower-class school children were presented a series of 20 question alternative answer items. The alternative answers associated with each question were varied in number and relative probability in order to obtain four degrees of objective uncertainty. Using Shannon-Weaver average information measure, these were calculated to have 0.9165, 1.5849, and 2.3219 bits of information. Recall of the correct answers, provided after each question-alternative answer item, was tested after all 20 items had been presented. Overall, recall of correct answers was found to be an inverted U-shaped function of objective uncertainty. Furthermore, differences in recall between middle- and lower-class subjects lessened for intermediate and high degrees of objective uncertainty. These findings had been predicted using Berlyne's definition of curiosity and the concept of generalization decrement. (Authors' Abstract)

O'Connor, M. The nursery school environment. Developmental Psychology, 1975, 11, 556-561.

Forty-eight preschool-age children in two nursery school settings were observed for social and dependency behavior. The schools were similar in most respects but differed in child-teacher ratio and grading. Findings indicated that in the setting with more adults

present per child, children interacted significantly more with adults and less with peers. Different factors for interaction were found for the schools, but patterns were similar over both settings with children high in adult interaction tending not to interact with peers and, conversely, children low in adult interaction tending to interact more with peers. Observations showed the groups to be similar in overall frequency of dependency; however, children in high-adult setting made proportionally more adult-directed dependency bids. Frequencies of social behaviors were compared with previous results. Principal findings for frequencies of social interaction, dependency, and patterns of interaction were attributed to the effect of the child-teacher ratio. (Author's Abstract)

Redd, W. H., Morris, E. K., and Martin, J. A. Effects of positive and negative adult-child interactions on children's social preference. Journal of Experimental Child Psychology, 1975, 19, 153-164.

The effects of positive and negative interactions on children's performance and preference for the adults associated with each type of interaction were studied. Five children served as subjects during daily sessions in which each of three adults followed prescribed patterns of social interaction. One adult (positive) dispensed positive comments contingent upon either color-sorting or completion of arithmetic problems; a second adult (negative) mildly reprimanded the child for off-task behavior; and the third adult (extinction or nonreactive) said nothing to the child when he was present. Following each session the three adults reentered and the child chose one of them for an additional period of interaction. Three response measures (frequency, latency, and percent of time on-task) and the children's adult preferences were obtained daily. The negative adult effected the most task behavior and had strongest stimulus control; the positive adult, though exerting little control over children's behavior, was the most preferred. Children's adult preferences were not specific to the task setting, but were observed across a variety of contexts. (Authors' Abstract)

Scarr, S. and Salapatek, P. Patterns of fear development during infancy. In Studies In The Competent Infant: Research Commentary. Stone, J. L., Smith, H. T., and Murphy, L. B. (Eds) New York: Basic Books, Inc., 1973.

The study reported here was prompted by the large number of unknown elements in the human development of fear during infancy. Three questions provided a framework for the research:

1. How are various fears that develop during infancy related to one another and how similar are the frequency and timing of the development of these fears?
2. What relationships, if any, exist between perceptual-cognitive development during infancy and the exhibition of specific fears?
3. What relationships, if any, exist between individual differences in temperament and the manifestation of specific fears?

The goals of the study were tentative and exploratory since so little consistent information was available on the development of fear responses during infancy. Because of the exploratory nature of the study, both the design and the stimuli chosen were selected for myriad possibilities. They do not represent, in retrospect, the best possible choices, but they have yielded some information in a relatively unexplored area.

The stimuli chosen to evoke fear responses were not presumed to be exhaustive or even representative of all possible types of fear. After consideration of a variety of stimuli, six were chosen as a sample of situations in which both cross-sectional and longitudinal data could be collected. The cross-sectional data comprise the majority of the results reported here. (Authors' Introduction)

Schaffer, H. R. and Emerson, P. E. Patterns of response to physical contact in early human development. In Studies In The Competent Infant: Research Commentary. Stone, J. L., Smith, H. T., and Murphy, L. B. (Eds) New York: Basic Books, Inc., 1973.

It has been long assumed that physical contact plays an important part in early human development and that all normal infants actively seek and enjoy this mode of interaction with their social environment. Some material bearing on this problem arose in the course of a longitudinal investigation concerned with the formation of social attachments in infancy. While carrying out this study it was noted that not all infants eagerly seek physical contact in the way that the literature might lead one to expect--indeed that a considerable proportion of the subjects actively resisted and protested at certain types of such interaction. It had not originally been one of the aims of the project to study contact behavior, but as spontaneous reports from the mothers of the infants repeatedly forced our attention in the direction, it was decided that a more systematic analysis of this aspect was called for. (Authors' Introduction)

Washburn, R. W. A study of the smiling and laughing of infants in the first year of life. In Studies In The Competent Infant: Research Commentary. Stone, J. L., Smith, H. T., and Murphy, L. B. (Eds) New York: Basic Books, Inc., 1973.

Taking into account only overt expressive behavior the subjects fell into three goups, of which the first group had two subdivisions.

In the first group, the ambi-expressive, the two opposed forms of behavior (smiling and laughing, soberness or crying) were equally noticeable, but within this group those whose expressive behavior was less both in degree and in incidence than in other subjects were designated pari-expressive, while those whose expressive behavior was exaggerated both as to frequency of occurrence and as to the form which it took were called multi-expressive.

Members of the second group were also expressive during much of each period of observation, but there was much smiling or laughing, while soberness or crying was at a minimum. As the risorius muscle which retracts the corners of the mouth was presumably more active than other muscles in these subjects, they were called risor-expressive.

The third group ranked in crying or in sober expressive behavior and low in smiling or laughing. Since two depressor muscles are said to be active in behavior of this type, the group was called depressor-expressive.

This grouping emerged from the study as it became apparent that the subjects' types of expressive behavior did not vary from observation to observation. (The behavior of most of the subjects who have been re-seen in their second year has been characteristic of the group in which they were placed in their first year.)

No relationship was demonstrated between physical type and type of expressive behavior. (Author's Conclusions)

C. Differentiation of Self and Others

Murphy, L. B. Development in the first year of life: Ego and drive development in relation to the mother-infant tie. In Studies In The Competent Infant: Research Commentary. Stone, J. L., Smith, H. T., and Murphy, L. B. (Eds) New York: Basic Books, Inc., 1973.

If now we review the dangers in the first year of life as a whole, we can outline them somewhat as follows:

1. Severe birth experience may produce an extreme degree of instability or predisposition to anxiety as Greenacre has termed it, laying foundation for difficulties in interaction between the mother and the baby, consequent hostility, tendencies to somatization, difficulties in differentiation and in normal ego development. Vegetative disturbances during the neonatal phase which are unassuaged may have a similar effect, and both of these may contribute to failure to establish adequate basic healthy narcissism and therefore interfere with the capacity for the cathexis of the environment which Bernfeld sees as developing from the early narcissism of the infants.
2. At about eight weeks the consolidation and integration of perceptual functions brings the possibility of overstimulation or understimulation and requires the assistance of the mother to protect the baby from overstimulation and to provide adequate stimuli for the developing perceptual functions. There is also the danger of contamination of these early ego function, distortions or disturbances of them as a result of excessive distress in the gastrointestinal zones, or failure of oral gratification.
3. At the level of twelve to sixteen weeks and later, failure or support for differentiation of affect, vocalization, body, and environment may contribute to disturbed perception of self and of objects. Similarly, failure of help of support to the baby in

acceptance of newness during the next months, particularly new foods and people, may lead to resistance to newness or anxiety regarding new people and new foods that can persist through the child's development.

4. The range of gratified and frustrated experiences with the mother at about this time may, if overweighed by bad feelings--either internal bodily pain that the mother cannot assuage, or excessive deprivation in oral or contact areas or extreme discomfort at the hands of the mother--produce profound difficulties in development of an integrated image of and acceptance of the mother.
5. Next, between sixteen and thirty-six weeks, failure of support for the development of language, the constructive use of aggression, the development of locomotion and other large muscle activity and of manual activities may all lead to cathexis of either specific ego functions or integrative functions of the ego and of the environment.
6. Extreme and persistent pain in teething may complicate the baby's relation to the environment, especially to the mother, adding to anxiety and distrustful feelings, increasing hostile feelings, and aggressive impulses.
7. Next, when inadequate development of part functions and of basic integrative capacities has been interfered with, through excessive anxiety or frustration or the functions contributing to differentiation, or failure of gratification of drives, the baby will have great difficulty not only in differentiating self but in proceeding with the normal development of identification toward the end of the first year. Without this development of identification, separation anxiety can be expected to be more intense and symbiotic trends will tend to become more fixed. Object love also will not be able to develop nor will the baby be able to achieve the range of flexibility of affective exchanges with the environment generally which the more optimally developing baby is is able to do. Anxious, hostile, and ambivalent reactions to the environment would tend to be reinforced when integration is interfered with. As part of this, there will be a failure of libido development from the level of cathexis of the part object to the level of cathexis of the whole object. The baby will tend to be fixated on parts and symbols of parts. There will be a failure of ego synthesis. The sense of mastery, triumph, and confidence in his own capacities cannot develop.
8. These failures in ego development are different from the anaclitic depression reaction to prolonged separation from the mother, or loss of the love object occurring in the baby who has been well-mothered and who developed well up to the time of separation. Spitz points out that of the group he observed, one third showed severe anaclitic depression and these were the babies who had had the best mothering up to that time. Another third showed mild anaclitic depression, and one third did not show anaclitic depression on separation. The latter group included those who had not had good mothering but we can assume that other symptoms could be expected in the group with least adequate mothering such

as excessive autoerotic play or obsessive preoccupation with impersonal objects. (Author's Conclusions)

D. Imitation

Weisberg, P. and Durrell, D. E. Imitative play behavior of children: The importance of model distictiveness and prior imitative training. Journal of Experimental Child Psychology, 1973, 16, 23-31.

The frequency of play behaviors of nursery school and second grade subjects who were imitative of one or two models depended upon the extent to which the two models were previously distinguished by the proposition of reinforcement each delivered, and whether reinforcement delivery was contingent upon imitative behavior. A model, high in distinctiveness and also involved in prior imitative training, engendered reliably more imitations than models high (or low) in distinctiveness but involved in nonimitative (or imitative) training. (Authors' Abstract)

E. Play

Scholtz, G. J. L. and Ellis, M. J. Repeated exposure to objects and peers in a play situation. Journal of Experimental Child Psychology, 1975, 19, 448-455.

Two hypotheses were contrasted. One posed a positive relationship between mere repeated exposure and preference for stimulus of concern; the other predicted that preference for stimuli would be modulated by their relative novelty and complexity. These hypotheses were tested within the context of a naturalistic play situation in which forty four to five-year-old children were repeatedly exposed to and interacted with play settings differing in complexity. Over preference for play objects declined with repeated exposure, the rate of decline being inversely determined by the complexity of the play stimuli. Preference for peers, however, increased as a function of repeated exposure, with the amount of increase being an inverse function of the complexity of the external setting. (Authors' Abstract)

Turner, C. W. and Goldsmith, D. Effects of toy guns and airplanes on children's antisocial free play behavior. Journal of Experimental Child Psychology, 1976, 21, 303-315.

The effects of toy guns and toy airplanes on children's antisocial (aggression and rule-breaking) behavior was investigated in two settings during 30-minute free play sessions. Four-and five-year-old children were observed during 15-16 free play session. During some sessions the children played either with (novel, aggressive) toy guns or with (novel, nonaggressive) toy airplanes in addition to their usual toys. In both studies, the toy guns treatment produced a reliably higher rate of antisocial behavior than the average of the toy airplanes and the usual toys. The novel-nonaggressive toy

airplanes also increased the rate of antisocial behavior as compared to usual toys. The results were related primarily to Berkowitz's and Bandura's analysis of aggressive behavior, but they were related also to other theoretical models which predict stimulus control of behavior. (Authors' Abstract)

Weisler, A. and McCall, R. B. Exploration and play: Resume and redirection. American Psychologist, 1975, 63, 533-541.

This article attempts to stimulate and guide research on exploration and play. A condensed review of the concepts exploration and play is presented, followed by an outline of the major research finding. From this basis, gaps in the literature and new research directions are discussed. The scope of the discussion is broad, covering a variety of organisms, ages, disciplines, and research approaches. The authors do not try to solve the conceptual and empirical issues in this area, but to step back from the field to gain perspective on what has been learned, what are the problems, and what new research directions need to be followed. (Authors' Abstract).

GROSS MOTOR DEVELOPMENT

Bender, B. G. and Levin, J. R. Motor activity, anticipated motor activity, and young children's associative learning. Child Development, 1976, 47, 560-562.

The purpose of this study was to determine whether motor activity, previously assumed necessary to induce imagery in young infant's associative learning, actually has to be executed. The results of our experiment with kindergartners clearly suggest not: In conditions where subjects simply planned an activity (without executing it), learning was enhanced. Further, the temporal proximity of the planning to the potential motor activity did not prove to be important. These results, combined with those from two follow-up experiments, give rise to the speculation--amount others--that young children can be "tricked" into imagery generation through appropriately worded instructions. (Authors' Abstract)

Finnie, N. R. Handling The Young Cerebral Palsied Child at Home. New York: E. P. Dutton & Company, Inc., 1975.

Early Stages of Normal Development

The posture of the normal baby for the first few months is predominantly one of flexion. At this early stage his head is rarely in mid-line; he has no active head control other than the ability, when placed on his tummy, to turn his head sideways to breathe. His arms are usually bent with loosely closed hands, his legs bent and apart. His "mass" movements are abrupt and follow no set pattern. He reacts to light and to loud sounds by blinking or by a Moro reaction, neither stimulus having any meaning for him.

Stage I

The first significant stage in motor devleopment is that of mid-line orientation and the start of head control. Both of these activities make it possible for the baby to begin to make contact with his environment, first with his eyes and much later as he explores with his hands.

A. Rolling

For the first time the baby starts to move from one position to another, he does this by rolling to either side from his back. To begin with he will often hold his hands together while he rolls. The movement of rolling starts with the turning of the head which causes the body to follow (neck-righting reaction) later the baby initiates the movement himself.

B. Vision and the beginning of eye-hand regard

Gradually the baby starts to select what he sees. He can follow his mother as she moves around the cot, follow a simple dangling toy 6 to 12 inches above his face through a half circle from side to side.

He begins to turn to the sound of a voice, smiling when his mother speaks to him. He is already learning to smile when he wants to be picked up, and to know that if he cries he will get attention.

Stage II

The next important pattern of motor development is the beginning of extension-adduction of the limbs (overlapping with flexion adduction) in conjunction with the extension of the whole body. He practices this extension in all positions but at the same time is able to do activities in flexion.

A. Vision and the beginning of eye-hand co-ordination

The baby can, as it were, now "grasp" an object with his eyes but is still unable to reach out and grasp it with his hands. He shows excitement and the fact that he wants something by kicking with both legs and waving both arms, opening and closing his fingers as he does so. At first he does this with his arms bent and near his body, but gradually progresses to opening and closing his hands as he both follows and reaches out for the object-but he is still unable to grasp or to manipulate at this stage. It is worth noting that this is the first time that we see the baby making a deliberate attempt to move his arms towards an object with the intention of trying to get it.

He can follow an object if it is moved slowly from left to right in front of his face. If we place a rattle in his hand he grasps it strongly with the inner side of his hands and fingers. He can look at it for a second and then starts to wave his arms about in an uncoordinated way, often hitting himself and complaining loudly; he cannot at this stage let go (rattles are so varied in shape and sound these days that they are an excellent way of trapping the ears and eyes at this stage of development).

B. Hearing and Speech

He responds momentarily to loud sounds, vocalizing as he moves and answering back in his way to sounds made by adults, in conjunction with the variation of pitch his repertoire enlarges. For example, sounds of anger appear. He blows "rasberries", syllables come into his babbling and he starts to make the sounds "m", "mm", and "ddd".

Stage III

The baby has progressed from being a flexed to being an extended

individual and now he has perfect head control. He has now reached the important stage in his development when he starts to break up these total patterns and a greater variety of motor patterns appear. This is the stage of strong extension-abduction of the limbs. Where before movements of the limbs were taking place predominantly at the shoulders and hips, we now see active movements appearing at the elbows and knees. It should be noted that the development of the arms is still in advance of that of the legs.

A. Rolling

He can now roll over from his tummy onto his back, a movement that includes rotation and active extension of the whole body, so essential when he finally stands and walks.

B. Vision and manipulation

As head control is now complete the baby can follow objects with his eyes in all directions. He is also able to fix his gaze on small objects. Where before when seeing his image in a mirror he was puzzled, he is now aware of himself and will reach forward and pat his image. Self exploration is now complete as the baby goes a step further and becomes aware of his feet.

Object exploration begins as he now has developed the ability to look, reach, touch, and clutch an object with his whole hand. Manipulation is still very crude and for this reason everything is immediately taken to his mouth, the mouth playing an important part in providing information such as taste, shape and consistency.

He still has no fine movements of his fingers; flapping and scooping with his hands, having to open the whole hand widely before grasping and succeeds in this way in picking up, for example, a one-inch wooden cube. This grasp is a "palmer" one, i.e., with the whole hand. Movements at the wrist are becoming noticeably more refined. He can hold and transfer two cubes of one-inch, but if he drops one, he takes no notice. He will accept large objects with both hands, looking at them and immediately taking them to his mouth. Wooden spoons, blocks and cups are much preferred at this stage to soft toys.

C. Hearing and Speech

He now turns immediately to sounds except for those that come from directly above his head, which tend to confuse him. He responds when spoken to by laughing, chuckling, and squealing, vocalizing with variations in a tuneful way. The continuous sounds he makes are forerunners of future speech; his babbling is repetitive using syllables such as "ppp" and "sss".

Stage IV

The baby now reaches the stage in his development when his ability

to rotate becomes well co-ordinated. While rotation was present before when he rolled, reaching across for an object when lying on his back, or when lying on his tummy supporting himself on one arm as he reached back with the other, now, with arm support sideways developing as well as forwards, spontaneous rotation, trunk control and sitting balance appear.

A. Rolling

He now rolls from his back to his tummy in a well co-ordinated manner where previously he was rather disorganized.

B. Vision and manipulation

As we have already pointed out a baby's ability to reach and grasp objects is dependent on his balance and his ability to look at what he is doing. It is therefore not surprising at this stage, to find him making exaggerated movements of his whole body and often over-balancing in his attempts to reach out for a toy. During the following months these exaggerated movements gradually diminish.

C. Speech

He uses sounds to express his anger and hunger and "nnn" sounds to express dislikes and imitates dialogue using chains of sounds with intonation.

Stage V

The final developmental stage we shall deal with is the acquisition of balance and the beginning of progression. Most activities at this time start from the sitting position; moving around is the most important function for the baby at this stage; an opportunity to start exploring his environment and himself in relation to his environment.

A. Supine

On the rare occasions when he does lie on his back he does so now with his legs straight and slightly apart.

B. Eye-hand development

At this time isolated movements of the fingers are possible enabling him to explore objects with his finger tips and poking them with his index finger. The thumb and index finger now play an important part in the manipulation of small objects being picked up and inspected. It is important to note, at this stage, that although manipulation has now reached a more advanced stage, release of an object is still impossible. The baby attempts to release by pressing an object against a surface. Play now is more purposeful and the baby becomes engrossed for longer periods of time. He is becoming aware of the permanence of objects and when he drops a toy on the floor he will

look to see where it is gone.

C. Speech

He vocalizes delibertely as a means of communication and understands the words "no" and "bye-bye" and enjoys copying adults, for example, when they cough.

Gregg, C. L., Haffner, M. E., and Lorner, A. F. The relative efficacy of vestibular-proprioceptive stimulation and the upright position in enhancing visual pursuit in neonates. Child Development, 1976, 47, 309-314.

Forty-eight healthy neonates born tomultiparae were randomly assigned to view a moving stimulus either in the horizontal or the upright position, with or without pacifier sucking. The infant was shown a moving black line inside a strictly controlled visual environment provided by an apparatus which permitted horizontal and upright positioning and displacement of the infant. Visual tracking was recorded by a concealed television camera positioned at a constant distance and angle from the infants eyes in both positions. Quality of tracking during each of four trials was scored on a seven-point scale. Results either horizontally or semivertically significantly enhanced his visual tracing, whereas the upright position did not. Pacifier sucking also improved his performances. (Authors' Abstract)

Hass, W., Tucker, N., and Kilburn, D. Movement in and for sensori-motor development: A Piagetian perspective. The Council for Exceptional Children: Movement In Early Childhood Education. Developed for CEC's Early Childhood Education Institute Series.

Gross Motor

1. Moves head and arms (Prone position)
1.01 Has involuntary movements
1.02 Turns head to one side or the other
1.03 Lifts head momentarily
1.04 Supports chest with forarms
1.05 Supports chest with hands
2. Moves extremities (Supine position)
2.01 Has no tonic neck reflex
2.02 Has symmetrical posture
2.03 Bends arms and legs
2.04 Raises both legs
2.05 Raises both arms
2.06 Kicks with both legs
2.07 Slides across surface
2.08 Holds head steady
3. Rolling
3.01 Rolls head and trunk to side
3.02 Rolls body from stomach to side (Holds)

3.03 Rolls from stomach to back
3.04 Rolls head and trunk from back to either side
3.05 Rolls body from back to either side (holds)
3.06 Rolls from back to stomach
4. Crreping
4.01 Pivots on stomach
4.02 Crawls in circle
4.03 Crawls backwards (no help)
4.04 Crawls cross-pattern
4.05 Assumes creeping position
4.06 Creeps cross-pattern
4.07 Creeps over and around objects
5. Sitting
5.01 Holds trunk erect
5.02 Sits in chair
5.03 Sits leaning forward supported
5.04 Sits erect (support)
5.05 Sits unsupported (no hands)
5.06 Leans forward
5.07 Leans backwards
5.08 Turns to side
5.09 Pulls self to sitting position (two hands)
5.10 Pulls self to sitting (side)
5.11 Rises from lying to sitting
5.12 Sits independently
6. Standing
6.01 Bounces
6.02 Bears partial weight on legs
6.03 Rises to standing (from kneeling support)
6.04 Bears whole weight on legs
6.05 Stands erect
6.06 Rises to standing (from sitting with support)
6.07 Rises to standing (no support)
6.08 Stands alone (narrow stance)
6.09 Stoops and recovers (no support)
7. Walking
7.01 Lifts foot off surface
7.02 Moves feet alternately
7.03 Cruises at rail
7.04 Walks holding onto support
7.05 Walks (one hand held)
7.06 Walks alone
7.07 Squats and recovers
7.08 Walks alone, seldom falls
7.09 Walks around obstacles
7.10 Walks with narrow stance
7.11 Walks with heel-to-toe gait
7.12 Climbs up stairs (independently)
7.13 Walks down stairs (two feet per step)
7.14 Walks backwards
7.15 Walks up stairs (alternately)
7.16 Walks down stairs (alternately)

7.17 Walks cross-pattern
7.18 Follows footprint pattern on floor
7.19 Walks on a variety of surfaces (tile, rug, hard-packed dirt, grass, sand, gravel)
7.20 Walks on a variety of surfaces barefoot (tile, rug, hard-packed dirt, grass, sand, water)
7.21 Walks up 15" incline
7.22 Walks down 15" incline
7.23 Walks forward touching heel of front foot to toe of other foot
7.24 Walks backward touching toe of back foot to heel of front foot
7.25 Walks forward with eyes closed.
7.26 Follows circular pattern on floor
7.27 Walks forward in narrow passageway without touching
7.28 Steps sideways - to the right
7.29 Steps sideways - to the left
7.30 Steps through rungs of a ladder
7.31 Walks carrying object which blocks view of floor
7.32 Walks on tiptoes
8. Pulls Objects
8.01 Walks forward pulling toy by cord - right hand
8.02 Walks forward pulling toy by cord - left hand
8.03 Walks backward pulling toy by cord - right hand
8.04 Walks backward pulling toy by cord - left hand
8.05 Pulls wagon while walking forward - right hand
8.06 Pulls wagon while walking forward - left hand
8.07 Pulls wagon while walking backward - right hand
8.08 Pulls wagon while walking backward - left hand
9. Pushes Objects
9.01 Pushes small objects while creeping
9.02 Pushes large objects while creeping
9.03 Pushes door (cabinet door) closed
9.04 Pushes drawer closed
9.05 Pushes light object (chair, large cardboard box) while walking-standing erect.
9.06 Pushes heavy object (heavy box, chair) while walking - standing erect.
9.07 Pushes object (wagon, cardboard box) while walking bending at waist
10. Balance
10.01 Balance on right foot
10.02 Balance on left foot
10.03 Hops on right foot
10.04 Hops on left foot
10.05 Hops forward on right foot
10.06 Hops forward on left foot
10.07 Hops forward on right foot successively
10.08 Hops forward on left foot successively
10.09 Hops from right foot to left foot
10.10 Hops from left foot to right foot
10.11 Balances on both feet - eyes closed
10.12 Balances on tiptoes - eyes closed

10.13 Balances on right foot - eyes closed
10.14 Balances on left foot - eyes closed
11. Running
11.01 Runs - wide base stance
11.02 Runs - narrow base stance
11.03 Runs avoiding objects
11.04 Runs on tiptoes
11.05 Skips
12. Walking and Balance
12.01 Walks forward on walking board (6" wide; 6" high)
12.02 Steps up on balance beam - 4" wide
12.03 Walks forward on balance beam - 4" wide
12.04 Walks forward on balance beam - 2" wide
12.05 Walks backward on balance beam - 4" wide
12.06 Walks backward on balance beam - 2" wide
12.07 Stands on balance board (20" square platform with 2" high X 4" wide block centered on bottom side)
13. Climbing
13.01 Climbs into an adult size chair
13.02 Climbs vertical ladder - 2 feet per step
13.03 Climbs vertical ladder cross pattern
14. Jumping
14.01 Jumps up - both feet leaving floor surfaces
14.02 Jumps forward in succession
14.03 Jumps backward in succession
14.04 Jumps sideways in succession (three times to right)
14.05 Jumps sideways in succession (three times to left)
14.06 Jumps down from 10" step
14.07 Jumps over 6" high object
14.08 Jumps over 5" high object while running
15. Using soccer size ball
15.01 Rolls ball toward aide
15.02 Bounces ball toward aide (seated)
15.03 Bounces ball while standing
15.04 Bounces ball in succession (dribble)
15.05 Catches rolled ball (seated)
15.06 Catches ball in air (seated on floor)
15.07 Catches ball in air (seated in chair)
15.08 Catches ball in air (standing)
15.09 Catches bounced ball (standing)
15.10 Catches bounced ball - hands only (standing)
15.11 Bounces ball on floor and catches it successively
15.12 Catches ball in air
15.13 Moves position to catch ball
15.14 Throws ball to aide (under-hand bucket style)
15.15 Throws ball to aide (push from chest position)
16. Using softball size ball
16.01 Rolls ball toward aide (seated on floor)
16.02 Bounces ball toward aide (seated on floor)
16.03 Bounces ball while standing (toward aide)
16.04 Catches rolled ball (seated on floor)
16.05 Catches ball in air (seated on floor)

16.06 Catches ball in air (seated on floor)
16.07 Catches ball in air (standing)
16.08 Catches bounced ball (standing)
16.09 Catches bounced ball - hands only (standing)
16.10 Bounces ball on floor and catches it three times in a row
16.11 Catches ball in air from five feet (standing)
16.12 Moves body position to catch ball
17. Using ball appropriate to hand size; (fingers of one hand can grasp and hold ball)
17.01 Throws ball under hand (right hand)
17.02 Throws ball under hand (left hand)
18. Kicking a ball
18.01 Kicks stationary ball - using right foot
18.02 Kicks stationary ball - using left foot
18.03 Kicks stationary ball from walking start - using right foot
18.04 Kicks stationary ball from walking start - using left foot
18.05 Kicks stationary ball while running (right foot)
18.06 Kicks stationary ball while running (left foot)

Mussen, P. H., Conger, J., and Kagan, J. Child Development and Personality. New York: Harper & Row, 1969.

The Maturation of Motor Development

The childs' sitting, crawling, and standing exemplify maturational development. They occur during the first two years of life as a consequence of the opportunity to use the body plus the maturation of certain neural tissues, expansion and increased complexity of the central nervous system, and growth of bones and muscles. In many instances, these seemingly unlearned behavior patterns improve and become better coordinated, more precise, and more accurate after practice.

In this chapter, the emphasis is only developments in locomotion, reaching, and grasping. No attempt is made to review the whole vast array of responses of the first year.

Locomotion

Sitting: The response repertiore of the neonate does not include any reflex sitting posture, but the ability to sit develops early. On the average, babies are able to sit for a minute, with support, at the age of 3 or 4 months, and by 7 or 8 months, they can do it without support. Once sitting is achieved, there is rapid improvement, so that by 9 months most babies can sit independently for 10 minutes or longer.

Crawling and Creeping: Ames (1937) analyzed motion pictures of crawling and creeping in twenty infants and concluded that there are 14 stages in the development of these activities. There are great individual differences in the ages at which infants reach the various stages, but practically all infants go through the same sequence.

The first stage, thrusting one knee forward beside the body, appeared in half the infants at 28 weeks of age or younger. The median age for crawling (i.e., moving with the abdomen in contact with the floor) was 34 weeks. At this age, the muscles of the trunk, arms, and legs are not sufficiently strong or coordinated to maintain the body weight. The infants began to creep on hands and knees, which requires new coordination and equilibrium, at a median age of 40 weeks, while creeping on hands and feet, the final stage of prone progression, was attained by a median age of 49 weeks. Infants may skip one or two stages of development, but all of them progress through most of the steps.

Walking: The ability to walk independently also matures gradually, after a series of preliminary achievements. As in other aspects of development, there is a wide range of ages at which the various stages are attained. The median ages for standing while holding on to furniture, walking when led, pulling up to a stand, standing alone, and walking alone were 42, 45, 47, 62, and 64 weeks, respectively, according Shirley's (1933) data on 25 children. The transition from one developmental step to the next is not always smooth and never does the infant pass completely and irretrievably from one stage into another. There is always a merging of patterns and parts of patterns both in the degree of perfection of the action and in the frequency of occurrence. There are often regressions to the less mature response.

There is considerable evidence that growth changes and maturation of the neural and muscular systems - rather then environmental conditions, experiences, or practice - determine when the child will sit, stand, and walk. For example, Dennis (1960) kept a pair of female twins on their backs for the first nine months of their lives, thus preventing any practice in sitting or standing. Despite these restrictions, they were only slightly retarded in these activities; the most marked retardation being in sitting. When they were given their first opportunities to sit alone at the age of 37 weeks, the restricted twins were not able to do so. Several weeks later, however, they were able to sit alone. Although most children by the time they are 40 weeks old can support their body weight while standing with help, the twins were not given their first opportunity to do so. Within three days, however, both infants could stand with help for at least two minutes. One twin suffered no retardation in crawling, walking when led, or standing or walking independently.

Generally speaking, although these motor behaviors develop without any special practice or teaching by adults, extreme degrees of environmental restriction on opportunity for motor development may retard the onset of walking. Dennis compared the motor development of children which provided its children with opportunities to sit and play in the prone position. The children in this relatively more enriched environment were less retarded in onset of walking than those in institutions where motor experience was more restricted.

Thus, the role of experience is vital. When a child's opportunity to use his body and to wander freely in a secure space is severely limited, he will walk later than a comparable child who has such freedom.

Schaffer, H. R. and Parry, M. H. Perceptual-Motor behavior in infancy as a function of age and stimulus familiarity. In Studies In The Competent Infant: Research Commentary. Stone, J. L., Smith, H. T., and Murphy, L. B. (Eds) New York: Basic Books, Inc., 1973.

The general approach of previous studies of familiarization was extended by, in the first place, using three-dimensional objects rather than two-diminsional pictures as stimuli and, in the second place, obtaining not only perceptual but also manipulative measures. As infants do not become motorically capable of adequate manipulation until the end of the first half-year, the problem of integration falls mainly into the second six months of life. This report will therefore be based on a comparison of two age-groups, namely infants of six and twelve months respectively, as preliminary observations had indicated certain relevant developmental changes taking place during this time which required highlighting. (Authors' Introduction)

Shirley, M. M. Interrelations of locomotor development. In Studies In The Competent Infant: Research Commentary. Stone, J. L., Smith, H. T., and Murphy, L. B. (Eds) New York: Basic Books, Inc., 1973.

Two phases of interrelationship among the various stages of locomotor development are worthy of consideration: first, the extent to which locomotor development follows a pattern, stage succeeding stage in a fixed and orderly sequence, and, second, the predictability of one stage from another. Since age was the only measure of proficiency in motor habits, prediction can be made only in such terms. (Author's Introduction)

FINE MOTOR DEVELOPMENT

Black, K. N., Williams, T. M., and Brown, D. R. A developmental study of preschool children's preference for random forms. Child Development, 1971, 42, 57-61.

Pairs of polygons containing 4, 8, 12, 16, and 20 sides were presented in random order to preschool children. The 8-sided form was most preferred by a group of 3-year-olds, while the 12-sided form was most preferred by a group of 4-year-olds. The functions relating stated preference to complexity level, defined as sidedness, were significantly different for the two groups. One year later the preferences of the younger group had changed. Now four years of age, they chose the more complex stimuli more frequently than previously. It was suggested that preferences may be multidimensionally determined. (Authors' Abstract)

Caplan, P. J. and Kinsbourned, M. Baby drops the rattle: Assymmetry of duration of grasp by infants. Child Development, 1976, 47, 532-534.

Infants of mean age 2.7 months maintained grasp of a rattle for a longer mean duration with the right than the left hand, developmentally the earliest instance of asymmetry of manual dexterity and/or preference. (Authors' Abstract)

Field, J. Relation of young infants' reaching behavior to stimulus distance and solidity. Developmental Psychology, 1976, 12, 444-448.

The reaching behavior of twelve infants in the presence of solid objects and pictures of objects placed within and beyond possible contact distance was videotaped in three sessions at 15, 19, and 24 weeks of age. From 15 weeks onward the subjects adjusted their reaching behavior to changes in the physical distance of stimuli. However, infants who attempted to manipulate the solid objects tended to reach for pictured objects in the same way. The different amounts of visual attention subjects paid to objects and pictures indicated that they could visually discriminate between the flat and solid stimuli, but it seemed this capacity for depth perception could be obscured by the rather compulsive tendency of young infants to manipulate patterned surfaces situated within reach. (Author's Abstract)

McDonnell, P. M. The development of visually guided reaching. Perception and Perception, 1975, 18, 181-185.

This investigation measured the accuracy of reaching in infants wearing 30-diopter prisms. Infants varied in age from 4 to 10 months. Although accuracy was barely affected, the reach trajectories indicated that infants switched from a miss path to a hit path in midcourse. There was some evidence to support the view that visually

directed reaching was operative in the youngest infants and that it improved with age. (Author's Abstract)

Mussen, P. H., Conger, J. J., and Kagen, J. Child Development and Personality, New York: Harper and Row, 1969.

Manipulation

Like locomotion, manipulative ability evolves through a series of stages. Analysis of motion pictures of infants reaching for and grasping cubes showed that those under 20 weeks of age do not actually reach for objects, although they may follow them with their eyes. Some infants 20 weeks old stretch their arms in the general direction of the object, making slow, awkward, and angular reaching movements that primarily involve shoulder and elbow action. With increased age, the approach becomes more direct, and the wrist and hand participate. By 60 weeks of age, the infant reaches for attractive objects without superfluous movements.

There are ten stages in the development of prehension, according to Halverson (1931). The neonate's grasp reflex disappears by the time he is 4 months old. Sixteen-week-old infants make no real contact with an object, but by 20 weeks they can touch and squeeze things in a primitive way without taking hold firmly. Grasping becomes more successful, and unnecessary movements decrease as the child matures. Thus by 28 weeks of age, he used his palm smoothly in closing in on a cube, but his thumb and fingers are not involved. The forefinger begins to play a part in grasping at about 36 weeks. In the final stages of development of prehension, thumb and forefinger function together, and other fingers are also used precisely in securing a cube. By the time the child is 60 weeks of age, his grasp is much like an adults.

Sensorimotor coordination and Reaching: One of the interesting maturational developments is a response that typically reaches maturity at about 5 months and has been called "visually directed reaching." If you place an attractive object in the field of vision of a one-month-old baby, he will stare at it, but will make not attempt to grab it. By 2½ months of age, he will raise his hand in the vicinity of the object, alternate his glance between the hand and object, gradually removing the gap between his hand and the object and then perhaps touching it. By 5 and 5½ months the infant will reach for the object and contact it efficiently. His aim is now perfect.

Although this response goes through a standard set of maturational steps, as walking or standing does, it is subject to dramatic alteration through environmental experiences of enrichment. Infants raised in an unstimulating institution where they were deprived of objects to attend to or reach are retarded in their attainment of visual motor reaching. The progress of the infants who are provided with enriched opportunity for reaching and watching attractive objects (e.g., through having attractive mobiles being placed above their

heads and being allowed to handle them) is accelerated; they will show visual motor reaching as early as 4 to 4½ months.

If the infant is provided with an opportunity to practice and, therefore, to perfect reaching responses, we see earlier manifestation of that behavior- even though the process is basically maturational. Enriching the stimulus environment does not always lead to acceleration of all the child's mental or motor development. The child must be maturationally ready to reach if the enrichment is to help. The child of 3 to 4 months ordinarily studies and swipes at attractive objects, and providing him with some if he has none will direct his attention to them and stimulate him to reach. However, providing stimulation to accelerate responses that the child is not prepared to display may accomplish nothing and in some cases may lead to a retardation. For example, the institutionalized infants placed in the enriched environment described above showed less attentiveness to the colorful environment during the first five weeks. These children were more irritable and fussy than those who did not have the enriched stimulation - as if the enriching stimuli were distressing the child. The presence of a stimulus to which the infant cannot make a response seems to be one cause of distress to the infant. It is possible that the 3-week-old baby is too immature to make any responses to the richly colored mobile and becomes more upset than if nothing were present.

Consider a 1-year-old who is not ready to write with a crayon. Giving him crayons or pencils would not necessarily facilitate earlier development of this skill. Indeed, if the child grows tired of the crayons or pencils, he may ignore them 2 years later when he has become maturationally ready to use them. The child can be helped to master skills earlier than he ordinarily would through enrichment, but the timing of the enrichment is important. It is almost as bad to present enriching experiences before the child is ready to use them effectively as it is to deprive the child of these stimulations entirely.

ADAPTIVE/REASONING DEVELOPMENT

A. Visual Pursuit (Eye Movement)

Aslin, R. N. and Salapatek, P. Saccadic localization of visual targets by the very young human infant. Perception and Psychophysics, 1975, 17, 293-302.

The direction, latency, and form of the 1- and 2-month-old human infant's saccadic eye movements toward peripheral targets were investigated. Infants of both ages reliable executed a directionally appropriate first saccade toward a peripheral target introduced as far as 30 degs from the line of sight along the horizontal and both diagonal axes, but only to 10 deg along the vertical axis. The presence of a second target in the ventral visual field reduced the probability of peripheral target localization. A significant inverse relation was found between target distance from the line of sight and probability of initiation at directionally appropriate saccade. Electrooculography revealed that latency to first saccade, although highly variable, was less than 500 msec on a significant proportion of trials. Unlike the adult, the first saccade to target was grossly hypometric and was followed by one or more saccades of approximately equal amplitude to the first. (Authors' Abstract)

Cardozo, . W. and Allen, R. M. Contribution of visual perceptual maturation to the ability to conserve. American Journal of Mental Deficiency, 1975, 79, 701-704.

The extent in which visual perceptual maturity contributes to intellectual efficiency, as measured by the ability to conserve, was investigated in educable mentally retarded and nonretarded children. Hypotheses that visual perceptual ability and conservational ability would be positively correlated and that children with more mature visual perceptual processes would be better able to conserve were supported. Relationships among visual perception, conservation, CA, MA, and IQ were discussed. (Authors' Abstract)

Dayton, G. O., Jones, M. H., Aiu, P., Rawson, R. A., Steele, B., and Rose, M. Developmental study of coordinated eye movements in the human infant: Visual acuity in the newborn human: A study bases on induced optokinetic nystagmus recorded by electro-oculography. In Studies In The Competent Infant: Research Commentary. Stone, J. L., Smith, H. T., and Murphy, L. B. (Eds) New York: Basic Books, Inc., 1973.

This is the first report of current investigations into the relationship of the development of the optomotor reflexes in the human infant to the acquisition of binocular vision. It has been established that in order to achieve normal binocular vision each eye must have macular vision, which some investigators believe is conditioned postnatally over a period of months. Therefore, as a first step in this study,

the precise determination of the visual acuity of the newborn was undertaken with targets subtending angles considerably smaller than those used in previously reported studies. This report presents results of measurement of visual acuity by the observation of induced optokinetic nystagmus (OKN), which was recorded by means of the technique of electro-oculography. (Authors' Introduction)

Dodwell, P. C., Muir, D., and DiFranco, D. Responses of infants to visually presented objects. Science, 1976, 194, 209-211.

The reaching behavior of some sixty infants between seven and 23 days of age was studied. Contrary to some other reports, the infants did not respond differently to a visually presented, graspable, solid object that to its two-dimensional representation. (Authors' Abstract)

Gordon, F. R. and Yonas, A. Sensitivity to binocular depth information in infants. Journal of Experimental Child Psychology, 1976, 22, 413-422.

In order to study infants' sensitivity to binocular information for depth, eleven infants, 20 to 26 weeks of age, were presented with real and stereo-scopically projected virtual objects at three distances, and the infants' reaching behavior was videotaped. When the virtual object was positioned out of reach, infants tended to lean further forward and to reach less frequently than when the virtual object was positioned within reach. In addition, the proportion of reaches in which the infants patted, closed their hands, or brought their hands together was greater when the virtual object was within reach. However, no difference in the terminal location of the infants' reaches was found as a function of the virtual object's position. Examination of reaches to a near real object revealed that infants frequently did not contact the object or show appropriate hand shape or orientation. The effectiveness of the cue of retinal size and of binocular information for the depth of an object is discussed. It is concluded that 5-month-old infants are sensitive to binocular information for depth. (Authors' Abstract)

Lefton, L. A. and Fisher, D. F. Information extraction during visual search: A developmental progression. Journal of Experimental Child Psychology, 1976, 22, 346-361.

Five developmental experiments examine the role of context in visual search. Experiments I and II presented either lists or paragraphs that were either in meaningful context or scrambled. Results showed a significant interaction of these variables. Experiment II examined within-item context or predictability and replicated and extended the work of Brand and Ingling. Experiments IV and V examined search through lists of various widths; results showed a significant interaction of Grade x Width reflecting the different perceptual spans of children and adults. Although these were search tasks, appropriate comparisons between list and paragraph performance were made allowing interpretations of the results to be supportive of a

model of reading in which meaningfulness, predictability, and peripheral vision play critical roles. (Authors' Abstract)

Mundy-Castle, A. C. and Anglin, J. M. Looking strategies in infants. In Studies In The Competent Infant: Research Commentary. Stone, J. L., Smith, H. T., and Murphy, L. B. (Eds) New York: Basic Books, Inc., 1973.

In the present study we have asked whether and to what extent the infant is equipped with cognitive strategies for extracting information from regular sequences of events. Armed with the implications and experimental techniques of those who have studied perception in the neonate, we have branched off in a somewhat different direction attempting to tap more cognitive capacities of infants during the first year of life. Thus, the primary purpose of this study was to examine developmental changes in the looking patterns of infants presented with a sequence of events governed by the simple rule of single alternation. Indices of attention, of systematic search, and of anticipation were our prime concern. From such indices our hope has been to infer the extent to which an internal model of the perceptual past can be used by infants when they are presented with a recurrent pattern. (Authors' Abstract)

Slater, A. M. and Findlay, J. M. Binocular fixation in the newborn baby. Journal of Experimental Child Psychology, 1975, 20, 248-273.

Three experiments are reported in which the newborn baby's ability to fixate binocularly was investigated, using the corneal relection techniques for measuring eye fixation position. Two criteria for consistent binocular fixation were assessed. These are: 1) the two eyes will be optically more divergent when fixating more distant targets, and 2) each eye will be scored as being on-target when corrections for the expected deviations of the pupil center from the fixated stimulus are introduced.

In the first experiment vertical arrays of lights were separately shown at distances of 10 and 20 inches from the subjects' eyes (with the retinal image size and luminance of the stimuli held constant). The 12 newborns who gave results at both viewing distances reliably converged to both stimuli, the optical divergence of the pupil centers of the eyes increasing with presentation of the more distant stimulus. In Experiment 2 similar stimuli at 5 and 10 inches from the eyes were shown. It was again the case that the subjects reliably converged to the stimulus at 10 inches. This was not so for the stimulus at 5 inches, and many subjects fixated this stimulus with monocular vision. The failure to converge is probably due to an inability to accomodate to this near distance. In Experiment 3, different stimuli (a vertical strip of light, and outline triangle and square, and an array of squares) were presented a constant distance from the eyes. The majority of the 15 subjects binocularly fixated all three stimuli: for those subjects who failed to converge consistently to these stimuli the observed alternatives to binocular fixation were monocular

divergent strabismus, and a third category of response that is most probably an indication of inattention to the stimulus. It can be concluded that the newborn baby possesses the ability to fixate binocularly on appropriately presented stimulus, and has the basic requirements for binocular vision. (Authors' Abstract)

B. Activities

Abravanel, E. Choice for shape vs. Textural matching by young children. Perceptual Motor Skills, 1970, 31, 527-533

Choice for shape vs textural matching of stimulus materials by means of active touch was studied intra and intermodally in 130 preschool children. A significant trend toward matching by shape was present as early as ages 4 and 5 under both intra- and intermodal conditions. This finding is contrary to those of other investigations of preference for shape vs texture matching and discrimination learning in children. This discrepancy is resolvable in terms of recent evidence on the nature of perceptual activity and exploration by young children which highlights the interaction between stimulus materials and mode of exploration for determining what is perceived. (Author's Abstract)

Brown, A. L. and Scott, M. S. Recognition memory for pictures in preschool children. Journal of Experimental Child Psychology, 1971, 11, 401-412.

Two continuous recognition experiments are reported in which the ability of children (CA 3-5) to recognize old pictures approximated that of adults. Thirty-three subjects were tested for immediate retention in Experiment I. The probability of recognizing items recurring within the series was .98, with no decline in accuracy even with 50 items intervening between presentations. For 32 of the subjects long-term retention was also examined. Accuracy declined as a function of increasing retention interval (1, 2, 7, or 28 days). The probability of recognizing a twice-seen item declined from .98 at one day to .78 after 28 days but was only .84 and .56, respectively for items seen only once. The probability of incorrectly identifying a new stimulus as old was consistently low. Nine new subjects were tested in Experiment II where it is shown that the superiority of twice-seen items was related to both seeing the item twice and making an overt recognition response to that item on its recurrance. (Authors' Abstract)

Bower, T. G. R., Broughton, J., and Moore, M. K. Development of the object concept as manifested in changes in the tracking behavior of infants between 7 and 20 weeks of age. Journal of Experimental Child Psychology, 1971, 11, 182-193.

The tracking behavior of infants up to 5 months of age was studied using linear and circular trajectories, with partial occlusion of the trajectories. Results indicate that it is not until the age of about 16 weeks that infants can be said to be tracking a moving object as an object. (Authors' Abstract)

Bucher, B. and Schneider, R. E. Acquisiton and Generalization of conservation by preschoolers using operant training. Journal of Experimental Child Psychology, 1973, 16, 187-204.

Children under 5 years old have rarely shown conservation even after training. In this study they were given reinforced training in graduated steps. They first learned to judge numerical equality or inequality of two rows of objects of unequal lengths. Then conservation of substance and then liquid quantity, in two steps each. Both conserving and non-conserving trials were presented. Over half the children completed all training steps. Their average age was 1 year, 2 months. Transfer test trials were included in each step to pretest performance at the next step. Transfer performance was typically above chance. Master of new steps occured with few errors. Two typical number conservation training procedures that may lead to spurious conserving judgements were investigated: use of conserving transformations only, and use of numerically small sets of objects. Both produced inflated test performance.

It is concluded that conservation training studies have frequently failed to control for possible artifacts that can produce false positive responding. In examining the present successful training, it is concluded that operant training programs show considerable potential for developing behavior skills indicative of conservation even in preoperational children. More detailed analysis of the behavioral manifestations of conservation is needed before it can be determined whether such training actually induces conservation as a cognitive ability. (Authors' Abstract)

Cole, M. A probe trial procedure for the study of children's discrimination learning and transfer. Journal of Experimental Child Psychology, 1976, 22, 499-510.

A discrimination reversal problem was presented to 192 children varying in age from 3 to 5 years. At the end of both the initial and transfer trials, probe trials were introduced to ascertain the response rule describing children's choices. Results were analyzed in terms of a binary division of the children according to their responses to the probe stimuli; children who responded errorlessly (concept responders) were contrasted with children who made errors on the probes (instance responders). Using this criterion, it was found that many children transferred in a way different from the way they learned the initial problem. There was no difference in the porportion of younger and older children responding conceptually to the original problem, but older children were more likely to transfer conceptually when standard geometric blocks were used as stimuli. Future studies must consider the possibility that learning and transfer may be accomplished by different processes whose application differs with age, the nature of the stimuli, and the stage of training. (Author's Abstract)

Daehler, M. W. Retention of sequences of responses by very young children as a function of instructional conduction. Developmental Psychology, 1976, 12, 473-474.

Developmental psychologists have often proposed explicitly or implicitly that processing of verbal-symbolic information requires a more advanced level of cognitive development than processing of imagistic or action-based cures. Empirical investigations of memory and problem solving have tended to give support to this general thesis. For example, Blank (1974), although expressing reservations about this point of view, noted that initial instructions often provide all the necessary information to solve a first discrimination problem, yet preschoolers frequently require numerous trials to achieve a learning criterion.

But very young children are typically expected to remember considerable amounts of information via verbal directions alone. While caretakers undoubtedly demonstrate and model instruction, even 2-year-olds are frequently simply "told" to do something. Corsini, using a procedure similar to that of the present experiment, found that when verbal instructions were accompanied by nonverbal cues (pointing to items or modeling their placement), memory for an instructional sequence improved in 4- and 5-year-olds. These children appeared to need the added visual or enactive information to effectively complete the task demands. Surprisingly, however, Corsini also found that a nonverbal, modeling demonstration was no more effective for retention of the instructional sequence than verbal instructions alone.

In the present study, eight boys and eight girls in each of three age groups averaging 30 (28-31), 36 (34-37), and 48 (42-54) months of age were tested for their ability to process verbal and nonverbal instructional sequences. Children in the two youngest groups were tested at the University while those in the oldest group were tested in a mobile laboratory located at a nearby nursery school they attended. Six boys in the youngest age-group were replaced for failure to pass one of the pretest conditions. In general, participants were children of highly educated, white, middle-class parents.

Each child was presented three different lengths of instructions in each of four different conditions. The instructions included placement of one item (a key, a penny, a toy car, or a toy dog) in one container (a box, a cup, a basket, or a doll dish), two of these items in two different containers, or three different items in three different containers.

In the "static" condition each test item was prearranged in a receptacle so that during the trial the experimenter said, "Put this in here", while pointing to each item in each container. This condition assessed how well the child could process and remember instructions given only the visual arrangement of items. The nonspecific verbal phrase and the accompanying pointing were included to insure that the

child attended to each item in each container. In the "verbal instructions" condition the child was merely told how to place the items in the containers. In the "modeling" condition the child watched the experimenter perform the task first. Thus, the child observed the operation of placing each item in each container. Accompanying nonspecific verbal instructions matched those used in the static condition. In a fourth condition both "modeling and verbal instructions" were combined to determine whether adding modeling cues to the verbal instructions improved performance.

The instructions, presented at the rate of approximately 4 seconds for each item in each container, were followed by the experimenter saying, "Now you do it. You make it that way." Between test trials each child turned to his or her left to insert pieces into a wooden puzzle. The order of trials was randomized with the restriction that each condition occur in every block of four trials and each length of instruction in every block of three trials. Items and containers were randomly paired for each trial for each subject with the restriction that each item and each container be used at least once in each condition.

Before the test trials each child was asked to identify each item and container when labeled by the experimenter. Each child was also given pretest trials requiring correct placement of one item in one container under each instructional condition. Because of failure to respond, two boys were placed on the identification and four boys were replaced on the pretest task.

Scores summed over the three trials of each instructional condition could range from 0 to 6. The mean number of correctly placed items for the 30-month-olds in static, verbal, modeling, and combined verbal-modeling conditions was 1.75, 3.12, 2.75, and 3.12, respectively. Corresponding scores for the 36- and 48-month-olds were 3.12, 3.62, 3.62, and 3.88 and 4.25, 4.50, 4.44, and 4.75, respectively. A 3 (Age) X 2 (Sex) X 4 (Condition) repeated measures analysis of variance performed on these scores yielded significant main effects for age, and condition, and no significant interactions. (Author's Review)

Elkind, D. Perceptual development in children. American Scientist, 1975 63, 533-541.

Jean Piaget, perhaps best known for his developmental theory of intelligence - adaptive thought and action. But Piaget has also elaborated a theory of perceptual development that complements and supports his work on the growth of intelligence. He assumes that intelligence is an extension of biological adaptation and that it results in the formation of new mental structures. These mental structures, however, are not performed, or acquired; rather they are "constructed" in the course of development. Piaget's interest in perception thus grew out of his desire to demonstrate that perception, no less than intelligence, is neither entirely performed (as Gestalt

psychology claimed) nor simply acquired (as some contemporary theorists, such as Gibson, contend).

Piaget's work on perception is, nonetheless, of more than theoretical interest. His theory or perceptual development suggests new ways of analyzing and interpreting children's performance in many practical domains, including reading. Unfortunately; in elaborating his theory, Piaget limited himself almost exclusively to the study of visual illusions and did not try to demonstrate the theory's relevance for pictorial or symbolic stimuli. For more than a decade, the author has been engaged in extending Piaget's theory to the perception of representational materials. The present article is an overview of some of the investigations and conclusions. (Author's Introduction)

Fagan, J. F. Infants delayed recognition memory and forgetting. Journal of Experimental Child Psychology, 1973, 16, 424-450.

Infants 21- to 25-weeks-old devoted more visual fixation to novel than to previously exposed stimuli or immediate and delayed tests of recognition. Abstract black and white patterns were recognized following a 48-hour delay and photos of faces after a 2-week delay. A decline in recognition over 3 hours for targets (face masks) most akin to objects (real faces) in subject's environment led to studies of the effect on delayed recognition of exposure to stimuli similar to those to be retained. One-minute delayed recognition for face photos was disrupted by intervening exposure to intermediate similarity (rotated photos) our low (rotated line drawings) similarity stimuli. Differentiation among intervening stimuli occured only for the upright photos used as high-similarity intervening material. In addition, immediate exposure to rotated photos also prevented 3-hour delayed recognition of upright photos but had no such effect when delayed for three hours. The present experiments confirm the existence of long-term recognition memory for pictorial stimuli in the early months of life and show that one source of forgetting is due to a diversion of the infant's attention to material bearing some perceptual similarity to the material to be retained. This diversion of attention must occur soon after immediate recognition testing to produce a reduction of recognition and such deleterious effects last for an appreciable period of time. (Author's Abstract)

Fagan, J. F. Infants recognition memory for a series of visual stimuli. Journal of Experimental Child Psychology, 1971, 11, 244-250.

The tendency of infants to distribute attention selectively to novel and familiar visual stimuli was employed to study infants recognition memory for a series of visual targets. Infants five months of age demonstrated an unequal distribution of visual fixation to novel and familiar stimuli, with more attention to the novel, on both immediate and delayed stimulus - recognition tests for each of three novelty problems administered during a single testing session. The degree of differential fixation to novel targets exhibited no reliable decline from immediate to delayed testing and was not significantly altered

by the serial order which the problem occupied during immediate recognition testing. (author's Abstract)

McCauley, C., Weil, C. M., Sperber, R. D. The development of memory structure as reflected by semantic-priming effects. Journal of Experimental Child Psychology, 1976, 22, 511-518.

This study was designed to investigate the development of knowledge about categorical and associative relationships as reflected by the presence or absence of semantic priming effects. Kindergartners and second-graders were shown pairs of pictures, one picture at a time, and asked to name each picture as rapidly and accurately as possible. Picture pairs were of four types which reflected the factorial combination of associative relatedness (high and low) with categorial relatedness (high and low). An analysis of naming times revealed a significant main effect of associative relatedness, i.e., second pictures or "target" pictures in high-associative pairs were named faster than those in low-associative pairs. This reduction in naming latency, or priming effect, was independent of developmental level. However, the effects of category relatedness varied with developmental level, i.e., target pictures in high-categorical pairs were named significantly faster than those in low pairs by second-graders, but not by kindergartners. These findings are discussed in terms of previous estimates of children's semantic competence. (Author's Abstract)

Milewski, A. E. and Siqueland, E. R. Discrimination of color and pattern novelty in one-month human infants. Journal of Experimental Child Psychology, 1975, 19, 122-136.

Visual discrimination of novel colors and patterns by one-month infants was studied in two experiments where visual reinforcers were presented contingent upon infants' rate of nonnutritive, high-amplitude sucking. Discrimination was measured by recovery of sucking to the presentation of novel visual reinforcing stimuli following decrements in sucking to familiar visual stimuli. In Experiment I following decrement to familiar stimuli, independent groups received either a change in color, pattern, both color and pattern, or no stimulus change. Reliable recovery was demonstrated for the three stimulus novelty groups relative to the no-change control. Experiment 2, employing achromatic visual reinforcers also showed reliable recovery to pattern change relative to no-change controls. These findings with one-month infants indicate discrimination between familiar and novel visual reinforcers on the basis of color and pattern differences and an increase due to novelty in the reinforcing effectiveness of visual stimuli. Individual subject differences in response decrement magnitude during familiarization were positively correlated with amount of response recovery to novelty. (Author's Abstract)

Murphy, M. D. and Brown, A. L. Incidental learning in preschool children as a function of level of cognitive analysis. Journal of Experimental Child Psychology, 1975, 19, 509-523

Preschool children's recall and clustering of organized lists of pictures were examined under deliberate instructions to remember or in incidental learning situation. The incidental tasks either required comprehension (categorization, or a rating of pleasantness-unpleasantness) or were formal orienting tasks involving processing in terms of physical features.

Explicit instructions to remember and formal incidental instructions did not differ, and both lead to poorer performance than the comprehension activities. Categorization, whether accompanied by explicit instructions to recall, or occurring in the context of a meaningful activity was no more efficient than categorization in and for itself. With children as with adults, it is the activity of the children which determines depth of processing and subsequent retention, not the intent to remember per se. (Author's Abstract)

Nelson, K. E. and Kosslyn, S. M. Recognition of previously labeled or unlabeled pictures by 5-year-olds and adults. Journal of Experimental Child Psychology, 1976, 21, 40-45.

Pictures accompanied by spoken descriptive labels or unaccompanied by labels were presented, and then pictures alone were shown in tests for recognition. Adults and 5-year-olds more often recognized the previously labeled pictures than the previously unlabeled pictures, but reaction-times were unaffected by labeling. These findings fit the view that recognition, like recall, involves active encoding and systematic retrieval processes. In contrast to previous data showing no developmental changes, fewer recognition errors were made by adults than by 5-year-olds. (Author's Abstract)

Pufall, P. B. Egocentrism in spatial thinking: It depends on your point of view. Developmental Psychology, 1975, 11, 297-303.

Sixty-three kindergarten children were tested on a spatial perspective task in which they had to copy the location and orientation of objects when the model and response spaces were aligned or one was rotated 90 degrees or 180 degrees. There were very few errors when the spaces were aligned, and there were significantly more errors on the 180 degrees than the 90-degree rotations. Egocentric responding dominated spatial responding on the 180 degrees but was infrequent on the 90-degree rotations. These findings are explained as due to the symmetry relations between space and self for each perspective difference. (Author's Abstract)

Ramsey, D. S. and Campos, J. J. Memory by the infant in an object notion task. Developmental Psychology, 1975, 11, 411-412.

In this study, the surprise paradigm was used in a Piagetian object notion task in an attempt to specify the types of memory processes which are developmentally intermediate between recognition and recall memory and which mediate the infant's search for a hidden object. These memory processes were inferred from the infant's differential

reaction to finding a different (but similar) toy as opposed to the same toy relative to the object soon hidden. Two questions asked in the study were whether infants at three ages (8, 12, and 17 months) would demonstrate any memory capacity (i.e., any evidence of surprise) in the task, and if so, whether they would demonstrate at every age evidence for both recognition memory of the object found and memory more complex than recognition. Recognition memory was inferred from behaviors directed toward the object found. The duration of looking at the object found and the deceleration in heart rate in orienting to that object were thought to index such a process. Memory more complex than recognition was inferred from behaviors directed away from the object found presumably toward rediscovering the disappeared toy. Various search behaviors which continued after finding a toy were thought to index such a process. A continued search was not construed as an index of recall memory of the identity of the object hidden since the infant, in continuing his search, may or may not remember what he is searching for. Recall memory presupposes the capacity for representation achieved by Stage VI of sensorimotor development. Since representation is difficult to demonstrate in very young infants, we were not able to index recall memory in this study. (Author's Review)

Reese, H. W. Verbal effects in children's visual recognition memory. Child Development, 1975, 46, 400-407.

Preschool children were shown line drawings of 12 pairs of items and were asked to describe them. Each child saw elaborated and unelaborated pictures (items interacting vs not interacting). The children's descriptions were rated as elaborated or unelaborated (interactions mentioned vs not mentioned). One week later, a recognition test was given, with choices between an elaborated picture for each pair. In general, recognition accuracy was best for elaborated pictures given elaborated description and worst for unelaborated pictures given elaborated descriptions. However, for the younger subjects, 32-55 months old, accuracy was influenced more by type of picture than by type of description; and for older subjects, 56-70 months old, opposite was true. Apparently younger preschoolers rely more on visual memory for recognition of this type of picture, and older preschoolers rely more on reconstruction from verbal memory. (Author's Abstract)

Ruff, H. A. Kohler, C. J. and Haupt, D. L. Infant recognition of two- and three-dimensional stimuli. Developmental Psychology, 1976, 12, 455-459.

To compare differences in the processing of two- and three-dimensional stimuli, infants of 31 and 22 weeks were familiarized with either a three-dimensional object or a photograph of the object. Recognition was tested by pairing novel stimuli with the familiarization stimulus at different points in the session. The younger subjects showed no recognition of either the two- or three-dimensional stimuli. Among the older subjects, however, infants in the three-dimension condition demonstrated recognition significantly more often than did the

infants in the two-dimension condition. The implications for the development of object perception are discussed. (Author's Abstract)

Rybash, J. M., Roodin, P. A., and Sullivan, L. F. The effects of a memory aid on these types of conservation judgements. Journal of Experimental Child Psychology, 1975, 19, 358-370.

Twelve boys and twelve girls at each of three ages (4, 5, and 6 years) were tested on three types of conservation judgements (qualitative, quantitative, and equivalence) on both continuous and discontinuous substances. Half of the subjects were provided a memory aid while the other half were not. Conservation ability was determined both with and without verbal justification. The memory aid increased the number of equivalence conservation responses only when verbal justification was not required. The number of subjects conserving on each of the three tasks varied as a function of the scoring criteria used. Type of materials, sex, and age effects were found. The role of transitive inferences and memory in the equivalence conservation task was discussed. Inconsistencies in previous research due to different scoring techniques were noted. (Author's Abstract.

Tomlinson-Keasey, C., Crawford, D. G., and Miser, A. L. Classification: An organizing operation for memory. Developmental Psychology, 1975, 11, 409-410.

Recently, both adult studies and developmental studies of memory have focused on cognitive organization as a central factor in the way material is processed and recalled. However, studies to date have neglected the relationship between the stage of cognitive development and the use of various memory strategies. In the present study, the presence or absence of class inclusion and hierarchical classification skills was examined in relation to organizational memory strategies. In addition, whether or not organization of material could be facilitated by supplying category cues for a list of items was examined. Specifically it was predicted that (a) children who evidenced class inclusion skills would be able to recall stimuli efficiently and would organize the stimuli into categories, and (b) children without such skills would not be able to organize the stimuli into categories unless they were given the category names as cues. (Author's Review)

SPEECH AND LANGUAGE DEVELOPMENT

A. Audition

Conroy, R. L. and Weener, P. The development of visual and Auditory selective attention using the central-incidental paradigm. Journal of Experimental Child Psychology, 1976, 22, 400-407.

Analogous auditory and visual central-incidental learning tasks were administered to 24 second,-fourth,- and sixth-grade and college-age subjects to study the effects of modality of presentation on memory for central and incidental stimulus materials. There was no strong evidence to indicate that modality of presentation was an important factor in the development of selective attention. Central task learning increased with age for both auditory and visual presentations; incidental learning declined at the oldest age level for both auditory and visual tasks. The serial position analysis revealed that the observed developmental increase in recall performance was due primarily to differences in the initial serial positions. The use of active strategies for focusing attention on the relevant stimulus materials seemed to be the crucial determinant of level of performance. (Author's Abstract)

Eimas, P. D. Auditory and linguistic processing of cues for place of articulation by infants. Perception & Psychophysics, 1974, 16, 513-521.

Two- and three-month old infants were found to discriminate the acoustic cues for the phonetic feature of place of articulation in a categorical manner; that is, evidence for the discriminability of two synthetic speech patterns was present only when the stimuli signaled a change in the phonetic feature of place. No evidence of discriminability was found when two stimuli, separated by the same acoustic difference, signaled acoustic variations of the same phonetic feature. Discrimination of the same acoustic cues in a nonspeech context was found, in contrast, to be noncategorical or continuous. The results were discussed in terms of infants' ability to process acoustic events in either an auditory or a linguistic mode. (Author's Abstract)

Hammer, M. and Turkewitz, G. Relationship between effective intensity of auditory stimulation and directional eye turns in the human newborn. Animal Behavior, 1975, 23, 287-290.

To examine Schneirla's biaphasic hypothesis that effectively weak stimulation results in approach-type responses and effectively strong stimulation results in withdrawl-type responses, 90 dB white noise stimuli were presented to twenty-five, two-day-old female infants. Based on prior investigation this stimulus was expected to be effectively strong when presented at the left ear. Results obtained from electro-oculargraphic recording of the infants' eye movements supported this hypothesis in that significant towards-turning occurred

when the stimulus was presented at the left ear and significant away-turning occured when the stimulus was presented at the right ear. (Author's Abstract)

Steinschneider, A., Lipton, E. L., and Richmond, J. B. Auditory sensitivity in the infant. Effect of intensity on cardiac and motor responsivity. In Studies In The Competent Infant: Research Commentary. Stone, J. L., Smith, H. T., and Murphy, L. B. (Eds) New York: Basic Book, Inc., 1973.

Sufficient data have been accumulated to warrant the conclusion that normal newborn infants are capable of responding to auditory stimuli. One of the major problems now confronting the investigator is to determine that extent of this capacity. This is the primary focus of the present investigation.

Since the newborn cannot report his sensory experiences, various objective techniques have been employed in such studies. These include the observation of gross motor movement, of more limited motor reflex changes such as the auropalpebral reflex, of the electroencephalogram or respiration, of skin resistance, and of cardiac responses. The conditioned-reflex technique has also been used. More recently, the inhibition of the sucking reflex as an index of hearing has been employed. The phenomenon of sensory habituation of the cardiac-rate response had been utilized for auditory discrimination in the newborn.

The present investigation stems from a general interest in determining whether normal newborn infants differ in their sensory capacities. More specifically, it was designed to test whether infants differ in their capacities to "discriminate" varying intensities of auditory stimulation. Another purpose of this study was to determine whether an individual's relative responsiveness to stimulation remained stable in spite of changes in stimulus intensity. Cardiac and motor responses were studied to ascertain the interrelation between response systems. (Author's Introduction)

B. Speech & Language

Brewer, W. F. and Stone, J. B. Acquisition of Spatial antonym pairs. Journal of Experimental Child Psychology, 1975, 19, 299-307.

Twenty-eight children (mean age 4.3 years) were tested for comprehension of spatial antonym pairs with arrays which contained four objects representing both members of two antonym pairs. The results showed that: (a) the most common error was to point to an object representing the same polarity (marked-unmarked) as the word requested; (b) there was not a high degree of confusion within antonym pairs; (c) unmarked antonyms tend to be acquired before marked antonyms, and (d) the order of acquisition of the pairs was: "tall-short, long-short, high-low, thick-thin, deep-shallow, wide-narrow". The results were interpreted

as supporting a modified semantic-feature hypothesis, in which polarity is acquired before dimension. (Author's Abstract)

Ford, W. and Olson, D. The elaboration of the noun phrase in children's description of objects. Journal of Experimental Child Psychology, 1975, 19, 371-382.

In an attempt to study the structure and elaboration of the noun phrase of a descriptive sentence, two experiments were conducted in which children aged 4 to 7 years were required to describe an object relative to increasingly large sets of alternatives. It was found that even 4 year olds do not give an invariant "label" or noun phrase designation of an object but rather represent that object in terms of the context of alternative objects. Older children describe an object in terms of a larger set of alternatives than do younger children.

Secondly, adjectives were found to be ordered in terms of their informational value, when this resulted in violation of adjective ordering rules, older children preserved these rules within a noun phrase by the use of conjunctions. Finally, older children were found to give longer and hence, more informative descriptions than younger children, but only when more than three adjectives were required for the description. (Authors' Abstract)

Johnson, H. L. The meaning of before and after for preschool children. Journal of Experimental Child Psychology, 1975, 19, 88-99.

Preschool children's understanding of temporal was examined in terms of their comprehension of sentences containing clauses linked by "before" and "after". The relative strategies in children's interpretation of temporal order information was also evaluated.

Divergent error patterns emerged on the tasks; omissions prevailed on the two tasks involving response to commands, reversals prevailed on the other. Further examination revealed that omissions reflected ambiguity in the linguistic structure of commands. Thus the effect of main-subordinate relations was confounded with directness of command. On all comprehension tasks, however, performance was superior on sentence forms in which order of mention and order of occurrence correspond. (Author's Abstract)

Johansson, B. S. and Sjolin, B. Preschool Children's understanding of the coordinators "and" and "or". Journal of Experimental Child Psychology, 1975, 19, 233-240.

The development of the understanding of the words "and" and "or" was studied. Children in the age interval 2.0-7.6 received two tests of word understanding, varying in the degree to which the context of the test items contributed in determining the meaning of the connectives, and one test of spontaneous usage. The results from the tests of word understanding showed that the context variable

facilitated small children's responding, and that most responses were correct at the age of four and beyond. The results from the production tests indicated that "and" was used to express enumerations and "or" to express alternatives. The difference between the linguistic and the logical meaning of the connectives was discussed. (Authors' Abstract)

Leonard, L. B. The role of nonlinguistic stimuli and semantic relations in children's acquisition of grammatical utterances. Journal of Experimental Child Psychology, 1975, 19, 346-357.

Eighteen children, randomly assigned to one of six conditions, were trained in the use of two-word subject-verb (e.g., "mommy go") utterances. The group differed in (1) the number of different semantic relations theoretically underlying the subject-verb utterances on which the children were trained, and (2) the extent to which these semantic relations were associated with nonlinguistic events. The results indicated that the children acquired the subject-verb utterance forms more readily when they were also exposed to the events to which the utterance actually referred. Provided that the subject verb utterances were related to ongoing events, the number of relations "underlying" these utterances did not appear critical. These results suggest that the child's acquisition of novel and grammatical utterances describing nonlinguistic stimuli highly similar to those in his natural environment are amenable to experimental control. (Author's Abstract)

Menyuk, P. Cognition and language. Volta Review, 1976, 78, 250-257.

"The following presentation, given at the A.G. Bell Association Convention in Boston, June 1976, highlights some of the areas of ongoing research that are crucial to achieving smooth and productive cognitive and linguistic development for the hearing impaired child. The research focuses on how both normally hearing and hearing impaired children organize their linguistic and nonlinguistic experiences so that these organizations can be applied generatively in appropriate contexts." (Introduction)

Ninio, A. and Lieblich, A. The grammer of action: "Phrase structure" in children's copying. Child Development, 1976, 47, 846-849.

Thirty 4-5 year-old children copied a horizontal line, a vertical line, and an inverted T. Preference for a certain strategy in copying the compound figure was interpreted in terms of a simple phrase structure, one involving movements controlled with minimal degrees of freedom. Considerations of the total utterance in terms of semantics and phrase structure are necessary to account for copying patterns. On a second experiment, 163 children from kindergarten through sixth grade were given the inverted-T copying task. With increased age, children come to prefer increasingly complex combinational structures. (Authors' Abstract)

Povey, R. and Hill, E. Can pre-school children form concepts? Educational Research, 1975, 17, 180-192.

Fifty-six children between the ages of two years four months and four years ten months were given tests relating to the acquisition of both "specific" and "generic" concepts. Several tests of concept acquisition were devised by the authors utilizing pictures drawn on card. A number of the children were also given some "Piagetian questions" concerning class inclusion.

The results conflict with the widely held view (following the writing of Piaget) that pre-school children cannot form generic concepts. Nearly all the children were able to identify the specific concepts as presented in the items and about half the group responded appropriately to the items involving an understanding of generic concepts. There was a clear and statistically significant relationship between the number of correct answers given to the items and the age and ability levels of the children. This was not the case, however, with the Piagetian test questions which showed no discriminatory power in these respects. It is argued that the Piagetian questions do not represent a sensitive or meaningful measure of concept acquisition at this age level whereas the experimental test items (HAPCAT) do appear to present pre-school children with intelligible tasks which allow many of them to demonstrate an understanding of generic concepts involving class inclusion. (Authors' Abstract)

Starr, S. The relationship of single words to two-word sentences. Child Development, 1975, 46, 701-708

The relationship between the single-word utterance and two-word sentences of twelve children was examined as part of a longitudinal study of language development. Children whose single-word utterances usually named objects produced sentences which named many objects. Children whose single words were frequently interjections produced sentences which expressed desire for an object. Two-word sentences seem to have some of their structural and functional roots in the single-word phase. (Author's Abstract)

Stewart, D. M., and Hamilton, M. L. Imitation as a learning strategy in the acquisition of vocabulary. Journal of Experimental Child Psychology, 1976, 21, 380-392.

Twenty-four 14- to 30-month-old children observed a model use 20 new words as labels for objects of varied semantic associations. Acquisition of the new words was clear in both elicited and spontaneous imitation by the children and in generalized use of the words. Age was highly and positively correlated with elicited and spontaneous imitation and scores for recognition of the objects associated with the words associated with food and active objects and low for passive objects and words with no associations. Older children's use of the words immediately after the model's use increased rapidly with the

first two presentations, and their use of the words prior to the model's use showed an increasing trend over the series of modeling sessions. Younger children respond at a low rate. (Authors Abstract)

Uzgiris, I. C. Patterns of vocal and gestural imitations in infants. In Studies In The Competent Infant: Research Commentary. Stone, J. L., Smith, H. T., and Murphy, L. B. (Eds) New York: Basic Book, Inc., 1973.

The current rebirth of interest in the phenomenon of imitation has resulted in a large number of empirical studies concerned with the variables influencing the occurrence of imitation in young children and in relatively few attempts at conceptualizing the processes underlying imitative behavior. While there have been a few systematic analyses of the various categories of phenomena which are labeled imitation, generally, imitation is said to occur whenever a subject duplicates the behavior enacted by a model as a result of having observed the model. Thus imitation is viewed as a powerful mechanism for the acquisition of new behaviors, and its study gains impetus in this context.

It is possible that the discussions of the processes involved in imitation might be enhanced by another look at imitative behavior during infancy. There have been relatively few recent studies of imitation by infants, and the earlier reports by Valentine (1930) and Piaget (1963) still remain the richest sources of observational materials.

Piaget's work stands out as well for being explicitly concerned with the problem of the origins of imitation and with the course of its development during infancy. The development in imitiation is described as paralleling development in general intelligence, starting with the appearance of sporadic imitation when the model's action triggers one of the child's own schemes of action; and progressing to instances of deferred imitation of novel actions, implying their internal representation.

Since Piaget's interpretations have been derived from extensive observations of a few infants, the present study was aimed at replicating Piaget's observations with a larger group of infants who had no special relationship to the observer. This was seen as a first step in the attempt to understand the development of imitation during infancy. (Author's Introduction)

Wolff, P. H. The development of attention in young infants. In Studies In The Competent Infant: Research Commentary. Stone, J. L., Smith, H. T., and Murphy, L. B. (Eds) New York: Basic Book, Inc., 1973.

This paper concerns the infant's capacity for attention to the environment, and the history of its development over the first month after birth. Parts of the report are items selected from running records of normal children observed for 30 hours a week in the natural environment of their home. Other parts are "ad hoc" experiments

based on these items, and carried out whenever the natural setting of the home made it possible. Since the number of subjects observed in great detail is small (10 bottle-fed infants), only the obvious results were subjected to statistical treatment. The findings are intended as points of departure for longitudinal studies of greater duration and for cross-sectional studies on larger samples, rather than as established facts.

The connecting thread throughout the diverse observations and experiments is their common relevance for the infant's attentive state. This means a general disposition to respond adaptively to selected elements in a constantly changing environment. The emphasis is therefore on the internal factors that determine the state (arousal, organic need, fatigue, etc.) rather than on the child's performance while he is alert, and the author shall be concerned with the dynamic and structural determinants of attention in babies, rather than with performance. R. L. Fantz has given us an excellent demonstration of the infant's perceptual skills at birth; in a sense the author's contributions are to provide the general background of arousal state that makes such refined discriminations possible.

In all observations on the development of young infants, the author has found that in order to make sense out of the infant's apparently haphazard spontaneous and elicited behavior, it is essential to classify each observation according to arousal state.

While classification of states makes no claim to universal validity, some system for categorizing the baby's disposition appears to be indispensable for the accurate description of behavior. This paper is an effort to take the variable of arousal as a topic of investigation rather than as an annoying complication that interferes with observation. (Author's Introduction)

FEEDING DEVELOPMENTAL PROFILE

Christensen, S., Dubignon, J., and Campbell, D. Variations in intra-oral stimulation and nutritive sucking. Child Development, 1976, 47, 539-542.

Sucking records were made from 24 infants, aged three-four days, fed small amounts of their usual formula from nipples of different sizes (5/16, - 8/16, - and 11/16 - inch diameter). Polygraphic and observer measures showed that the large nipple elicited fewer sucks and a slower sucking rate; five infants seen on two successive days showed a more marked nipple preference on the second day. The results show that intra-oral stimuli control sucking for a nutriment in much the same way as they have already been shown to control nonnutritive sucking. (Authors' Abstract)

Cortial, C., and Lezine, I. Comparative study of nutritive sucking in the newborn (premature and full-term) Early Child Development and Care, 1974, 3, 211-228.

The authors describe their graphic analysis of sucking patterns in premature infants. The rhythm is disorganized in comparison to that found in normal infants. It is suggested that this disturbance is related to the difficulties in space orientation found in older prematurely born children. The authors point out the psychoprophylactic importance of individually appropriate feeding procedures which should be used in the care of premature infants. (Author's Abstract)

Crook, C. K. Neonatal sucking. Effects of quantity of the response - contingent fluid upon sucking rhythm and heart rate. Journal of Experimental Child Psychology, 1976, 21, 539-548.

The temporal organization of neonatal nutritive sucking and heart rate were studied in two consecutive four-minute periods to analyze the effects of two quantities of response-contingent fluid. One group of newborns experienced only the larger amount, a second experienced the smaller, and two other groups experienced both in counter balanced order. Cumulative pausing time and intersuck intervals (sucking rate within bursts) were both affected by the amount of fluid delivered at each response. At the start of sucking bursts, heart rate accelerated to a stable level. Within-burst heart rates were higher with increased quantity of contingently delivered fluid. The results are discussed in relation to the distinction between nutritive and nonnutritive sucking and to previous findings on the effects of fluid sweetness upon sucking. (Author's Abstract)

Crook, C. K. and Lipsitt, L. P. Neonatal nutritive sucking: Effects of taste stimulation upon sucking rhythm and heart rate. Child Development, 1976, 47, 518-522.

The sucking behavior and heart rate of 22 full-term newborns were

recorded. Half of the infants sucked for nine minutes in three blocks of three minutes, first receiving a 0.02-ml. drop of 5% sucrose for each criterion suck, then no fluid contingent upon such sucks, and finally a 0.02-ml. drop of 15% sucrose for each suck. The other half received these conditions in reverse order. Regardless of the order in which the two nutrient conditions were administered intersuck intervals were longer under the sweeter condition, but heart rate was also higher. Possible interpretations include a hedonic explanation suggesting that sucking rate is modulated to facilitate savoring of the sweeter fluid. (Authors' Abstract)

Finnie, N. R. Handling The Young Cerebral Palsied Child at Home. New York: E. P. Dutton & Co., Inc., 1975.

The First Steps Toward Self-Feeding

Babies of a few weeks often rest a hand on their bottle while they are being fed, at about five to six months they hold the bottle with both hands. Gradually the hands are brought in front of the child's face and he begins to look at them.

At about one month he starts to put one hand to his mouth, without being conscious that he is doing so, this is then followed by both hands and he starts to suck them.

At about six months when he starts to reach out and grasp, he will take a rusk to his mouth and suck it, but he will quickly drop it.

At about nine months he will take a rusk to his mouth now in a deliberate way and will drop it only when he has had enough or his attention is distracted.

Some children at about eight to nine months begin to understand that the spoon and the food go together and will guide their mother's hand when she is feeding them with a spoon, others at this stage will help to guide a cup to their mouth. Babies, of course, differ considerably and some will never bother to help or will do so only when they are hungry.

Between the age of nine and twelve months a child will go through the stage of putting his hands into his food for the joy of squeezing it and will then smear it over his face and anything else that happens to be near. At this time, the child will often snatch at the spoon when he is being fed but will only use it to bang on the table or to plunge it into the food; he is still unable to use a spoon to feed himself.

At about fifteen months he has the ability to grasp the spoon with his whole hand and to feed himself, for short periods however, and in a clumsy way. Finding difficulty in getting the food onto the spoon he will use his other hand to push the food on, dropping a great deal and turning the spoon over in his mouth in his effort to get the food off.

From now on through constant practice, his abilities commence to improve fairly rapidly and by the time he reaches the age of two he has become proficient and most of the time usually insists on feeding himself.

McGrade, B. J. Newborn activity and emotional response at eight months. In Studies In The Competent Infant: Research Commentary. Stone, J. L., Smith, H. T., and Murphy, L. B. (Eds) New York: Basic Book, Inc., 1973.

McGrade, Kessen, and Leutzendorf (1965) reported a relation between length of labor and the response of human newborns to nipple withdrawal and forehead rubbing. Infants born after short labors were more responsive; that is, they showed greater increase over baseline activity with stimulation. The present study relates these newborn measures to ratings of emotional response made when the subjects were eight months old.

DRESSING AND SIMPLE HYGIENE. DEVELOPMENT

Finnie, N. R. Handling The Young Cerebral Palsied Child at Home. New York: E. P. Dutton & Co., Inc., 1975.

A child starts to cooperate with his dressing at about twelve months. He begins by holding out his foot for his shoe, or an arm for a sleeve.

At about eighteen months, at the same time he achieves unsupported sitting and no longer has to rely on his hands for support, he will deliberately start to pull off his socks, shoes and hat. Previously he may have snatched them off, but unintentionally.

Between eighteen months and two years, he will cooperate more and more, starting to help to undress himself at about two years of age. He first starts to take off his clothes and gradually, as his hand movements become more coordinated, he begins to be able to put clothes on.

Between four and five, he can dress and undress except for buttons, ties and laces, and enjoys doing so; he attempts to lace his shoes but without appreciating whether or not the laces are in correct holes. During this period he learns a lot by copying the way his mother does things by experimenting with his own clothes or with those belonging to anyone else that he can find.

In dressing, as in all functional activities, the aim from the beginning is to work towards maximum independence within the child's capabilities.