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ABSTRACT

This paper on infant behavior offers a program to positively change decelerating mental development curves in infants. It attempts to (1) suggest a theoretical model, (2) present a developmental matrix derived from observation using the model, and (3) note specific instrumentation for infant observation and an experimental-stimulating responsive environment for infants. The theoretical model proposed is an expansion of the Kirk and McCarthy (1961) psycholinguistic model. The proposed model, which is diagrammed in the appendix, can be a useful research model from which research hypotheses may be generated for test. As an example of the conceptualizations concerning infant behavior that can be developed from this model, a developmental matrix is presented, along with a hypothesis that might be derived from such a matrix. The hypothesis is limited to the input phase of infants in their first 6 months of life, but other, broader hypotheses can follow. Finally, an experimental-stimulating responsive environment is suggested both for observing infant behavior and for modifying it in cases of decelerated growth patterns. (MH)

AN APPROACH TO THE STUDY OF INFANT BEHAVIOR

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There is currently an increased research interest in infant behavior. This is partly because of a continued bias in developmental theory toward the importance of early experience for later development. It is partly due to an increased concern with the expanding population of apparently environmentally determined mentally retarded children in this country. Finally, it is hastened and intensified by interesting research findings over the last several years in the area of infant behavior and development.

In the clinical/diagnostic area, Knobloch and Pasamanick (1962) cite the importance of specific knowledge of infant behavior as necessary in the diagnosis of certain neurological conditions. Hunt (1961) and Flavell (1963) emphasize the extreme importance of understanding early experience and infant behavior as the foundation for subsequent intellectual process. Fantz (1961) cites the need for a better evaluation of the development of perception in

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infants and Bayley (1966) indicates the need for understanding the transitional elements involved in perceptual/cognitive development in infancy. She especially emphasizes the language-emerging months as critical to intellectual development. Oppenheimer (1965) has demonstrated the utility of infant evaluation in identifying intellectually high risk infants.

All of these investigators, both clinical and research, discuss intervention programs. Few offer specific programs for positively changing decelerating mental development curves in infants. None offer a specific approach to developing and individualizing a stimulation program for such high risk children. There is no basic, data-oriented matrix from which to build treatment programs or select treatment variables.

This paper is an attempt to: (1) suggest a <u>theoretical model</u>, (2) present a <u>developmental matrix</u> derived from observation using the model, and (3) note specific instrumentation for infant observation and an <u>experimental-stimulating responsive environment for infants</u>.

I. THE MODEL

An expansion of the psycholinguistic model put forth by Kirk and McCarthy (1961) is seen as a potentially useful research model upon which conceptualizations concerning infant behavior can be developed, and from which research hypotheses may be generated for test. The expanded model (Figure 1) may be seen as a simplified version of communications models

employed by other researchers of cognition and perception, as well as metabolism, growth and nutrition. It allows systematic behavioral and psychophysiologic study and provides a framework within which to view the infant in control of, and in response to, his environment.

(Figure 1 about here)

The environment in this framework impinges upon the infant through the primary sensory modes and the prime organic mode of information input, I-IV. These modes provide the decoding phase of behavior. The modes include, but are not limited to, the sensory end organs. They are visual, auditory, tactual and nutrient modes of receiving or acquiring information. Olfactory and gustatory senses are not minimized by their absence from the model. They have a survival function for the infant that stimulates directed or aversive behaviors. However, as non-observables, they provide difficult modes to measure and can be subsumed under nutrient and tactual modes for the present.

The visual mode includes light-dark adaptation, tracking, focusing, accomodation, attitude-reflex reactions, visual descrimination, and other peripheral action such as blinking, squinting and visual grimacing. Auditory decoding includes attending to auditory inputs, hearing and auditory discrimination. The tactual mode includes body surface reception of stimuli including heat, pressure, orientation shifts, tactual pattern reception, as in vibration, and "internal," kinethetic stimuli receipt. The nutrient mode includes ingestion of nutritional information, as in satiation, and also such "information" as is provided to body chemistry by caloric or protein intake.

Output modes, the encoding phase, include the primary capabilities of influencing or responding to the environment or the expression of processed input information, V-VII. The vocal mode includes vocalizations, verbal communications and encoding of certain states such as crying in response to fear or hunger. Motor encoding includes non-verbal communication, gestures, persistent motor patterns (activity) or expediting behavior (crawling). Organic outputs include VIIa, organ change (heart rate increase) and VIIb, organic output (urine) in response to varied input or process phase activity.

Process phase includes activity inferred from output or input-to-output change. Process phase includes at least six major inferred "mental" states probably useful in explaining input-output (stimulus-response) chains. These are "chunks" of behavior or operants rather than classical stimulus-response activity. They are association, representation, analysis, synthesis, storage and retrieval.

The model should be seen as a moment in time. It does not suggest solely input-to-output activity but a link in a chain of similar models, including feedback. It could also be viewed as a self-stimulating model (vocal[1]-auditory[1]-vocal[2]-auditory[2], as in humming or visual[1]-motor[1]-visual[2]-vocal[2], as in autistic visual interruption).

Two examples of the descriptive use of the model may be cited: (1) Crying (vocal encoding) in response to a face (visual decoding) previously paired in time with "pain, implies association. Heart rate (organic encoding) may increase and activity level (motor encoding) may decrease. (2) Normal protein input (nutrient decoding) may lead to abnormal histidine in urine

(organic encoding) with inferred mal-process of histidinemia. Accompanying delayed development of language (vocal encoding) and hyperactivity (motor encoding) may be causally related to the inferred mal-process.

The value of the model would appear to lie primarily in its simplification of human behavior. It is felt that the complexity of behavior can be better understood, especially in developmental studies, by the use of parsimonious models systematically applied and tested rather than by complex models applied to segments of behavior.

Input-output sequences are seldom single or unitary activities. Visual and auditory modes are frequently stimulated simultaneously. Vocal and motor outputs frequently occur together. These are combinations and multiples in modality inputs and outputs with complex information processing which activates several process phases. However, information is organized on a time, value and complexity dimension so that processing can be expedited. There are probably levels of processing and integration of information which relate to stimuli, situational and experimental factors. These are inferred levels as the process phases themselves are inferred but are probably learned patterns similar to the development of neural development in a determining way. That is, the environmental stimuli may form or allow formation of neural structure in a "normal" and orderly way. This is neither unique nor inconsistent with previous theoretical and experimental work performed by learning and experimental psychologists. It does suggest extending research into the effect of environmental factors on the process phases, especially levels of integration and complexity of process, and longitudinal studies about the process. The model presented provides a basis for such research.

II. THE DEVELOPMENTAL MATRIX

Using this model, a sensory-learning hypothesis can be derived from a systematic observation of apparent decoding behavior of infants, inferred from decoding behavior, an analysis of infant developmental schedules and data from the literature on infant maturation. This hypothesis pertains only to the decoding (input) phase during the first six months of life but subsequent hypotheses concerning developmental aspects of process and encoding phases can follow.

The infant interacts with his environment responding to its stimuli, his own "internal" states and self-stimuli. He also "shapes" his environment with his response patterns and "summons" stimuli for response activity (repetitive movements, crying in absence of hunger to summon mother, coordinating activities to achieve complex tasks). During the first six months the hierarchy of input modes appear to re-order with maturation and learning and with regard to their shaping potency and value in achieving response patterns (Figure 2).

(Figure 2 about here)

During the first six months the nutrient input requirement is primary for survival. It increases with body weight and appears to be constantly critical for development and aging. However, the sensory modes appear to fluctuate. At thirty days of age, the human infant is primarily a tactual

animal, the auditory mode appears to be more potent than the visual mode. This is partly a function of maturation and partly a hierarchy of learned modes useful for successful interaction with the environment, whether "shaped" or "shaping." By sixty days the visual mode has gained potency over auditory decoding but the tactual modes remain primary. At ninety days visual becomes the primary mode while auditory maintains its relative potency and tactual drops to tertiary importance. This hierarchy appears to obtain through 180 days and follow-up studies suggest that it remains stable through nine months. It is the hierarchy that is apparent in normal six-year-old children.

This hypothesis of developmental hierarchies of sensory input modes immediately raises several questions. Among them--

1. Is the re-ordering of modes characteristic of development in most or all normal infants?
2. Do the hierarchizations constitute critical factors in early "mental" growth?
3. Does stimulation alter the hierarchy re-orderings? Enhance them? Impede them?
4. How does input model development relate to encoding and processing phases?
5. Does the matrix provide a useful system for selection of age-appropriate reinforcers for stimulation programs?
6. What is the nature of the change system? Will a noticeable delay predict developmental lag?

The developmental matrix generates testable hypotheses, described within a useful mode of infant behavior.

III. AN EXPERIMENTAL-STIMULATING RESPONSIVE ENVIRONMENT

Instrumentation is not always necessary for advancing scientific information. However, where isolation and control of variables is crucial, instrumentation can enhance and clarify scientific efforts. Application of the model and use of the developmental matrix require the development of a stimulating-responsive environment and a precise monitoring and responding capability. The application of the responsive environment may follow as a stimulation program designed to intervene into lagging development.

A responsive environment (Figure 3) can be designed to provide visual, auditory and tactual input and to monitor vocal, motor and organic outputs. Input can be experimenter or infant induced. Recording devices provide for measuring input and output. The responsive environment provides for isolation and control of experimental variables or can monitor free behavior over time in pre-determined environmental situations. It is maximally flexible for a variety of studies and allows for permanent, visual recordings of infant behavior. It provides a communication system for the pre-language child and reduces extraneous factors often limiting infant observational studies. It provides a vehicle for application of the model and validation of the developmental matrix.

(Figure 3 about here)

SUMMARY

This paper has simply presented an approach to the study of infant behavior by suggesting a model for use in generating notions about behavior, describing those behaviors and enhancing inferrences made about "internal," developmental processes. An example of a developmental matrix which can flow from such a model was presented, together with a hypothesis which might be derived from such a matrix. Finally, an experimental-stimulating responsive environment was suggested as both a monitoring and intervention format for studies of behavior and application of stimulation programs to infants with decelerating growth patterns.

The paper attempts a systematic approach to a complex area of study in which a great deal of fragmentary work is now ongoing, either without theoretical base or without experimental testing of apparently fruitful conceptualization on the effects of environment on development and maturation. It is open to use and to test. It is public and it is heuristic. It should be tried.

References

Bayley, Nancy, The two-year-old: is this a critical age for intellectual development? Lecture delivered at Duke University, May 5, 1966. (Copies available from the Education Improvement Program, Duke University, Durham, North Carolina 27706.)

Fantz, R., The origin of form perception, Sci.Amer. 1961, 204, 66.

Flavell, J., The Developmental Psychology of Jean Piaget, New York, Van Nostrand Co., 1963.

Hunt, J. McV., Intelligence and Experience, New York, Ronald Press, 1961.

Kirk, S. A. and McCarthy, J. J., the Illinois Test of Psycholinguistic Abilities: An approach to differential diagnosis. Amer. J. Ment. Defic., 1961, 66, No. 3, 399.

Knobloch, Hilda and Pasamanick, B., The developmental behavior approach to neurologic examination in infancy, Child Development, 1962, 33, 181.

Oppenheimer, Sonya, Early identification of mildly retarded children, Amer. J. Orthopsy., 1965, 35, No. 5, 845.

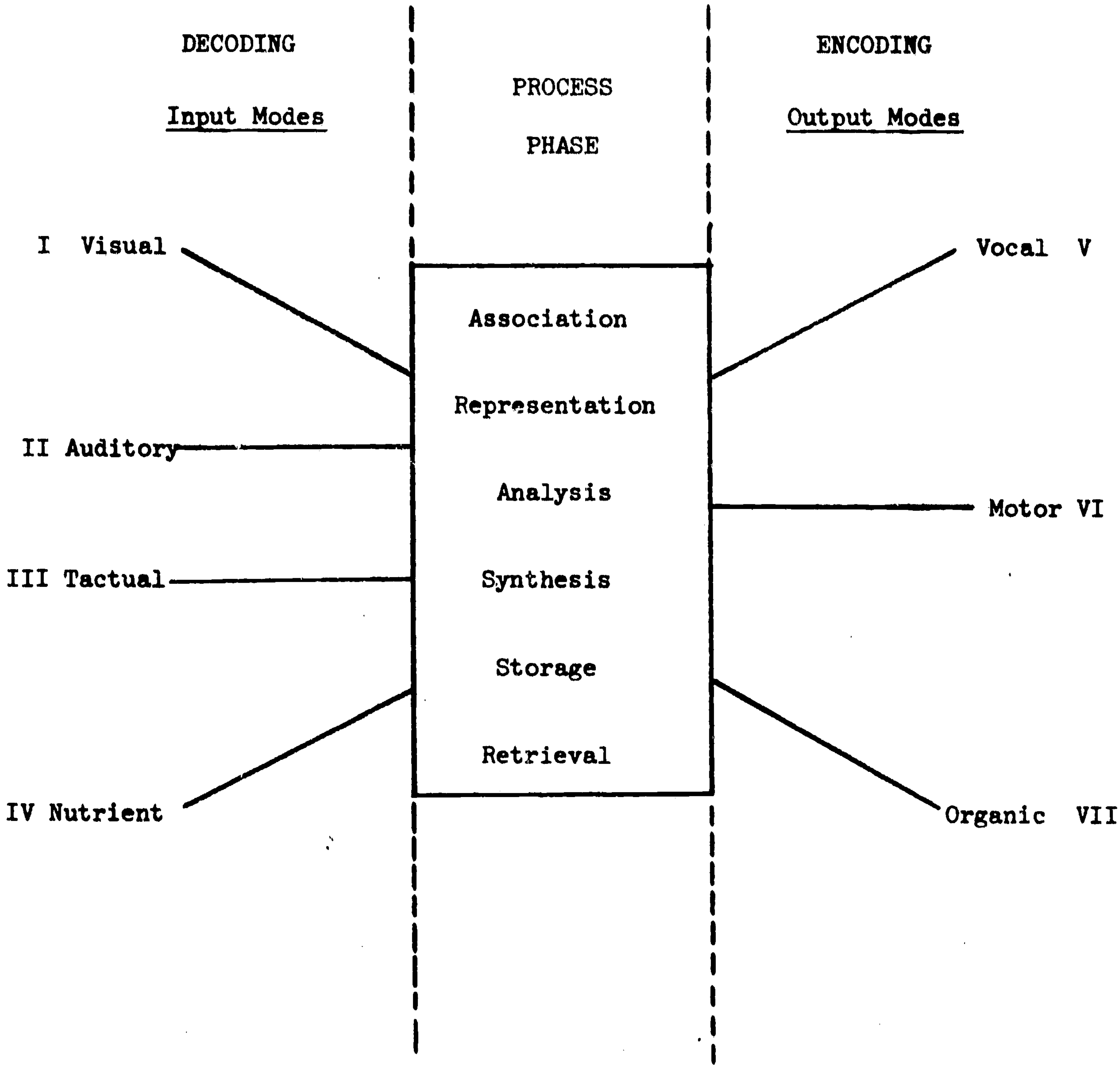


Figure 1.

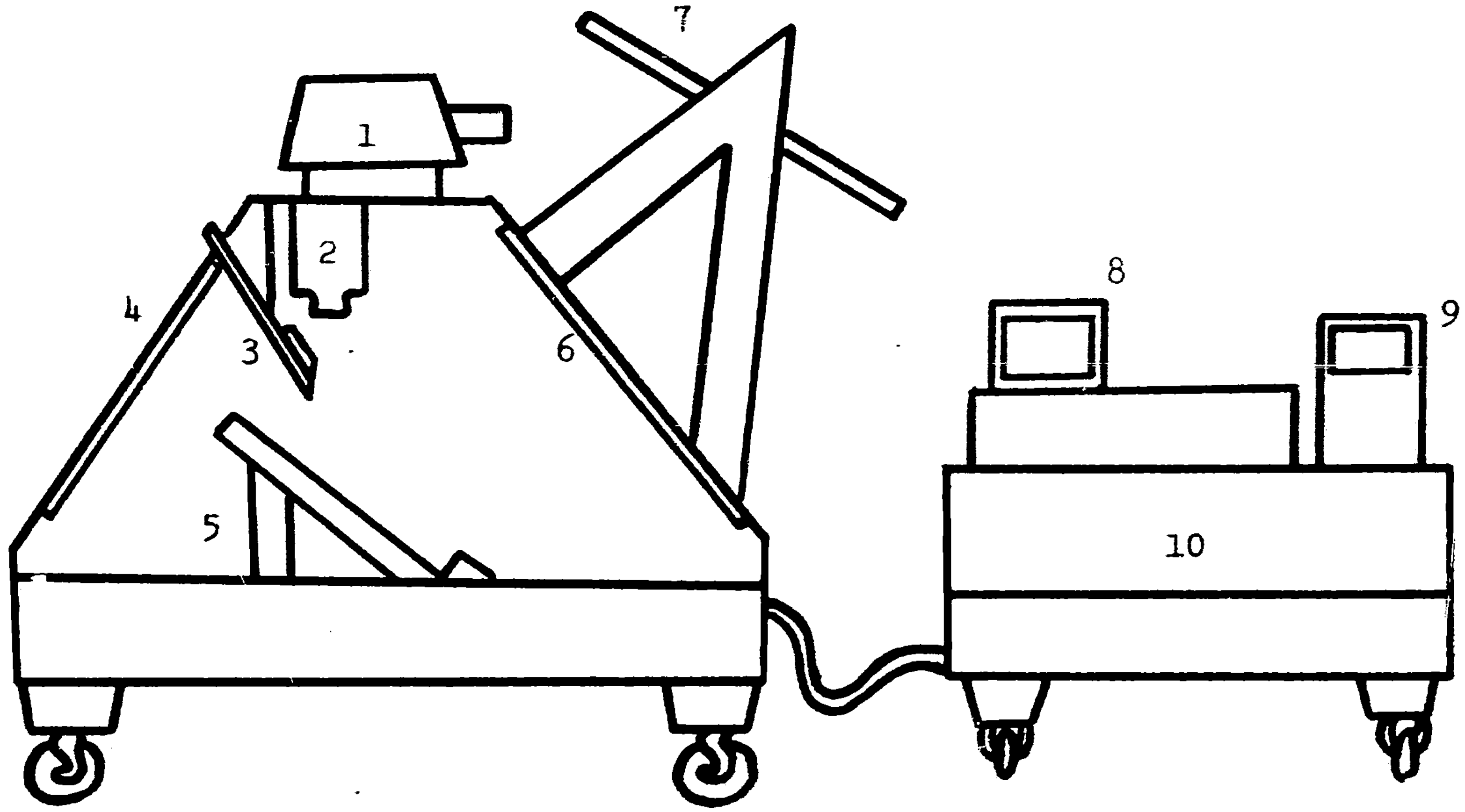
INFANT BEHAVIOR MODEL

		AGE				
		30 Days	60 Days	90 Days	180 Days	6 Years
Modal	1	Tactual	T	V	V	V
	2	Auditory	V	A	A	A
Primacy	3	Visual	A	T	T	T

Figure 2.

SENSORY LEARNING HYPOTHESIS

[From observations of apparent decoding behaviors of twenty-four infants from birth to six months of age at Duke University Medical Center, Infant Evaluation Project, Education Improvement Program, Duke University.]



1. Slide Projector
2. Television Projector
3. Slide Screen Reflector
4. One-way Glass
5. Pallet
6. Rear Screen Projection
7. Stimulus Mirror
8. TV Monitor
9. Event Recorder
10. Audio Recorder

Figure 3.

RESPONSIVE ENVIRONMENT