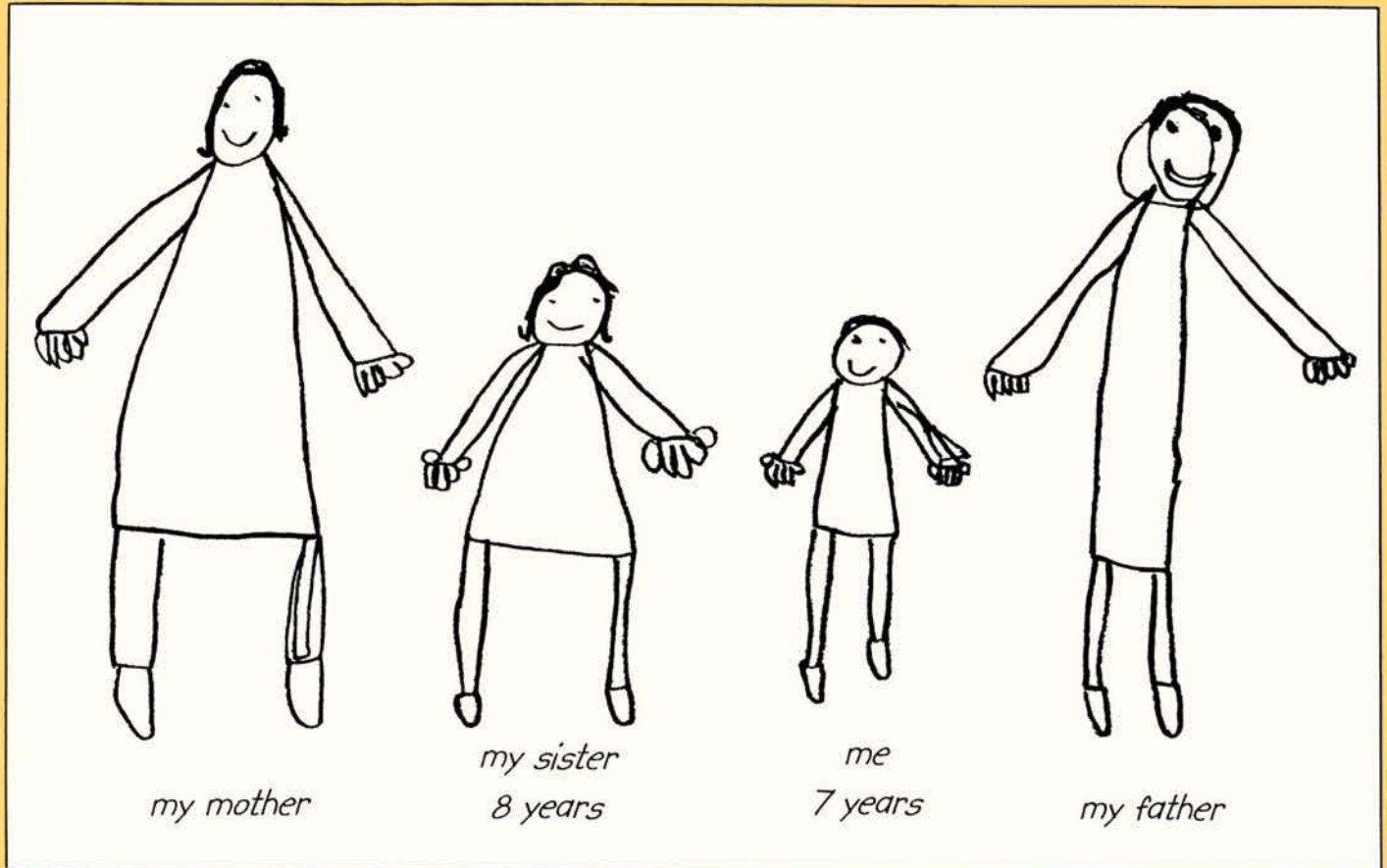


# CHILD DEVELOPMENT



## Analysis and Synthesis

**Joseph H. Di Leo, M.D.**

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DEVELOPMENT:  
ANALYSIS  
AND  
SYNTHESIS**

by

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ANALYSIS AND SYNTHESIS**



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## Introduction

Many years ago, in the course of my residency in pediatrics, it became increasingly clear to me that what I was learning about formulas, immunizations, and disease was pitifully little about what really mattered—the child. Quite by chance, I came upon a volume that was to mark a turning point in my career—*Developmental Diagnosis* by Gesell and Amatruda, in which were described the changing patterns of behavior as the child matured during the first three years. It was utterly fascinating and opened up a whole new horizon. Later, when the opportunity arose to go to the Yale Clinic of Child Development, I responded enthusiastically. There, under the direction of Gesell and Amatruda, I was trained in the techniques of developmental evaluation.

After this training, I was charged with the direction of a clinic for the appraisal of growth and development at the New York Foundling Hospital. I have continued in that capacity these thirty odd years. It soon became apparent, however, that the observation, recording, and conclusions drawn from the developmental evaluations left many questions unanswered. To fill in the gaps, I added to the technique a neurological survey aimed at determining the absence or persistence of certain reflexes peculiar to the developing organism. But it seemed that we must also consider the adverse environmental factors, and the inhibitions and disorders of motility so common in infants without families. I found help in Anna Freud's writings on children separated from their families. Erikson's classic, *Childhood and Society*, added a social dimension to the comprehensive view I was developing.

Piaget's monumental work on how children learn added an indispensable aspect to what was now an almost total view. My interest and study of drawings by young children provided an opportunity to see what children thought and felt about people and themselves.

No one could be expected in a lifetime to investigate the whole and its complexity. But drawing from the masters, as well as my own clinical experience, might it not be possible to view the whole synoptically? There is no other valid way. It must be done if we are to help the child and not merely one part. The reality is that the parts do not exist as such. Body, physiology, intellect, emotions, and experience are inseparable aspects of a

whole. The subject of our study is an integrated whole. Difficult as it may be, the child cannot be understood unless the aspects mentioned, as well as others which may be relevant, are taken into account. With this end in view, I shall first briefly survey each aspect singly, then show how they are interrelated, and finally present a synoptic chart that illustrates not only the time relationship but also the oneness of the subject under consideration. Having found this effort most helpful, I am offering it to those working with children as a practical device for keeping the forest in mind while examining the trees.

Before attempting to present the various aspects of development in a stage-to-stage relationship, I shall review in outline those stage-dependent theories that I believe to be the most coherent, having found them the most helpful in my long association with children and their problems.

Psychoanalytic theory as presented in the work of S. Freud, A. Freud, M. Mahler and R. Spitz, provides the framework for the outline of affective development. Its application to social development is derived from E. Erikson. Cognitive developmental stages are those of J. Piaget. For the outline of behavior patterns based on decades of systematic observation, I have turned to A. Gesell. The sequences in drawing behavior, in which cognition and affect fuse, are as identified by G. H. Luquet in his pioneer observations and interpretations and as described in my own publications. Language developmental stages are based on the work of McCarthy, Gesell, Brown, Myklebust, Lenneberg, and others.

Some, but perhaps not all, of these outlines will seem superfluous to those who are familiar with the theories from which the survey is derived. To others, the outlines may stimulate a desire for more substance, which they will find in the list of selected references.

The book is divided into three sections. In the first, the world of childhood is viewed, described, investigated, and interpreted by adults. In the second, the children speak for themselves. In word, and more cogently in deed, they tell of themselves and of the adults who constitute their world. The third section is devoted to a synthesis of views that are often in only apparent conflict.

*The child who is known only through adults is known wrong.*

**PART ONE**  
**The World of Childhood**  
**as Seen by Adults**

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# 1

## DEVELOPMENTAL STAGES

All development is a continuous process. There are no exceptions to this rule. It applies to psychological as well as biological development. Yet, even in its physical aspects, there are differences in the pattern of growth: The brain takes an early lead while genital maturation lags far behind; rapid spurts in general body growth occur during the first and preadolescent years; qualitative as well as quantitative changes transform the child into an adult. The child is not a miniature adult.

Cognitive, psychosexual, psychosocial, and even drawing behavior displays no exceptions to the phenomenon of lawful growth. Development proceeds stage by stage in orderly sequence, and although there are individual variations, these do not basically alter the ground plan that is typical of our species and that, inherent in the DNA of our first 46 chromosomes, distinguishes us from all other forms of life.

Development sometimes takes a quantum jump but, like all biological phenomena, it is a continuum. It advances upward and forward, not in linear fashion, but more like a spiral, with its downward as well as upward cycle, yet always a bit more upward and a bit less downward, each stage representing a level of maturity whose features are qualitatively different yet derived from and dependent upon the earlier stages.

It is within this conceptual framework of identifiable stages in the developmental continuum that I shall attempt to show the relationships that express the oneness of the organism and the unifying concept of growth.

# 2

## CRITICAL PERIODS

The theory of critical periods has gained support from phenomena observed in biological development and from clinical observations in the behavioral sciences.

There can be no doubt that in embryological development timing plays a crucial role. The effects of noxious exogenous agents on embryonic differentiation are influenced by the timing of the insult. The role of sensitive periods in teratogenesis is beyond question: The thalidomide disaster is a dramatic case in point. The effects of cosmic radiation, viruses, pollutants, and drugs are clearly related to the time of their action during organogenesis, as well as to the specific noxious agent. The first prenatal months are a time of particular vulnerability, for it is during this period that arms, and eyes, and lips, and brains may be arrested and deformed. Animal experiments have demonstrated impaired brains due to unavailability of essential nu-

trients during the late prenatal and early neonatal period. Studies of deprived human populations suggest the possibility of impaired intellectual functioning in children who suffered from similar early malnutrition. More specifically, studies of neural development in mammals indicate the need for specific proteins and lipids at the right time for normal growth of the myelin sheath that insulates nerve fibres. Critical periods have been detected in the stages of neural proliferation and dendritic formation.

How neural structure affects behavior is a fascinating problem under continual investigation. The weight of evidence supports the view that once a system becomes organized it resists reorganization (Scott, 1962). This principle applies to structure and to function. There are optimal periods for physical growth and there is considerable clinical evidence that there are sensitive periods for behavioral development, for learning, and for the acquisition of social skills. The conviction that such sensitive periods do actually occur has drawn attention to the abiding effects of one's earliest encounters with environmental influences and, crucially, of exchanges between child and nurturing adult.

The concept of critical periods has far-reaching implications for the care, education, and training of children, as well as for their physical health and well-being.

Rene Spitz has stressed the critical significance of three periods in the early development of the psyche. During these periods, "organizers" of the psyche are established. The first of these organizers is the smiling response, which appears at about six weeks. At first indiscriminate, responding to any nodding full-face, the social smile is gradually directed more to the mothering person. A second organizer is represented by the anxiety which is often displayed at about eight months, when the infant reacts negatively to strangers and shows a decided preference for the mother figure. She has become the established libidinal object in whom the infant's aggressive and affective drives are fused. During the second year, the third organizer is represented by the words *no*, *nein*, *niet*, and by the ubiquitous horizontal shaking of the head that universally expresses negation and the awareness of a separate and distinct self.

Studies of animal psychology, notably by Konrad Lorenz, indicate that the critical period for imprinting in animals occurs soon after birth. By waddling and quacking like a mallard mother, newly-hatched ducklings took him on as their mother,

following and responding to him in typical duckling fashion. In humans, it is suggested that the critical period for “imprinting,” that is, for the establishment of the libidinal object, occupies a much longer period and requires reciprocally gratifying tactile, auditory, visual, and emotional interaction.

Establishment of the gender role in human beings is not a function of chromosomal sex, gonadal sex, or hormones, and although the character of the external genitalia does play a role, it is not necessarily a determining one. Environmental factors are involved and often play a decisive role. These environmental influences operating early in life may result in the assumption of a sexual orientation that is at variance with the biological sex. Clinical evidence places the critical period for gender role and orientation well within the preschool years.

# 3

## THE NEURAL SUBSTRATE

Underlying all behavioral development is the maturation of the nervous system. The repertory of patterned reflexes that is present in the newborn is based on changes in the structure of the nervous system that have been going on long before birth. The gradual weakening and eventual disappearance of these phylogenetic reflexes coincide with the descent of moderating and controlling influences from the supra-segmental hierarchical structures. "The direction of development is cephalocaudal. The first movable parts to come under volitional control are those nearest the brain, namely, the eyes. Thence forward, progressively downward and distally into the extremities, controlled movements occur until mastery is established over the skeletal musculature and even over emotional expression. Meanwhile, growing awareness and accumulating experience are making sensory reception increasingly meaningful and elevat-

ing it to the level of perception. . . . The persistence of certain phylogenetic reflexes beyond the time that they should have disappeared is a sign of delayed encephalization of behavior or of damage to the central nervous system” (Di Leo, 1967). Among the reflexes destined to extinction during the normal course of development are the Moro, tonic-neck reflex, indiscriminate sucking, automatic hand grasp and toe grasp, and Babinski.

As behavior evolves, structural maturation proceeds at a continuous, progressive pace. During the fetal period, the brain takes an early lead and outstrips all other systems in rapidity and complexity of growth and maturation. Histologically, the changes are revealed as a striking proliferation of brain cells and a differentiation of the cortex into layers.

At birth, the brain is by far the most developmentally advanced organ in the body. Its average weight (350 grams) is one-fourth of the weight of an adult brain. The male brain is slightly heavier than the female’s, but this is not associated with a functional advantage. Already, at birth, the brain has its full complement of neurons—approximately 10 billion—as well as the nerve cells of the rest of the nervous system. The only cells that are added are the neuroglia; these are the supporting structures of the nervous system. Neurons begin to die in early adulthood. By age 35, approximately 100,000 brain cells are lost every day (Crelin, 1973). (This is just one of the indications that the human organism reaches its peak efficiency during adolescence.)

In the newborn, function is mediated from the midbrain. Though all neurons that one will ever have are present in the cortex, the nerve fibres (axons) issuing from the cell bodies are not efficiently conducting impulses. To do so, the axons must first acquire their myelin sheath, a process that proceeds distally from the cell body. Only then can the cortical cells exert their controlling, moderating influence over the phylogenetically older subcortical system that blindly governs the diffuse, reflex activity of the newborn. Descending control by the cortex is largely inhibitory and is manifested by restriction of response and gradual disappearance of the blind, inborn, atavistic reflexes (rooting, automatic hand and toe grasp, stepping, Moro, doll’s eyes, tonic-neck reflex).

Inhibitory control from the cortex is an essential prerequisite for the emergence of voluntary, goal-directed response. As this is occurring, the electroencephalogram shows the appearance of alpha-type 3 per second rhythm.

As myelination and control spread downward and distally

into the face, trunk, and limbs, voluntary movements replace the generalized responses of the immature organism. The response to stimuli from eyes, ears, skin, and muscles becomes increasingly appropriate. The infant thinks motorically. Piaget calls this the sensori-motor stage. Freud called it the oral stage, for everything is experienced with the mouth, currently the prime organ for pleasurable, sensitive contact with an object, living or inanimate. Touch and movement are intimately interwoven in structure and function, in the brain and in action. The mouth and the finger must move in order to feel. In the brain, the motor area has sensory elements, while the sensory area has motoric elements.

By age three the brain has attained three-quarters of its adult weight. By age five, it will have attained 90 percent of its adult size. Its capacity for storage and retrieval is impressive. As the child achieves mastery over the action system, movements will become effortless, as they are almost unconsciously performed in the service of purpose and goal. The child is then free to explore the environment as boundaries are enlarged and curiosity and assertiveness become dominant traits . . . unless physical or environmentally imposed restrictions create deviations in the normal flow of development.

During prenatal development, spontaneous movements occur as early as three weeks, when the heart begins its lifelong beat. Response to stimulation of the mouth region has been noted in the two-month embryo. Spontaneous movements of the total organism have been noted as early as nine weeks. As the fifth-month fetus becomes increasingly active, the mother becomes aware of a life within her. The full repertory of phylogenetic patterned reflexes typical of the full-term newborn is already present in the seventh-month fetus; these include the Moro, suspension grasp, rooting, sucking, toe grasp, and Babinski reflexes. Underlying these manifestations is the structural-functional maturation of the central and peripheral neural apparatus, in which enzymatic, endocrine, electrical, and other physio-chemical phenomena play a correlative, as yet imperfectly understood, role.

Considerable insight into the activity of the nervous system even before birth is provided by electroencephalographic studies. Brain waves reaching the surface of the cortex have been detected as early as the seventh fetal month. Using the electroencephalogram as an index of maturation, stages have been defined