Sensory-Motor Dysfunction and Therapy in Infancy and Early Childhood

Delmont Morrison, Ph.D.

Clinical Professor
University of California
San Francisco

Patricia Pothier R.N., M.S.

Associate Professor
University of California
San Francisco

Katy Horr, R.P.T., M.S.

George Miller, Jr., Memorial Center West
Richmond, California

This text presents detailed descriptions of assessment and treatment procedures for use with infants and young children demonstrating sensory-motor dysfunction and delays in learning. The chapters are grouped into three major sections which encompass *Sensory-Motor Therapy: Theory and Research; Sensory-Motor Development, Assessment, and Therapy;* and *The Relationship Between Sensory-Motor and Emotional Development.* Additional information is presented on primitive reflex assessment, evaluating children's abilities, and equipment resources.

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PREFACE

THIS book is the direct result of the collaborative professional relationship of a physical therapist, whose specialty is handicapped children, a child psychiatric nurse, and a child clinical psychologist. In the course of our work together we were made aware of what was unique to our professional training and experience and what we had in common. More importantly, we learned a great deal from each other as a direct result of our individual training and experience and have in the process become more competent clinicians. This book reflects this interdisciplinary approach. The child demonstrating sensory-motor dysfunction certainly needs an assessment and intervention that treats this problem but must also be assessed more generally and appropriate intervention provided. It is seldom that the developing human organism presents us with one isolated problem. More frequently a dysfunction and related delay in one area affects other areas of development and so on until the total organism reorganizes to adapt to these disrupting events. The competent clinician may be able to apply his or her expertise to one or more aspect of the problem but must know how to refer to other appropriate professionals and collaborate with them in the treatment of the total child. Although the major focus of this text is the assessment and treatment of sensory-motor dysfunction by Sensory-Motor Therapy, the general perspective encompasses the child's psychological experiences of this problem.

The text should be of interest to anyone interested in the role that sensory-motor experience plays in psychopathological development in infancy and early childhood and the treatment of this psychopathology through sensory-motor techniques. Although we feel that the clinical evidence for the effectiveness of the assessment and treatment techniques reviewed is con-

vincing, we urge the clinician to be appropriately critical, and we encourage the use of scientific research in this area. The clinical effectiveness of Sensory-Motor Therapy would be greatly enhanced by more objective data on assessment and treatment.

The application of these techniques with infants and young children demonstrating sensory-motor dysfunction is relatively new. Therefore considerable space and discussion have been given to the methods of assessment and treatment. This material should provide the student with the necessary basic knowledge to learn assessment and treatment of sensory-motor dysfunction with appropriate supervision. The application of these techniques should be enhanced by the discussions of broader clinical issues, case presentations, and theory. The theory used is developmental with a major focus on Piaget's theory of sensorimotor intelligence. In the authors' experience, assessment of sensory-motor dysfunction and demonstration of the effects of Sensory-Motor Therapy are best accomplished within a developmental framework.

Finally, we wish to thank our spouses and the many friends, colleagues, and students who have criticized our work, encouraged us to improve, and supported the effort. In particular we wish to thank the staff and children of the Lucinda Weeks Children's Center in San Francisco, California and the George Miller Jr. Memorial Center West, Richmond, California. The photographic work was done by the staff of CORT, University of California, San Francisco and Pamela McNeill-Badger. We wish to thank Jason White and Dylan McNeill who posed for the photographs demonstrating normal development. Sarah Semans, RPT provided a very useful criticism of one of the first drafts of the text, and we thank her. Finally, we acknowledge and thank our diligent typist Rick Bolton.

D.M.
P.P.
K.H.

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PART I

SENSORY-MOTOR THERAPY: THEORY AND RESEARCH

The infant has the unique task of organizing and adapting to an enormous amount of novel stimulation. Generally the infant and later the child will actively seek to explore this novelty through sensory-motor interactions that elaborate understanding of his own body and his environment. This will not be the case of the infant and child who demonstrates significant delays in sensory-motor integration. In this situation the task of discovering the environment and developing self is made difficult and at times impossible because the sensory and motor components cannot be modulated so as to produce the consistent and reliable information necessary for cognitive growth. The data on the effectiveness of early intervention as a means of correcting developmental delay and cognitive retardation are reviewed in this section. Particular attention is paid to the research and theory related to Sensory-Motor Therapy, with the conclusion being made that this technique can be clinically effective in helping the infant and child develop sensory-motor integration. Piaget's theory of sensorimotor intelligence is used to understand how exploration of novelty through specific patterns of sensory-motor interactions stimulate coordination and integration of the sensory-motor systems. This early sensory-motor integration is assumed to be a requirement for the discovery of self and for later cognitive growth and may be interfered with if the infant and child experience physical impairments and/or early deprivation and difficulties in emotionally attaching to a significant adult.

CHAPTER 1

THE ROLE OF SENSORY-MOTOR DYSFUNCTION IN INFANCY AND EARLY CHILDHOOD

INTRODUCTION

IN the normal course of events an infant moves quickly from a grossly coordinated sensory-motor-emotional system to a system demonstrating relatively well-defined coordinations between the various sensory-motor-emotional components. For example, the newborn infant will respond to a sudden change in environmental stimulation such as a relatively loud noise by gross startle reactions and possibly by crying. This same infant, twelve months later, may respond to the same sound by a mild startle reaction followed by a visual orientation in the direction of the noise. If the situation is novel the infant may first run to his or her mother, if available, and perhaps tentatively begin to explore the area or source of the sound after making this interpersonal contact. All these behaviors at twelve months will be accompanied by a great deal of babbling and perhaps a few distinguishable words that appear to have social meaning, such as *mama*. Give the child another twelve months, and at age twenty-four months such a minor change in environmental stimulation will probably elicit much less fear and curiosity. By this time the child has had a good many such experiences and generally finds them of minimum interest. If the child has had the experience of having a supporting adult available in strange and novel situations, he or she now relies less heavily on having an adult nearby in order to explore novelty and satiate curiosity. A sense of self is developing as evidenced by a frequent use of the word *no* that is but one word in a rather elaborate

expressive and receptive communication system. In two years time the rather immobile and grossly coordinated infant has become a child who spends a great deal of time in motoric activities exploring and developing his cognitive and affective self.

This accelerated pattern of growth and development goes on until approximately age five where the process certainly continues but at a less accelerated pace. Unfortunately, there are a considerable number of children in this age range between infancy and early childhood who in varying degrees demonstrate significant delays in the coordination and integration of these sensory-motor-emotional components. In a predominate number of these children there is a correlated retardation in cognitive development as well as problems in their interpersonal relationship with peers and adults. Some of these children have demonstrable sensory-motor problems related to well-defined central nervous system (CNS) impairment. These difficulties may have been present at birth, caused during the birth process, or resulted from an early-occurring illness or injury affecting the CNS. Children with cerebral palsy are found in this group. In these cases intense medical care is needed, and coordinated effort by a medical staff as well as specialists in physical and occupational therapy and education is the recommended treatment.

There are many children who do not demonstrate such a history of injury of illness involving the CNS. Frequently these children may have been referred for medical evaluation such as neurological or psychiatric evaluation, but they have not received a diagnosis that predicated a medical or psychiatric treatment. In some cases medical care may be recommended as adjunctive treatment for a home stimulation program for an infant or for placement in a special therapeutic preschool for a child. Assessment and evaluation of an infant and child for a home stimulation or preschool program are conducted for the purpose of delineating areas of retardation in need of specific remediation rather than establishment of diagnosis. Such a developmental assessment frequently detects varying degrees of retardation in the sensory-motor areas that appear to be intimately related to the child's cognitive problems. If the develop-

mental evaluation is done early enough, arrangements can be made to provide a home stimulation program for the infant as well as appropriate counseling for the parent. Either as a result or as a cause of the general developmental delays present, these infants and children often demonstrate early-occurring emotional problems that are observable during their interactions with their parents. Consequently some type of counseling, or in some cases treatment for the emotional problems, must be offered for the infant or child and parent.

The primary need of these infants and children is for a program that can stimulate the normal development of the demonstrated sensory-motor-emotional delays. Environmental interventions implemented with this general goal in mind would include remedial language programs, efforts to stimulate fine perceptual-motor skills, dance and movement activities, and appropriate socialization experience. These therapeutic interventions may be implemented in the context of ongoing medical care or without correlated medical intervention. This population of infants and children is the major focus of what follows. Although sensory-motor assessment and intervention receive major emphasis in this text, it should be clear that adequate sensitivity to the infant and child's total emotional development and cognitive capacities must be present in any therapeutic effort. In our opinion, the infant and child's sensory-motor integration is intimately related to his cognitive capacities, and his or her early emotional reactions are experienced and expressed primarily through the sensory-motor system.

FACTORS INFLUENCING SENSORY-MOTOR INTEGRATION

A review of the current literature in child development indicates a major deficit in our knowledge of the development of sensory-motor integration (2). Typically, we obtain a description of the development of each sensory system, such as visual perception and audition, and in the end very little regarding the development of intersensory relationships such as visual-auditory coordination. In the same textbooks we frequently

find, in a separate chapter, a description of motor development ranging from postural control to walking and grasping prehension and reaching. The data for motor coordination, although much less than needed, are greater than the existing data for sensory coordination, and consequently we do have some discussion on the development of motor coordination. However, the development of motor coordination is most often presented without specific reference to the corresponding development of the individual sensory modalities or the coordination of the various sensory modalities. This state of affairs is particularly relevant to the subject matter of this text, which is dysfunctions of sensory-motor integration and the remediation and habilitation of these dysfunctions in infants and young children. Acknowledging that we lack a firm body of data regarding the development of sensory-motor integration, the authors think that we do have enough data on the development of the infant and child that can be related specifically and directly to sensory-motor development and thereby serve as a valid and reliable basis for therapeutic intervention.

For the purposes of this text, perception may be defined and distinguished from sensation as the ability of the human organism to recognize and organize stimuli by relating the stimuli to previous experience. Cognition can be contrasted to perception as the psychological process whereby sensations and perceptions are converted to potentially meaningful signs, symbols, concepts, and propositions. In our view, during infancy and early childhood, sensation perception and cognition are interrelated with motor action. The early coordination of sensory-motor systems for exploration and adaptation to the environment lays the groundwork for further personal-social-cognitive development. Dysfunctions in these systems frequently result in early developmental delays, mental retardation, and emotional disturbance. The independent integrity of the sensory and motor systems is necessary for simple sensory and motor functions. An individual sensory system, such as the auditory system, must have the basic capacity to receive, analyze, and selectively organize competing stimuli. However, there is evidence in early development that input via

one sensory modality is affective in modifying other systems, both as they function independently and in coordination with other systems. When multiple sensory input is related to one sensory system and the independent integrity of that system, we are referring to intrasensory integration. Of major concern for the development of sensory-motor integration is the process whereby multiple stimuli are transmitted through different sensory modalities: intersensory integration. A major clinical and research question which must be dealt with is an adequate description of these systems and how they evolve. Behaviorally, intersensory integration is observed when a child relates information received through one modality to information which has been received through another. For example, when a small bell is rung behind an infant and he turns to look at or in the direction of the bell, we can assume that the auditory and visual systems are individually integrated and coordinated to some degree. This example also serves to emphasize the role of motor development and coordination in the development of intersensory integration. Reliable head control and muscle involvement must be in existence before the rather complicated motor act of turning the head toward an object of sound can be attempted or accomplished.

The development of sensory-motor integration may be explained through at least three different theoretical orientations: behaviorism, maturation, and Piaget's interaction hypothesis. Briefly, behaviorism as originally put forward by Watson (13) and later by Skinner (11) stated that all complex behavior is a growth or development from simple responses. Behavior in infancy is observed as a set of a few simple reflexes and responses that evolve into stabilized patterns of complex behaviors through conditioning. We shall later discuss other aspects of this theoretical approach, but the theory had and still has a definite influence on research. The main task of the behavioral scientist in this approach is to determine the repertoire of innate motor responses in the infant and describe how they are developed through conditioning. The maturation hypothesis is best exemplified perhaps in the work of Gesell (3). In this view, while environmental factors support and specify, they do not