

**MOTOR DEVELOPMENT AND
MOVEMENT ACTIVITIES FOR
PRESCHOOLERS AND INFANTS
WITH DELAYS**

Second Edition

**MOTOR DEVELOPMENT AND
MOVEMENT ACTIVITIES FOR
PRESCHOOLERS AND INFANTS
WITH DELAYS**

**A Multisensory Approach for
Professionals and Families**

By

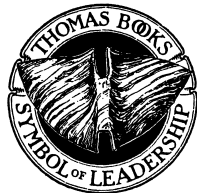
JO E. COWDEN, PH.D.

*University of New Orleans
Professor*

and

CAROL C. TORREY, PH.D.

*Coordinator of Special Education Programs
Jefferson Parish Public schools*



CHARLES C THOMAS • PUBLISHER, LTD.
Springfield • Illinois • U.S.A.

Published and Distributed Throughout the World by

CHARLES C THOMAS • PUBLISHER, LTD.
2600 South First Street
Springfield, Illinois 62794-9265

This book is protected by copyright. No part of
it may be reproduced in any manner without written
permission from the publisher. All rights reserved.

©2007 by CHARLES C THOMAS • PUBLISHER, LTD.

ISBN 978-0-398-07764-8 (hard)
ISBN 978-0-398-07765-5 (pbk.)

Library of Congress Catalog Card Number: 2007014825

*With THOMAS BOOKS careful attention is given to all details of manufacturing
and design. It is the Publisher's desire to present books that are satisfactory as to their
physical qualities and artistic possibilities and appropriate for their particular use.
THOMAS BOOKS will be true to those laws of quality that assure a good name
and good will.*

*Printed in the United States of America
MM-R-3*

Library of Congress Cataloging in Publication Data

Cowden, Jo E.

Motor development and movement activities for preschoolers and infants
with delays : a multisensory approach for professionals and families / by
Jo E. Cowden and Carol C. Torrey. -- 2nd ed.

p. cm.

Ref. ed. of: Pediatric adapted motor development and exercise. c1998.

Includes bibliographical references and index.

ISBN 978-0-398-07764-8 (hard) -- ISBN 978-0-398-07765-5 (pbk.)

1. Children with disabilities--Development. 2. Exercise therapy for chil-
dren. 3. Motor ability in children. 4. Physical fitness for children. I. Torrey,
Carl C. II. Cowden, Jo E. Pediatric adapted motor development and exer-
cise. III. Title.

RJ138.C68 2007
615.8'2083--dc22

2007014825

PREFACE

The second edition of the book is intended to provide information for professionals, families, and students interested in learning about motor development of young children with delays or disabilities. A practical approach is used so that families and caregivers can provide instruction utilizing the ecological dynamics of the home environment. The book emphasizes the age group of infancy (6 months) to 6 years. However, families with older children and professionals who work with older children who have significant motor delays will also benefit from the information and activities in this book. Activities are specifically designed for parents of children with delays/disabilities and specialists of motor development, adapted physical education, special education, early childhood, early intervention and allied health.

The purpose of the book is to explain the principles of motor developmental theories and relate them to practical intervention, answer questions about muscle tone (hypotonicity, hypertonicity) related to positioning, lifting, carrying, and feeding of young children, provide directions for early diagnosis and assessment of symptoms recognizable in developmental domains including autism, and help professionals and families understand the impact of medical conditions on motor development and related daily living skills for young children. In addition, practical suggestions and activities for families and professionals to enhance sensory motor development of the young child during structured motor intervention and throughout the day are provided.

Throughout this book, the term “movement specialist” has been used to refer to one of the many professionals that provide motor assessment and activities to young children with disabilities. This array of professionals may include, but is not limited to: adapted physical educator, occupational therapist, physical therapist, early childhood

educator, preschool classroom teacher, home-based early intervention teacher, and so forth. Regardless of the title of this professional, a movement specialist will have been trained in the psychomotor domain, and will have knowledge to provide appropriate and valuable motor assessment and intervention to young children with disabilities. Additionally, it must be noted that a para-educator (teacher assistant) may also be provided specific training to complete intervention.

JO E. COWDEN
CAROL C. TORREY

ACKNOWLEDGMENTS

The authors wish to acknowledge: Connie L. Phelps, Chair of Reference Services Earl K. Long Library at the University of New Orleans who provided detailed assistance for the references in this book.

The families and children with delays or disabilities who have participated in motor interventions during the past 25 years at The University of New Orleans, and who have provided us learning and expertise in the field of motor interventions.

Jean Burke, whose friendship, faith, humor, and love have provided me with the wisdom necessary for completion of this revision.

Margaret Huffman, Jo's sister, who has provided love, faith, and incredible strength.

Peter Torrey, and my two daughters, Alexandra and Alanna Torrey, for their patience, encouragement, and love while I worked endlessly on the revision of this book.

Our friend, Anita Hartzell Hefler, who administers the program at the Greater New Orleans Therapeutic Riding Center, encouraging excellence in the young children with disabilities and working with university students in adapted physical education practices.

I also want to dedicate this publication to the memory of my beloved pup, Chelsea Makala Cowden, who stayed very close to her mom for 15 years providing companionship for hours of writing.

Michael Payne Thomas and Claire Slagle of Charles C Thomas Publisher who provided incredible leadership and support for developing this book.

JEC
CCT

CONTENTS

	<i>Page</i>
<i>Preface</i>	v
Chapter 1. Motor Development	3
Interaction of Child and the Environment	4
Motor Development Theories	6
Traditional Developmental Theories	6
Neurodevelopmental Theories	8
Principles of Motor Development Theories	10
Contemporary Dynamic Systems Theory	20
Components of Dynamic Systems Theory	24
Summary	30
Chapter 2. Organization of the Nervous System	37
Development of the Nervous System	38
Spinal Cord Development and Functions	40
Cranial Nerves	43
Central Nervous System	44
Perceptual Motor Response Theory Model	49
Sensory Systems and Sensory Input	49
Tactile Modality	50
Vestibular Modality	52
Auditory Modality	54
Visual Modality	55
Kinesthetic Modality	58
Intact Central Nervous System	59
Motor Output	60
Motor Output as a Reflex	60
Motor Output as a Reaction	61

Motor Output as Skill .....	.62
Feedback .....	.62
Summary .....	.62
Chapter 3. Muscle Tone .....	.67
Importance of Muscle Tone .....	.68
Assessment of Muscle Tone and Reflexes .....	.70
Positioning and Handling .....	.72
Guidelines for Positioning and Handling .....	.74
Carrying .....	.78
Feeding .....	.83
Lifting .....	.84
Summary .....	.84
Chapter 4. Medical and Biological Considerations .....	.87
Prematurity and Low Birth Weight .....	.88
Premature Labor .....	.89
Placenta Previa .....	.89
Abruptio Placenta .....	.89
Amniotic Fluid and Premature Rupture .....	.89
Entangled Umbilical Cord .....	.89
Meconium Aspiration Syndrome .....	.90
Hyperbilirubinemia .....	.90
Apgar .....	.90
Medical Conditions .....	.91
Genetic Variations .....	.91
Chromosomal Abnormalities .....	.93
Down Syndrome .....	.93
Turner Syndrome .....	.95
Fragile X Syndrome .....	.95
Single Gene Defects .....	.95
Phenylketonuria (PKU) .....	.96
Hypothyroidism .....	.96
Tuberous Sclerosis .....	.96
Abnormalities or Syndromes of Unknown	
Etiology .....	.97
Spina Bifida .....	.97
Hydrocephalus .....	.101
Microcephaly .....	.100

Prader-Willi Syndrome	101
Congenital Infections	101
Toxoplasmosis	101
Rubella	102
Cytomegalovirus (CMV)	102
Herpes	103
Syphilis	103
Human Immunodeficiency Virus (HIV)	104
Hepatitis B Virus (HBV)	105
Sensory Impairments	106
Visual Impairments	106
Auditory Impairments	107
Orthopedic and Neurologic Conditions	108
Cerebral Palsy	108
Seizures	110
Hypoxia Ischemic Encephalopathy	112
Significant Intracranial Hemorrhage	113
Intraventricular Hemorrhage (IVH) (Grade III or IV)	113
Periventricular Leukomalacia (PVL)	113
Technology Dependence	113
Respiratory Distress Syndrome (RDS)	114
Bronchopulmonary Dysplasia (BPD)	114
Tracheostomy	115
Gastrostomy	119
Gastroschisis	120
Exposure to Known Teratogens or Drugs	121
Fetal Alcohol Syndrome (FAS)	121
Fetal Hydantoin Syndrome	122
Prenatal Exposure to Cocaine/Crack and Tobacco	123
Psychiatric Disturbances of Infancy	124
Developmental Delay	125
Pervasive Developmental Disorder	125
Autistic Spectrum Disorders	127
Motor	129
Cognition	130
Social	130
Communication	131
Infantile Autism: Early Indicators of Delay	132
Sensory Dysfunction	133

Team Decision-Making Process	136
Summary	138
Chapter 5. Assessment	147
Team Approach	150
ROADMAP Model	152
Purposes and Procedures for Assessment	155
Assessment Instruments	161
Screening Instruments	161
Ages and Stages Questionnaire: A Parent- Completed, Child-Monitoring System, Second Edition (AS.)	161
Battelle Developmental Inventory Screening Test ..	162
Denver II	163
Eligibility Instruments	165
Battelle Developmental Inventory, Second Edition ..	165
The Bayley Scales of Infant and Toddler Development, Third Edition	167
Brigance Diagnostic Inventory of Early Development-II	170
Developmental Programming for Infants and Young Children (Rogers & Donovan, 1981) ..	173
Peabody Developmental Motor Scales, Second Edition	174
Instruments for Program Planning	175
Assessment, Evaluation, and Programming System for Infants and Children, Second Edition (AEPS)	175
Carolina Curriculum for Infants and Toddlers with Special Needs, Third Edition (CCI) (Johnson-Martin, Jens, Attermeier, & Hacker, 2004)	179
Carolina Curriculum for Preschoolers with Special Needs, Second Edition (CCPSN)	179
Hawaii Early Learning Profile (HELP) Curriculum and Assessment Materials	181
Movement Assessment of Infants (MAI)	184
Transdisciplinary Play-Based Assessment	185
Instrument Recommendations	189
Summary	191

Chapter 6. Principles of Intervention: Progressive	
Interactive Facilitation	195
Theoretical Principles of Intervention	196
Intervention Principles	199
Progression of Balance Development	208
Progressive Model of Infant Stepping Movements	212
Implementation and Evaluation of PIF	217
Summary	221
Chapter 7. Activities for Children with Hypotonicity	225
Introduction to Developmental Activity Programs	225
Exercises and Activities for Increasing Muscle Tone and Strength	229
Supine Position	229
Prone Position	237
Rolling Position	244
Four-Point Creeping	246
Exercises for Progression to Standing and Locomotion	253
Enhancing the Exercises	259
Chapter 8. Activities for Reflex Integration and Decreasing Muscle Tone	263
Assessment of Asymmetrical Tonic Neck Reflex (0 to 4–6 mos.)	264
Activities for Integration of Asymmetrical Tonic Neck Reflex	265
Assessment of Tonic Labyrinthine Supine Reflex	266
Activities for Integration of Tonic Labyrinthine Supine Reflex	267
Assessment of Tonic Labyrinthine Prone Reflex	269
Activities for Integration of Tonic Labyrinthine Prone Reflex	271
Assessment of Symmetrical Tonic Neck Reflex	271
Activities for Integration of Symmetrical Tonic Neck Reflex	271
Relaxation Activities	272
Enhancing the Activities	273
Therapeutic Riding	273

Chapter 9. Activities For Sensory Motor Development . . . . .	.279
Activities for Postural Reactions and Vestibular Stimulation . . . . .	.280
Activities for Visual Motor Control . . . . .	.282
Activities for Auditory Discrimination . . . . .	.286
Activities for Tactile Stimulation . . . . .	.288
Activities for Kinesthetic and Spatial Awareness . . . . .	.289
Chapter 10. Manipulative Activities: Reach, Grasp, Hold and Release . . . . .	.293
Assessment of Reaching . . . . .	.294
Reaching Activities . . . . .	.295
Assessment of Grasping . . . . .	.296
Grasping Activities . . . . .	.297
Assessment of Hold and Release . . . . .	.299
Hold and Release Activities . . . . .	.299
<i>Glossary</i> . . . . .	.303
<i>Author Index</i> . . . . .	.319
<i>Subject Index</i> . . . . .	.325

**MOTOR DEVELOPMENT AND
MOVEMENT ACTIVITIES FOR
PRESCHOOLERS AND INFANTS
WITH DELAYS**

Chapter 1

MOTOR DEVELOPMENT

Chapter Objectives: After studying this chapter, the reader will be able to:

1. Relate the importance of the interaction between the child and environment;
2. Give a meaningful definition of motor development;
3. Explain the principles of Motor Development Theory;
4. Provide a summary of traditional developmental theories, neurodevelopmental theories and Dynamic Systems Theory (DST).



Figure 1.1. Motor development begins prenatally and continues throughout the lifespan as repetitive practice and increasingly difficult challenges expand one's motor skills.

INTERACTION OF CHILD AND THE ENVIRONMENT

The interaction of a young child with his/her environment provides critical opportunities for motor development, as well as development within all of the other learning domains (language, self-help, cognitive, social). The interplay between forces within the individual and the environment is referred to by Gallahue and Ozmun (2006) as *adaptation*, while Sherrill (2004) referred to changes within the individual, the environment and the blend of both the individual and everything in his environment as *ecological theory*. Most professionals agree that the child's environment is critical in the learning process and that valuable opportunities for learning experiences are provided through interaction with an enriched environment. Thus, the importance of early intervention is highlighted.

An understanding of motor development theory and principles of normal motor development influence one's ability to administer motor assessments and to develop motor intervention programs for young children with delays or abnormal motor development. The needs of young children place specific challenges on movement specialists or teachers who provide service delivery in the motor domain. A unique understanding of varied theoretical perspectives, combined with the talents of selecting the appropriate plan of action result in development of optimal movement programs. Philosophical concepts are applied and incorporated into performance objectives for intervention and provide the framework or structure for long-term goals or outcomes. Combining elements from the various traditional, neurodevelopmental, and contemporary theories is the key to successful individualization of intervention curricula for preschoolers and infants with delays. An overview of selected theoretical perspectives will be briefly discussed within this theoretical framework.

A theoretical basis of motor development provides a basis for linking assessment and intervention processes. A theoretical background assists the movement specialist in understanding the relationship between normal and abnormal motor development. Each movement specialist who participates in the evaluation process develops an internal schema that depicts mature versus immature patterns of movement. A critical reference is then needed to determine if the immature patterns actually have a neurological orientation that would indicate possible central nervous system damage associated with abnormal

motor developmental patterns (e.g., cerebral palsy). The specialist establishes an assessment approach based on his or her theoretical frame of reference. The following model (see Figure 1.2) will assist in clarifying the link between theory, assessment, and intervention. Theories included in this model are summarized following the model.

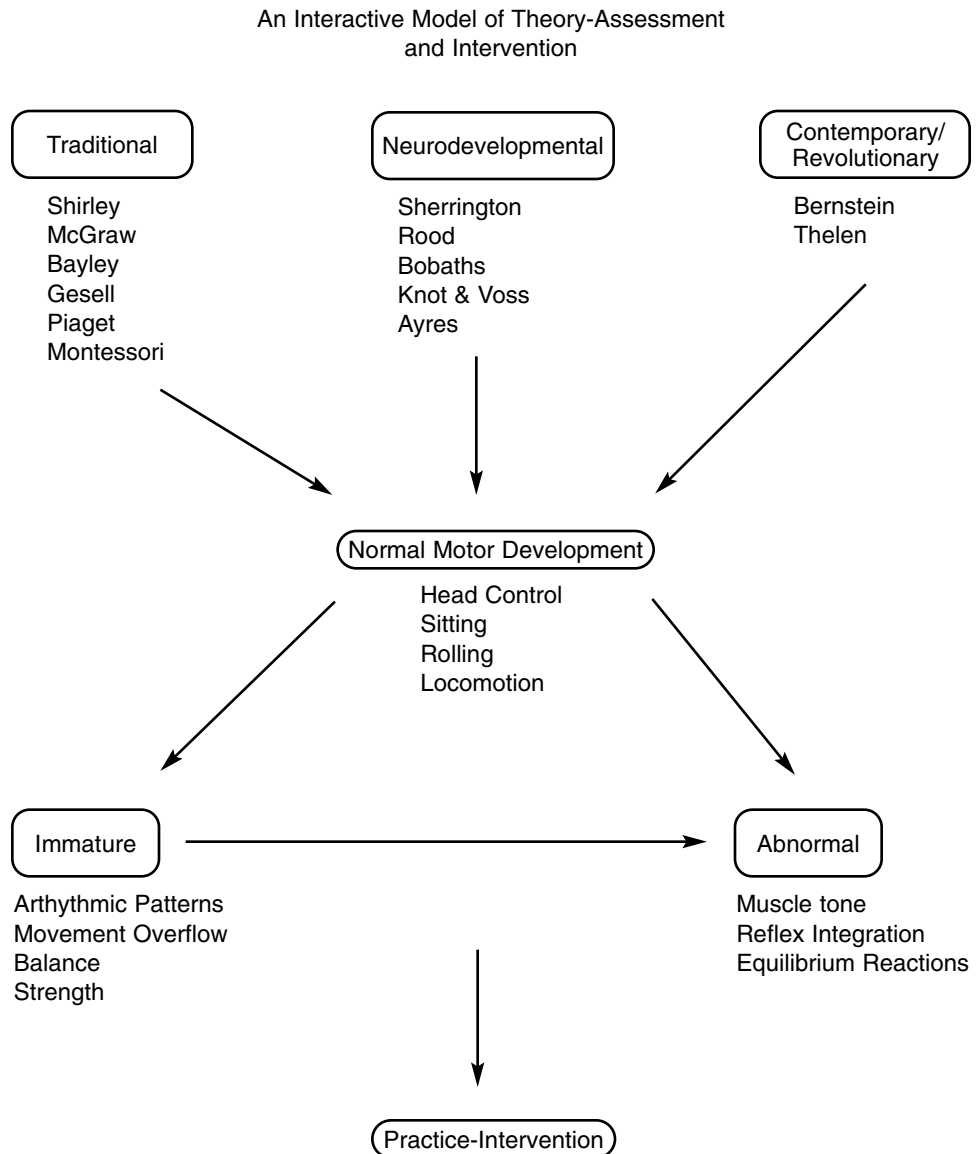


Figure 1.2. The Model for Linking Theory, Assessment, and Intervention.

MOTOR DEVELOPMENT THEORIES

Prior to discussing the various motor development theories, it is important to define some terms related to early childhood development. **Motor development** may be defined as changes of movement behavior across the lifespan including growth, development, and maturation. The process of motor development is continuous and age-related and includes growth, maturation, and development. **Growth** involves quantitative biological and structural changes of the physical size of the child. **Maturation** is defined as qualitative changes that occur as a function of time and age. **Development** includes functional changes which lead to compensation by the individual throughout the lifespan. There is a fixed and sequential order of development; however, rate of change may vary (Gallahue & Ozmun, 2006; Malina, 1975; Payne & Isaacs, 2005; Seefeldt, 1989; Sherrill, 2004).

Traditional Developmental Theories

Traditional developmental theories are based on a hierarchical model of motor skill acquisition. Shirley (1931) proposed a neuromaturation theory of motor development that suggested interindividual variability exists in the motor development of young children. Shirley (1931) outlined five specific phases of motor development: “(a) development of passive postural control; (b) development of active postural control; (c) active efforts toward locomotion; (d) locomotion by creeping and walking with support, and (e) walking alone” (p. 193). These phases develop sequentially and can be correlated with observational assessment of infant movement and play.

McGraw (1932, 1940, 1945) analyzed the development of motor patterns in relation to functional growth and maturation of the nervous system. She emphasized that developmental phases must be carefully studied and understood to increase practical value of standardized tests. McGraw recorded observations of infant behavior in prone progression including neonatal swimming actions, suspended inversion and postural adjustment, rolling, sitting, erect posture, and upright locomotion. She concluded that reflexive movements appear prior to controlled motor patterns and that maturation influences acquisition of upright locomotion. New motor patterns emerge gradually, although stress may increase the use of immature patterns. Her

diagrams of erect locomotion are continually used in efforts to better understand infant development.

During this time period, Bayley (1936) developed one of the first motor scales to objectively quantify infant motor development. Her longitudinal study of mental and motor development remains one of the most intricate and complex of human development studies. The *Bayley Scales on Infant Development* is one of the more widely-used standardized instruments in clinical settings (Fewell & Glick, 1996), and it is projected that the newest edition of the instrument, *The Bayley Scales of Infant and Toddler Development, Third Edition* (2006) will continue to provide valuable assessment information.

Gesell (1928, 1939, 1949, 1954) suggested the following principles of motor development: (a) development is governed by maturation, (b) development occurs in cephalocaudal and proximodistal directions, (c) development occurs asymmetrically, and (d) progression within various developmental domains occurs at uneven paces. Gesell emphasized an intermesh or a spiraling view of development resulting in a complex model of dynamic behavior. He also suggested that an infant's upright postural stability is dependent on the process of reciprocal innervation, whether reflexive or voluntary, and progressive reintegration of muscle groups is prerequisite to subsequent motor development. Many of these principles continue to guide assessment processes and standardized testing (Sherrill, 2004) (see Figure 1.3).

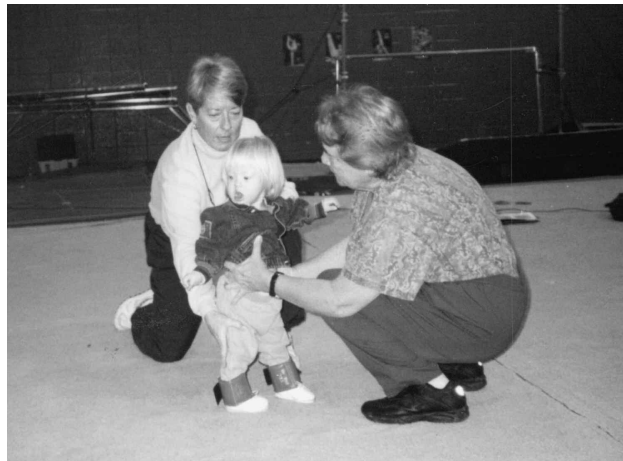


Figure 1.3. The movement specialist and physical therapist collaborate to assess the strength and balance of an infant with Down syndrome.

Additionally, Piaget (1952, 1985) highlighted the importance of the environment and active involvement in the environment as critical to child development. He emphasized the following: (a) continuous development occurs in a fixed and defined order through four sequential stages (i.e., sensorimotor period, preoperational period, concrete operations, formal operations); (b) there are individual differences in rate of development; and (c) through self-organization, sensorimotor experiences influence the quality of cognitive processes. Piagetian principles are utilized throughout early intervention and link assessment to programming strategies.

Montessori, an Italian physician who began her work with children with disabilities, developed the Montessori Method which was based, in part, on the efforts of Itard and Sequin in associationistic psychology (DeVries & Kohlberg, 1990; Moran & Kalakian, 1974). Montessori was the original proponent of “sensorial education” through activities which involve both intelligence and movement (Montessori, 1936a/1956, 1936b/1966, 1949/1967). The Montessori Method allows the child the freedom to interact independently in a prepared environment that is filled with age-appropriate child-size furnishings and toys. The environment is arranged systematically to promote the child’s progressive interests and personality development (Montessori, 1909/1964, 1914/1965). Exercises in daily living, sensory materials, and conceptual elements promote the child’s construction of independence, self-control, self-reliance, and intrinsic rewards. Montessori recognized the connection between mental and motor development, “But to always be thinking of the mind, on the one hand, and the body, on the other, is to break the continuity that should reign between them” (1967, p. 171). Thus, there is a cyclic relationship between mental and motor development whereby one promotes the other and the working of the mind and body elevates the child to higher learning planes.

Neurodevelopmental Theories

Sherrington (1906) originated the reflex model of motor control which influenced many subsequent theories. His principles of normal motor development were utilized to better understand problems of abnormal motor development and central nervous system dysfunction. The term proprioception was derived by Sherrington (1906) to