

CHILDREN

Fourteenth Edition

JOHN W. SANTROCK

University of Texas at Dallas





CHILDREN, FOURTEENTH EDITION

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brief contents

SECTION 1 THE NATURE OF CHILDREN'S DEVELOPMENT 2

- 1 Introduction 3
- Appendix:** Careers in Children's Development 40

SECTION 2 BEGINNINGS 44

- 2 Biological Beginnings 45
- 3 Prenatal Development 72
- 4 Birth 99

SECTION 3 INFANCY 119

- 5 Physical Development in Infancy 120
- 6 Cognitive Development in Infancy 156
- 7 Socioemotional Development in Infancy 187

SECTION 4 EARLY CHILDHOOD 219

- 8 Physical Development in Early Childhood 220
- 9 Cognitive Development in Early Childhood 244
- 10 Socioemotional Development in Early Childhood 276

SECTION 5 MIDDLE AND LATE CHILDHOOD 313

- 11 Physical Development in Middle and Late Childhood 314
- 12 Cognitive Development in Middle and Late Childhood 341
- 13 Socioemotional Development in Middle and Late Childhood 379

SECTION 6 ADOLESCENCE 415

- 14 Physical Development in Adolescence 416
- 15 Cognitive Development in Adolescence 447
- 16 Socioemotional Development in Adolescence 473

*Glossary G-1
References R-1
Name Index N-1
Subject Index S-1*

contents



About the author	xi
Expert Consultants	xii
Connecting Research and Results	xiv
Preface	xvii
Acknowledgments	xxxix

SECTION 1 THE NATURE OF CHILDREN'S DEVELOPMENT 2



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CHAPTER 1 Introduction 3

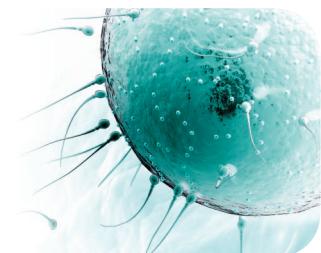
Why Is Caring for Children Important?	5
The Importance of Studying Children's Development	5
Improving the Lives of Children	5
CONNECTING WITH CAREERS Luis Vargas, Clinical Child Psychologist	6
CONNECTING WITH DIVERSITY Gender, Families, and Children's Development	9
What Characterizes Development?	11
Biological, Cognitive, and Socioemotional Processes	11
Periods of Development	12
Age and Cohort Effects	12
Issues in Development	13
How Is Child Development a Science?	16
The Importance of Research	16
Theories of Child Development	17

CARING CONNECTIONS Strategies for Parenting, Educating, and Interacting with Children Based on Erikson's Theory	19
--	----

Research Methods for Collecting Data	26
Research Designs	30
Research Challenges	33
CONNECTING WITH RESEARCH Why Are Research Journals Important in the Field of Child Development?	34
CONNECTING WITH CAREERS Pam Reid, Educational and Developmental Psychologist	35
Reach Your Learning Goals	37
Key Terms	39
Key People	39
Connecting With Improving the Lives of Children	39

APPENDIX Careers in Children's Development 40

SECTION 2 BEGINNINGS 44



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CHAPTER 2 Biological Beginnings 45

What Is the Evolutionary Perspective?	47
Natural Selection and Adaptive Behavior	47
Evolutionary Psychology	48
What Are the Genetic Foundations of Development?	50
The Collaborative Gene	50
Genes and Chromosomes	52
Genetic Principles	53
Chromosomal and Gene-Linked Abnormalities	55
CONNECTING WITH CAREERS Holly Ishmael, Genetic Counselor	58

What Are Some Reproductive Challenges and Choices?	58
---	----

Prenatal Diagnostic Tests	58
Infertility and Reproductive Technology	60
CONNECTING WITH RESEARCH Are There Developmental Outcomes in Adolescence of In Vitro Fertilization?	61
Adoption	61
CONNECTING WITH DIVERSITY The Increased Diversity of Adopted Children and Adoptive Parents	62
CARING CONNECTIONS Parenting Adopted Children	63





How Do Heredity and Environment Interact?

The Nature-Nurture Debate 63

- Behavior Genetics 64
- Heredity-Environment Correlations 65
- The Epigenetic View and Gene × Environment (G × E) Interaction 66
- Conclusions About Heredity-Environment Interaction 67
- Reach Your Learning Goals* 69
- Key Terms** 70
- Key People** 70
- Connecting With Improving the Lives of Children* 71

CHAPTER 3

Prenatal Development 72

What Is the Course of Prenatal Development? 74

- The Germinal Period 74
- The Embryonic Period 74
- The Fetal Period 76
- The Brain 78

What Are Some Important Strategies That Enhance the Expectant Mother's Health and Prenatal Care? 79

- The Expectant Mother's Nutrition and Weight Gain 79
- Exercise 80
- Prenatal Care 81

CARING CONNECTIONS *Exercise Guidelines for Expectant Mothers* 82

CONNECTING WITH CAREERS *Rachel Thompson, Obstetrician/Gynecologist* 83

CONNECTING WITH DIVERSITY *Cultural Beliefs About Pregnancy* 85

What Are Some Potential Hazards to Prenatal Development? 86

- Some General Principles 86
- Prescription and Nonprescription Drugs 87
- Psychoactive Drugs 88

CONNECTING WITH RESEARCH *Is Expectant Mothers' Cigarette Smoking Related to Cigarette Smoking by Their Adolescent Offspring?* 90

- Incompatible Blood Types 91
- Environmental Hazards 91

Maternal Diseases 92

Other Parental Factors 93

Reach Your Learning Goals 96

Key Terms 98

Key People 98

Connecting With Improving the Lives of Children 98

CHAPTER 4

Birth 99

What Happens During the Birth Process? 101

- Stages of the Birth Process 101
- Childbirth Setting and Attendants 102
- Methods of Childbirth 103

CONNECTING WITH CAREERS *Linda Pugh, Perinatal Nurse* 104

CARING CONNECTIONS *From Waterbirth to Music Therapy* 105

The Transition From Fetus to Newborn 106

What Are Some Measures of Neonatal Health and Responsiveness? 106

How Do Low Birth Weight and Preterm Infants Develop? 108

Preterm and Small for Date Infants 108

CONNECTING WITH DIVERSITY *Incidence and Causes of Low Birth Weight Around the World* 109

Consequences of Preterm Birth and Low Birth Weight 109

Nurturing Preterm Infants 110

CONNECTING WITH RESEARCH *How Does Massage Therapy Benefit the Health and Well-Being of Babies?* 111

What Happens During the Postpartum Period? 112

- Physical Adjustments 112
- Emotional and Psychological Adjustments 113

CONNECTING WITH CAREERS *Diane Sanford, Clinical Psychologist and Postpartum Expert* 114

Bonding 115

Reach Your Learning Goals 116

Key Terms 117

Key People 118

Connecting With Improving the Lives of Children 118

SECTION 3 INFANCY 119



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CHAPTER 5

Physical Development in Infancy 120

How Do Infants Grow and Develop Physically? 122

- Patterns of Growth 122
- Height and Weight 123
- The Brain 123

Sleep 128

Nutrition 130

Health 133

CARING CONNECTIONS *Improving the Nutrition of Infants and Young Children Living in Low-Income Families* 134

CONNECTING WITH CAREERS *T. Berry Brazelton, Pediatrician* 134





How Do Infants Develop Motor Skills? 135

The Dynamic Systems View 135

Reflexes 136

Gross Motor Skills 137

CONNECTING WITH DIVERSITY Cultural Variations in Guiding Infants' Motor Development 140

Fine Motor Skills 141

How Can Infants' Sensory and Perceptual Development Be Characterized? 142

What are Sensation and Perception? 142

The Ecological View 143

Visual Perception 143

CONNECTING WITH RESEARCH How Can the Newborn's Perception Be Studied? 144

Other Senses 148

Intermodal Perception 149

Nature, Nurture, and Perceptual Development 150

Perceptual-Motor Coupling 151

Reach Your Learning Goals 152

Key Terms 154

Key People 154

Connecting With Improving the Lives of Children 155

CHAPTER 6 Cognitive Development in Infancy 156

What Is Piaget's Theory of Infant Development? 158

Cognitive Processes 158

The Sensorimotor Stage 159

CONNECTING WITH RESEARCH How Do Researchers Study Infants' Understanding of Object Permanence and Causality? 162

Evaluating Piaget's

Sensorimotor Stage 162

How Do Infants Learn, Remember, and Conceptualize? 165

Conditioning 165

Attention 165

Memory 167

Imitation 168

Concept Formation 169

How Are Individual Differences in Infancy Assessed, and Do These Assessments Predict Intelligence? 171

Measures of Infant Development 171

CONNECTING WITH CAREERS Toosje Thyssen Van Beveren, Infant Assessment Specialist 171

Predicting Intelligence 172



What is the Nature of Language, and How Does it Develop in Infancy? 173

Defining Language 173

Language's Rule Systems 174

How Language Develops 175

Biological and Environmental Influences 178

CONNECTING WITH DIVERSITY Language Environment, Poverty, and Language Development 180

An Interactionist View 181

CARING CONNECTIONS How Parents Can Facilitate Infants' and Toddlers' Language Development 182

Reach Your Learning Goals 183

Key Terms 186

Key People 186

Connecting With Improving the Lives of Children 186

CHAPTER 7 Socioemotional Development in Infancy 187

How Do Emotions and Personality Develop in Infancy? 189

Emotional Development 189

Temperament 193

CARING CONNECTIONS Parenting and the Child's Temperament 197

Personality Development 198

How Do Social Orientation/Understanding and Attachment Develop in Infancy? 200

Social Orientation/Understanding 200

Attachment and its Development 202

Individual Differences

in Attachment 203

Developmental Social Neuroscience and Attachment 206

How Do Social Contexts Influence Socioemotional Development in Infancy? 208

The Family 208

Child Care 212

CONNECTING WITH DIVERSITY Child-Care Policies Around the World 212

CONNECTING WITH CAREERS Wanda Mitchell, Child-Care Director 213

CONNECTING WITH RESEARCH What Are Some Important Findings in the National Longitudinal Study of Child Care in the United States? 214

Reach Your Learning Goals 215

Key Terms 217

Key People 217

Connecting With Improving the Lives of Children 218

SECTION 4 EARLY CHILDHOOD 219



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CHAPTER 8 Physical Development in Early Childhood 220

How Does a Young Child's Body and Brain Grow and Change? 222

Height and Weight 222
The Brain 223

How Do Young Children's Motor Skills Develop? 226

Gross and Fine Motor Skills 226
CARING CONNECTIONS Supporting Young Children's Motor Development 227
Perceptual Development 228
Young Children's Artistic Drawings 229

What Are Some Important Aspects of Young Children's Health? 231

Sleep and Sleep Problems 231
Nutrition 232
Exercise 235

CONNECTING WITH RESEARCH Physical Activity in Young Children Attending Preschools 236

Health, Safety, and Illness 237

CONNECTING WITH CAREERS Barbara Deloian, Pediatric Nurse 239

CONNECTING WITH DIVERSITY The State of Illness and Health in the World's Children 240

Reach Your Learning Goals 241
Key Terms 243
Key People 243
Connecting With Improving the Lives of Children 243

CHAPTER 9 Cognitive Development in Early Childhood 244

What Are Three Views of the Cognitive Changes That Occur in Early Childhood? 246

Piaget's Preoperational Stage 246
Vygotsky's Theory 249

CARING CONNECTIONS Tools of the Mind 252
Information Processing 253

CONNECTING WITH RESEARCH Can Parents Suggest False Events to Children? 256

CONNECTING WITH CAREERS Helen Hadani, Developmental Psychologist, Toy Designer, and Children's Museum Director 258

How Do Young Children Develop Language? 262

Understanding Phonology and Morphology 262

CONNECTING WITH CAREERS Sharla Peltier, Speech Pathologist 262
Changes in Syntax and Semantics 263

Advances in Pragmatics 264
Young Children's Literacy 264

What Are Some Important Features of Young Children's Education? 266

Variations in Early Childhood Education 266
Educating Young Children Who Are Disadvantaged 268

CONNECTING WITH CAREERS Yolanda Garcia, Head Start Director and College Dean 269
Controversies in Early Childhood Education 269

CONNECTING WITH DIVERSITY Early Childhood Education in Japan and Developing Countries 271

Reach Your Learning Goals 272
Key Terms 274
Key People 274
Connecting With Improving the Lives of Children 274

CHAPTER 10 Socioemotional Development in Early Childhood 276

What Characterizes Young Children's Emotional and Personality Development? 278

The Self 278
Emotional Development 280

CONNECTING WITH RESEARCH Caregivers' Emotional Expressiveness, Children's Emotion Regulation, and Behavior Problems in Head Start Children 282

Moral Development 283
Gender 286

What Roles Do Families Play in Young Children's Development? 289

Parenting 289

CONNECTING WITH CAREERS Darla Botkin, Marriage and Family Therapist 293

Child Maltreatment 293
Sibling Relationships and Birth Order 295
The Changing Family in a Changing Social World 296

CARING CONNECTIONS Communicating with Children About Divorce 300

CONNECTING WITH DIVERSITY Immigration and Ethnic Minority Parenting 302

How Are Peer Relations, Play, and Media/Screen Time Involved in Young Children's Development? 303

Peer Relations 303
Play 304
Media/Screen Time 307

Reach Your Learning Goals 309

Key Terms 311

Key People 311

Connecting With Improving the Lives of Children 312

SECTION 5 MIDDLE AND LATE CHILDHOOD 313



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CHAPTER 11 Physical Development in Middle and Late Childhood 314

What Changes Take Place in Body Growth, the Brain, and Motor Development? 316

- Skeletal and Muscular Systems 316
- The Brain 316
- Motor Development 318

What Are the Central Issues in Children's Health? 319

- Nutrition 319
- Exercise and Sports 319

CARING CONNECTIONS Parents, Coaches, and Children's Sports 321

- Overweight Children 321

CARING CONNECTIONS Parenting Strategies for Helping Overweight Children Lose Weight 324

- Diseases 324

CONNECTING WITH RESEARCH Heart Smart 326

- Accidents and Injuries 326

CONNECTING WITH CAREERS Sharon McLeod, Child Life Specialist 327

What Are the Prevalent Disabilities in Children? 328

- Who Are Children With Disabilities? 328
- The Range of Disabilities 328
- Educational Issues 335

CONNECTING WITH DIVERSITY

Disproportionate Representation of Minority Students in Special Education 337

- Reach Your Learning Goals 338*
- Key Terms 340*
- Key People 340*
- Connecting With Improving the Lives of Children 340*

CHAPTER 12 Cognitive Development in Middle and Late Childhood 341

What Is Piaget's Theory of Cognitive Development in Middle and Late Childhood? 343

- Concrete Operational Thought 343
- Evaluating Piaget's Concrete Operational Stage 344
- Applications to Education 344

What Is the Nature of Children's Information Processing? 346

- Memory 346

Thinking 348

Metacognition 350

CARING CONNECTIONS *Strategies for Increasing Children's Creative Thinking 351*

How Can Children's Intelligence Be Described? 353

Intelligence and Its Assessment 353

Types of Intelligence 354

Interpreting Differences in IQ Scores 356

Extremes of Intelligence 359

CONNECTING WITH CAREERS *Sterling Jones, Supervisor of Gifted and Talented Education 361*

What Changes in Language Development Occur in Middle and Late Childhood? 363

Vocabulary, Grammar, and Metalinguistic Awareness 363

Reading and Writing 364

Dual-Language and Second-Language Learning 366

CONNECTING WITH DIVERSITY *What Is the Best Way to Teach English Language Learners? 367*

CONNECTING WITH CAREERS *Salvador Tamayo, Teacher of English Language Learners 367*

What Characterizes Children's Achievement? 368

Extrinsic and Intrinsic Motivation 368

Sustained Attention, Effort, and Task Persistence 369

Mastery Motivation and Mindset 369

Self-Efficacy 370

Goal Setting, Planning, and Self-Monitoring/Self-Regulation 371

Social Relationships and Contexts 371

CONNECTING WITH RESEARCH *Parenting and Children's Achievement: My Child Is My Report Card, Tiger Moms, and Tiger Babies Strike Back 373*

Reach Your Learning Goals 375

Key Terms 377

Key People 378

Connecting With Improving the Lives of Children 378

CHAPTER 13

Socioemotional Development in Middle and Late Childhood 379

What Is the Nature of Emotional and Personality Development in Middle and Late Childhood? 381

The Self 381

**CARING CONNECTIONS** *Increasing Children's*

- Self-Esteem 384
- Emotional Development 385
- Moral Development 387
- Gender 393

What Are Some Changes in Parenting and Families in Middle and Late Childhood? 398

- Developmental Changes in Parent-Child Relationships 398
- Parents as Managers 398
- Stepfamilies 399

What Changes Characterize Peer Relationships in Middle and Late Childhood? 400

- Developmental Changes 400
- Peer Status 400
- Social Cognition 402
- Bullying 402

CONNECTING WITH RESEARCH *How Are Perspective Taking and Moral Motivation Linked to Bullying? 404*

Friends 405

What Are Some Important Aspects of Schools? 406

- Contemporary Approaches to Student Learning 406
- Socioeconomic Status and Ethnicity 408

CONNECTING WITH DIVERSITY *The New Hope Intervention Program 409***CONNECTING WITH CAREERS** *James Comer, Child Psychiatrist 410*

- Reach Your Learning Goals 411*
- Key Terms 413*
- Key People 413*
- Connecting With Improving the Lives of Children 414*

SECTION 6 ADOLESCENCE 415

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CHAPTER 14
Physical Development in Adolescence 416**What Is the Nature of Adolescence? 418**

- Positive and Negative Views of Adolescence 418
- Developmental Transitions 419

What Are the Physical and Psychological Aspects of Puberty? 421

- Sexual Maturation, Height, and Weight 422
- Hormonal Changes 422
- Timing and Variations in Puberty 423
- Psychological Dimensions of Puberty 424
- The Brain 425

What Are the Dimensions of Adolescent Sexuality? 427

- Developing a Sexual Identity 427
- Timing and Trends in Adolescent Sexual Behavior 428
- Sexual Risk Taking in Adolescence 429

CONNECTING WITH DIVERSITY *Cross-Cultural Comparisons of Adolescent Pregnancy 433***CONNECTING WITH CAREERS** *Lynn Blankinship, Family and Consumer Science Educator 434***CARING CONNECTIONS** *Reducing Adolescent Pregnancy 434***How Can Adolescents' Health and Health-Enhancing Assets Be Characterized? 435**

- Adolescent Health 435
- Leading Causes of Death in Adolescence 438
- Substance Use and Abuse 439
- Eating Problems and Disorders 441

CONNECTING WITH RESEARCH *Evaluation of a Family Program Designed to Reduce Drinking and Smoking in Young Adolescents 442*

- Reach Your Learning Goals 444*
- Key Terms 446*
- Key People 446*
- Connecting With Improving the Lives of Children 446*

CHAPTER 15
Cognitive Development in Adolescence 447**How Do Adolescents Think and Process Information? 449**

- Piaget's Theory 449
- Adolescent Egocentrism 450
- Information Processing 451

CONNECTING WITH CAREERS *Laura Bickford, Secondary School Teacher 456***What Characterizes Adolescents' Values, Moral Development and Education, and Religion? 457**

- Values 457

CONNECTING WITH RESEARCH *Evaluating a Service-Learning Program Designed to Increase Civic Engagement 458*

- Moral Development and Education 459
- Religion 461

What Is the Nature of Schools for Adolescents? 464

- The American Middle School 464

CONNECTING WITH CAREERS *Katherine McMillan Culp, Research Scientist at an Educational Center 465*



The American High School 466

CONNECTING WITH DIVERSITY *Cross-Cultural Comparisons of Secondary Schools* 467

High School Dropouts 468

CARING CONNECTIONS *The "I Have a Dream" Program* 469

Reach Your Learning Goals 470

Key Terms 472

Key People 472

Connecting With Improving the Lives of Children 472

CHAPTER 16

Socioemotional Development in Adolescence 473

What Characterizes Identity, Emotional Development, and Gender Classification in Adolescence? 475

Identity 475

Emotional Development 479

Gender Classification 480

What Is the Nature of Parent-Adolescent Relationships? 482

Parental Monitoring and Adolescents' Information Management 482

Autonomy and Attachment 483

Parent-Adolescent Conflict 484

CARING CONNECTIONS *Strategies for Parenting Adolescents* 485

What Aspects of Peer Relationships Are Important in Adolescence? 486



Friendship 486

Peer Groups 487

Dating and Romantic Relationships 488

Why Is Culture an Important Context for Adolescent Development? 491

Cross-Cultural Comparisons 491

CONNECTING WITH DIVERSITY *How Adolescents Around the World Spend Their Time* 493

Ethnicity 493

Media and Technology 495

What Are Some Socioemotional Problems in Adolescence? 497

Juvenile Delinquency 497

Depression and Suicide 498

CONNECTING WITH CAREERS *Rodney Hammond, Health Psychologist* 499

The Interrelation of Problems and Successful Prevention/Intervention Programs 502

CONNECTING WITH RESEARCH *Fast Track* 503

Reach Your Learning Goals 504

Key Terms 506

Key People 506

Connecting With Improving the Lives of Children 507

Glossary G-1

References R-1

Name Index N-1

Subject Index S-1

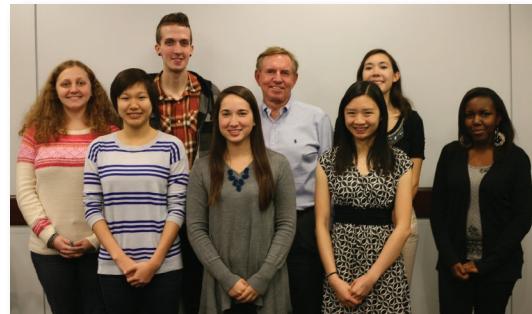
about the author

John W. Santrock

John Santrock received his Ph.D. from the University of Minnesota in 1973. He taught at the University of Charleston and the University of Georgia before joining the Program in Psychology at the University of Texas at Dallas, where he currently teaches a number of undergraduate courses and has received the University's Effective Teaching Award.

John has been a member of the editorial boards of *Child Development* and *Developmental Psychology*. His research on father custody is widely cited and used in expert witness testimony to promote flexibility and alternative considerations in custody disputes. John also has authored these exceptional McGraw-Hill texts: *Life-Span Development* (16th edition), *Adolescence* (16th edition), *A Topical Approach to Life-Span Development* (9th edition), and *Educational Psychology* (6th edition).

For many years, John was involved in tennis as a player, teaching professional, and coach of professional tennis players. As an undergraduate, he was a member of the University of Miami (FL) tennis team that still holds the record for most consecutive wins (137) in any NCAA Division I sport. John has been married for four decades to his wife, Mary Jo, who is a Realtor. He has two daughters—Tracy and Jennifer—both of whom are Realtors after long careers in technology marketing and medical sales, respectively. He has one granddaughter, Jordan, age 25, who completed her master's degree from the Cox School of Business at SMU and currently works for Ernst & Young, and two grandsons—the Bellucci brothers: Alex, age 12, and Luke, age 11. In the last two decades, John also has spent time painting expressionist art.



John Santrock (back row middle) with the 2015 recipients of the Santrock Travel Scholarship Award in developmental psychology. Created by Dr. Santrock, this annual award provides undergraduate students with the opportunity to attend a professional meeting. As of 2017, 40 students have benefited from this award. A number of the students shown here attended the 2015 meeting of the Society for Research in Child Development.

Courtesy of Jessica Serna

Dedication:

With special appreciation to my
grandchildren: Jordan, Alex, and Luke.



Jordan Bowles.
Courtesy of John Santrock.



Alex and Luke, the Bellucci brothers.
Courtesy of John Santrock.

expert consultants

Children's development has become an enormous, complex field, and no single author, or even several authors, can possibly keep up with all of the rapidly changing content in the many periods and different areas of life-span development. To solve this problem, author John Santrock has sought the input of leading experts about content in a number of areas of children's development. These experts have provided detailed evaluations and recommendations in their area(s) of expertise.

The following individuals were among those who served as expert consultants for one or more of the previous editions of this text:

Urie Bronfenbrenner, *Cornell University*
Diana Baumrind, *University of California–Berkeley*
Tiffany Field, *University of Miami*
Scott Johnson, *University of California–Los Angeles*
Nel Noddings, *Stanford University*
Ross Thompson, *University of California–Davis*
Sandra Graham, *University of California–Los Angeles*
James Marcia, *Simon Fraser University*
John Bates, *Indiana University*
Florence Denmark, *Pace University*
Rosalind Charlesworth, *Weber State University*
David Sadker, *The American University–Washington DC*

Marilou Hyson, *University of Pennsylvania*
Algea Harrison-Hale, *Oakland University*
Campbell Leaper, *University of California-Santa Cruz*
Janet DiPietro, *Johns Hopkins University*
Allan Wigfield, *University of Maryland–College Park*
Barbara Pan, *Harvard University*
Peter Scales, *Search Institute*
Esther Leerkes, *University of North Carolina-Greensboro*
David Moore, *Pitzer College and Claremont Graduate University*
Elizabeth Gershoff, *University of Texas*
Susan Spieker, *University of Washington*

Following are the expert consultants for the fourteenth edition, who (like those of previous editions) literally represent a *Who's Who* in the field of child and adolescent development.



James A. Graham Dr. Graham is a leading expert on diversity. He currently is a Professor of Psychology at The College of New Jersey (TCNJ). Dr. Graham received master's and doctoral degrees in developmental psychology from the University of Memphis. His research addresses the social-cognitive aspects of relationships between the group and dyadic levels across early, middle, and late childhood in community-based settings. Three interdependent dimensions of his research program examine (1) populations that are typically understudied, conceptually limited, and methodologically constrained; (2) children's development of empathy and prosocial behavior with peer groups and friends; and (3) developmental science in the context of community-engaged research partnerships. Currently, he is Coordinator of the Developmental Specialization in Psychology at TCNJ. For a decade, Dr. Graham taught graduate courses in psychology and education in Johannesburg, South Africa, through TCNJ's Graduate Summer Global Program. His co-authored book, *The African American Child: Development and Challenges*, is in its second edition, and he is co-author and co-editor of two other volumes. Dr. Graham has presented his work at a variety of international and national conferences and has published articles in professional journals such as *Social Development, Behavior Modification, Journal of College Student Development, Journal of Multicultural Counseling and Development*, and *American Journal of Evaluation*.

"Dr. Santrock seamlessly integrates the latest research on physical, cognitive, and socioemotional processes of children in an ever-evolving multicultural society. This book is an excellent resource for students in psychology and other social science fields. I am impressed with Dr. Santrock's sensitivity to the impact of culture, ethnicity and socioeconomic status on child and adolescent development. . . This text will help students learn to analyze, compare, and contrast alternative perspectives of children domestically and globally with the major principles and

theories of child development in cognitive, socioemotional, and social-contextual domains. This text will also help students to understand the latest research regarding societal values about ethnicity, socioeconomic, and gender issues in child development, and how they influence individual development as well as shape social policy." —James A. Graham, The College of New Jersey

Photo courtesy of James Graham



Joan E. Grusec Dr. Grusec is one of the world's leading experts on parenting and children's socioemotional development. She obtained her Ph.D. from Stanford University and is currently a Professor Emerita in the Department of Psychology at the University of Toronto. Dr. Grusec was previously a professor at Wesleyan University and at the University of Waterloo. Her research focuses on socialization processes, with current studies focusing on the relationship between parenting in different domains of socialization (protection, mutual reciprocity, group participation, guided learning, and control) and internalization of prosocial values. Dr. Grusec is a Fellow of the Canadian and American Psychological Associations. She is past chair of the Examination Committee of the Association of State and Provincial Psychology Boards and has been an Associate Editor of *Developmental Psychology*. She has authored and edited several books, including *Social Development* (written with Hugh Lytton), *Handbook of Parenting and Internalization of Values* (edited with Leon Kuczynski), and *Handbook of Socialization* (two editions edited with Paul Hastings). Her work has been published in leading research journals including *Child Development, Developmental Psychology*, and *Social Development*.

"This is, of course, a very successful text. 'Socioemotional Development in Infancy' is a well-presented chapter. The exercises and the reference to previous material both in this and other chapters is an excellent feature. 'Socioemotional Development in Early Childhood,' again, is an impressive bringing together of a

great deal of research into a coherent package. ‘Socioemotional Development in Middle and Late Childhood’ is overall an engaging and informative chapter.” —**Joan E. Grusec, University of Toronto**

Photo courtesy of Robert Lockhart



Megan McClelland

Dr. McClelland is a leading expert on young children’s cognitive development. She is currently the Katherine E. Smith Professor of Healthy Children and Families in Human Development and Family Sciences at Oregon State University. Dr. McClelland also serves as Director of the Healthy Development in Early Childhood Research Core at the Hallie Ford Center for Healthy Children and Families. She obtained her Ph.D. from Loyola University–Chicago. Her research focuses on optimizing children’s development, especially as it relates to children’s self-regulation and school readiness. Dr. McClelland’s investigations include links between self-regulation and academic achievement from early childhood to adulthood, recent advances in measuring self-regulation, and intervention efforts to improve these skills in young children. She has published more than 50 theoretical and empirical articles on the development of self-regulation with colleagues and collaborators around the world, including a new book on promoting self-regulation in the early childhood classroom. Dr. McClelland is currently conducting two federally funded projects to develop measures of self-regulation and an intervention to improve school readiness in young children.

“Strong developmental focus and coverage of relevant theories and concepts in cognitive development. I like the looking back and looking forward summaries and the Reach Your Learning Goals sections. I also think the Resources section is very useful.”

—**Megan McClelland, Oregon State University**

Photo courtesy of Megan McClelland



Virginia Marchman

A leading expert on children’s language development, Dr. Marchman is a Research Associate at the Stanford University Language Learning Laboratory. She obtained her Ph.D. at the University of California–Berkeley. Her main research areas are language development, language disorders, and early childhood development. Dr. Marchman’s specific interests focus on individual differences in typically-developing and late-talking children, as well as lexical and grammatical development in monolingual and bilingual learners. Her studies have incorporated a variety of experimental methods as well as computational approaches and naturalistic observation. Dr. Marchman has worked extensively with the MacArthur-Bates Communicative Development Inventories (CDI), developing the CDI Scoring program and serving on the MacArthur-Bates CDI Advisory Board. She has been a consulting editor for *Journal of Speech, Language & Hearing Research* and *Child Development*. Dr. Marchman’s most recent work involves the development of real-time spoken language understanding using the “looking-while-listening” task in typically-developing and at-risk children. Her current studies explore links between children’s language processing skills, early learning environments, and individual differences in monolingual and bilingual English-Spanish learners from diverse backgrounds.

*“This new edition of John Santrock’s *Children* continues to offer a comprehensive, up-to-date but also nuanced overview of child development. The material is grounded in the traditional issues that are the core of our current understanding of development, but also offers students many opportunities to think about the open questions that remain. The format enables students from many different perspectives to relate easily to the material and to*

make connections to their own personal and professional lives.”

—**Virginia Marchman, Stanford University**

Photo courtesy of Craig Salling



Maureen Black

Dr. Black is one of the world’s leading experts on children’s health and nutrition. She currently is the John A. Scholl and Mary Louise Scholl Endowed Professor in the Department of Pediatrics and the Department of Epidemiology and Public Health at the University of Maryland School of Medicine. She also is the founder/director of the Growth and Nutrition Clinic that provides services to children with inadequate growth and nutrition problems. Dr. Black obtained her Ph.D. from Emory University. Her major research focus is on evaluation of nutrition and caregiving intervention programs involving the health and development of young children. Dr. Black’s intervention research not only targeted children from low-income communities in the United States but also in developing countries as well. Among her many awards are being a past president of two divisions in the American Psychological Association and induction into the Maryland Women’s Hall of Fame.

“Very comprehensive coverage—I am impressed with the updated references! The inclusion of topics such as sleep and electronic device use will make the text very relevant and timely for students. Well done!” —**Maureen Black, University of Maryland**

Photo courtesy of University of Maryland, School of Medicine



Janet DiPietro

One of the world’s leading experts on prenatal development, Dr. DiPietro is Vice Dean for Research and Faculty as well as a Professor in the Bloomberg School of Public Health at Johns Hopkins University. She obtained her Ph.D. from the University of California–Berkeley. In her research, Dr. DiPietro uses digitized assessment methods to measure fetal neurobiological functioning to predict clinical and developmental outcomes in postnatal development. She also studies maternal factors, including substance exposure, maternal emotions, and physiological changes during pregnancy, as influences on prenatal development.

“Certainly, a tremendous effort went into this.” —**Janet**

DiPietro, Johns Hopkins University

Photo courtesy of Janet DiPietro



Karen Adolph

Dr. Karen Adolph is one of the world’s leading experts on children’s motor development. She currently is Professor of Psychology and Neural Science at New York University. Dr. Adolph obtained her Ph.D. at Emory University. She has conducted pioneering and leading-edge research on children’s motor development. In her Infant Action Laboratory, she has created novel predicaments, including crawling over bridges, squeezing through openings, and reaching for targets with infants’ bodies in motion. She observes infant behavior using computerized video recording and state-of-the-art technology, including motion-tracking and eye-tracking equipment. She recently was honored with the appointment of President of the International Congress of Infant Studies, has been awarded numerous research grants from such agencies as NICHD and NSF, and has served on the editorial boards of leading journals such as *Child Development*, *Developmental Psychology*, and *Developmental Science*. Dr. Adolph also has been given multiple teaching awards at New York University.

“. . . readers can learn about the important debates with opposing viewpoints. Best of luck to John on this new edition!”

—**Karen Adolph, New York University**

Photo courtesy of Shohan Hasan

Connecting Research and Results

As a master teacher, John Santrock connects current research and real-world applications. Through an integrated, personalized digital learning program, students gain the insight they need to study smarter and improve performance.

McGraw-Hill Education Connect is a digital assignment and assessment platform that strengthens the link between faculty, students, and course work, helping everyone accomplish more in less time. Connect for Child Development includes assignable and assessable videos, quizzes, exercises, and interactivities, all associated with learning objectives. Interactive assignments and videos allow students to experience and apply their understanding of psychology to the world with fun and stimulating activities.



Real People, Real World, Real Life

At the higher end of Bloom's taxonomy (analyze, evaluate, create), the McGraw-Hill Education Milestones video series is an observational tool that allows students to experience life as it unfolds, from infancy to late adulthood. This groundbreaking, longitudinal video series tracks the development of real children as they progress through the early stages of physical, social, and emotional development in their first few weeks, months, and years of life. Assignable and assessable within Connect, Milestones also includes interviews with adolescents and adults to reflect development throughout the entire life span.

The screenshot shows a user interface for the McGraw-Hill Education Milestones video series. At the top, there is a horizontal grid of six video thumbnails with titles: "Attachment Colin and Esme" (Attachment Colin and Esme), "Brain Development Colin 8-24wks" (Brain Development Colin 8-24wks), "Conflict and Play Mult Child 1-3yrs" (Conflict and Play Mult Child 1-3yrs), "Counting Amalia 40-47mths" (Counting Amalia 40-47mths), "Development of Taste Amalia 4-20mths" (Development of Taste Amalia 4-20mths), and "Emergence of Friendship Mult Child 1-4yrs" (Emergence of Friendship Mult Child 1-4yrs). Below this grid, there is a large video player window. On the left side of the player, there is a thumbnail for "Language Challenges, Jasmine, 2-4yrs" (Language Challenges, Jasmine, 2-4yrs) with a play button icon. To the right of the player, there is a question: "2. Parker has begun experiencing the changes of puberty. The age range for boys beginning puberty is usually ____ to ____." Below the question, there is a video thumbnail of a man named Barry, with the text "Barry Age 78". A progress bar at the bottom of the video player indicates the video is at 00:34 of 01:14.

Developing Brain: Infant

The screenshot shows a section titled "Developing Brain: Infant". At the top left, there is a small icon of three blue stylized human figures. Below the title, there is a large image of a human brain with various colored regions labeled: yellow (occipital lobes), green (temporal lobes), and grey (frontal and parietal lobes). To the right of the brain diagram, there is a video player showing a baby in a bouncer. Below the video player, there is a caption: "The **occipital lobes** are involved in vision and the **parietal lobes** play important roles in attention." At the bottom right of the screen, there is a small "McGraw-Hill Education" logo.

Inform and Engage on Psychological Concepts

At the lower end of Bloom's taxonomy, students are introduced to Concept Clips—the dynamic, colorful graphics and stimulating animations that break down some of psychology's most difficult concepts in a step-by-step manner, engaging students and aiding in retention. They are assignable and assessable in Connect or can be used as a jumping-off point in class. Now with audio narration, this edition also includes new Concept Clips on topics such as object permanence and conservation, as well as theories and theorists like Bandura's social cognitive theory, Vygotsky's sociocultural theory, Buss's evolutionary theory, and Kuhl's language development theory.

Better Data, Smarter Revision, Improved Results

Students helped inform the revision strategy of *Children*. McGraw-Hill Education's SmartBook is the first and only adaptive reading and learning experience! SmartBook helps students distinguish the concepts they know from the concepts they don't, while pinpointing the concepts they are about to forget. SmartBook continuously adapts to create a truly personalized learning path and offers students learning resources such as videos, Concept Clips, and slides to further reinforce difficult concepts. SmartBook's real-time reports help both students and instructors identify the concepts that require more attention, making study sessions and class time more efficient.

Informed by Students

Content revisions are informed by data collected anonymously through McGraw-Hill Education's SmartBook.

STEP 1. Over the course of three years, data points showing concepts that caused students the most difficulty were anonymously collected from Connect for Child Development's SmartBook®.

STEP 2. The data from LearnSmart was provided to the author in the form of a **Heat Map**, which graphically illustrates "hot spots" in the text that affect student learning (see image at right).

STEP 3. The author used the **Heat Map** data to refine the content and reinforce student comprehension in the new edition. Additional quiz questions and assignable activities were created for use in Connect to further support student success.

RESULT: Because the **Heat Map** gave the author empirically based feedback at the paragraph and even sentence level, he was able to develop the new edition using precise student data that pinpointed concepts that gave students the most difficulty.

SMARTBOOK™

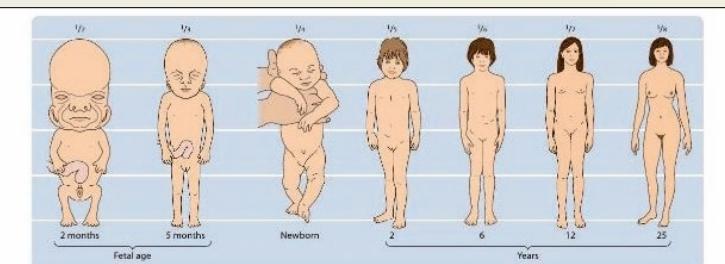


FIGURE 3.1

CHANGES IN PROPORTIONS OF THE HUMAN BODY DURING GROWTH. As individuals develop from infancy through adulthood, one of the most noticeable physical changes is that the head becomes smaller in relation to the rest of the body. The fractions listed refer to head size as a proportion of total body length at different ages.

Infancy The average North American newborn is 20 inches long and weighs 7% pounds. Ninety-five percent of full-term newborns are 18 to 22 inches long and weigh between 5% and 10% pounds.

2.1 In the first several days of life, most newborns lose 5 to 7 percent of their body weight. Once infants adjust to sucking, swallowing, and digesting, they grow rapidly, gaining an average of 5 to 6 ounces per week during the first month. Typically they have doubled their birth weight by the age of 4 months and have nearly tripled it by their first birthday. Infants grow about 3 inches per month during the first year, increasing their birth length by about 40 percent by their first birthday.

2.2 Infant rate of growth slows considerably in the second year of life (Burris & others, 2013). By 2 years of age, infants weigh approximately 26 to 32 pounds, having gained a quarter to half a pound per month during the second year; at age 2 they have reached about one-fifth of their adult weight. The average 2-year-old is 32 to 35 inches tall, which is nearly one-half of adult height.

Early Childhood As the preschool child grows older, the percentage of increase in height and weight decreases with each additional year (Letter, 2011). Girls are only slightly smaller and lighter than boys during these years. Both boys and girls slim down as the trunks of their bodies lengthen. Although their heads are still somewhat large for their bodies, by the end of the preschool years most children have lost their top-heavy look. Body fat also shows a slow, steady decline during the preschool years. Girls have more fatty tissue than boys; boys have more muscle tissue (McMahon & Strycker, 2013).

Growth patterns vary individually (Wilson & Hockenberry, 2012). Think back to your preschool years. This was probably the first time you noticed that some children were taller than you, some shorter; some were fitter, some thinner; some were stronger, some weaker. Much of the variation is due to heredity, but environmental experiences are also involved. A review of the height and weight of children around the world concluded that two important contributors to height differences are ethnic origin and nutrition (Meredith, 1978).

Why are some children unusually short? The causes are sometimes genetic, parents or prenatal problems, growth hormone deficiency, a physical problem, it develops in childhood, maternal smoking during pregnancy, or an emotional difficulty (Wit, Kless, & Mullis, 2011).

Middle and Late Childhood The period of middle and late childhood involves slow, consistent growth. This is a period of calm before the rapid growth spurt of adolescence.



The bodies of 5-year-olds and 2-year-olds are different from one another. The 5-year-old not only is taller and heavier, but also has a longer trunk and legs than the 2-year-old. What might be some other physical differences between 2 and 5-year-olds?

SECTION 2 Biological Processes, Physical Development, and Health

93

Dev Psych - Life-Span Development - Santrock, 16e, PHYSICAL DEVELOPMENT IN INFANCY

Section Three

Chapter 4 Introduction

1 Physical Growth and Development in Infancy

LG1 Discuss physical growth and development in infancy.

Patterns of Growth Height and Weight The Brain Sleep Nutrition

Infants' physical development in the first two years of life is extensive. Newborns' heads are quite large in comparison with the rest of their bodies. They have little strength in their necks and cannot hold their heads up, but they have some basic reflexes. In the span of 12 months, infants become capable of sitting anywhere, standing, stooping, climbing, and usually walking. During the second year, growth decelerates, but rapid increases in such activities as running and climbing take place. Let's now examine in greater detail the sequence of physical development in infancy.

PATTERNS OF GROWTH

An extraordinary proportion of the total body is occupied by the head during prenatal development and early infancy (see Figure 1). The cephalocaudal pattern is the sequence in which the earliest growth always occurs at the top—the head—with physical growth and differentiation of features gradually working their way down from top to bottom (for example, shoulders, middle trunk, and so on). This same pattern occurs in the head area, because the top parts of the head—the eyes and brain—grow faster than the lower parts, such as the jaw.

2 Motor Development

Previous Highlight Previous Section Next Section Next Highlight Practice



Powerful Reporting

Whether a class is face-to-face, hybrid, or entirely online, Connect for Child Development provides tools and analytics to reduce the amount of time instructors need to administer their courses. Easy-to-use course management tools allow instructors to spend less time administering and more time teaching, while easy-to-use reporting features allow students to monitor their progress and optimize their study time.

- The At-Risk Student Report provides instructors with one-click access to a dashboard that identifies students who are at risk of dropping out of the course due to low engagement levels.
- The Category Analysis Report details student performance relative to specific learning objectives and goals, including APA outcomes and levels of Bloom's taxonomy.
- Connect Insight is a one-of-a-kind visual analytics dashboard—now available for both instructors and students—that provides at-a-glance information regarding student performance.
- The LearnSmart Reports allow instructors and students to easily monitor progress and pinpoint areas of weakness, giving each student a personalized study plan to achieve success.

Online Instructor Resources

The resources listed here accompany *Children*, Fourteenth Edition. Please contact your McGraw-Hill representative for details concerning the availability of these and other valuable materials that can help you design and enhance your course.

Instructor's Manual Broken down by chapter, this resource provides chapter outlines, suggested lecture topics, classroom activities and demonstrations, suggested student research projects, essay questions, and critical thinking questions.

Test Bank and Computerized Test Bank This comprehensive Test Bank includes more than 1,500 multiple-choice and approximately 75 essay questions. Organized by chapter, the questions are designed to test factual, applied, and conceptual understanding. All test questions are available within TestGen™ software.

PowerPoint Slides The PowerPoint presentations, now WCAG compliant, highlight the key points of the chapter and include supporting visuals. All of the slides can be modified to meet individual needs.

preface

Making Connections . . . From My Classroom to *Children* to You

Having taught two or more undergraduate courses in developmental psychology—child development, adolescence, and life-span development—every year across four decades, I’m always looking for ways to improve my course and *Children*. Just as McGraw-Hill looks to those who teach the child development course for input, each year I ask the students in my undergraduate developmental courses to tell me what they like about the course and the text, and what they think could be improved. What have my students told me about my course and text? Students said that highlighting connections among the different aspects of children’s development would help them to better understand the concepts. As I thought about this, it became clear that a connections theme would provide a systematic, integrative approach to the course material. I used this theme to shape my goals for my course, which in turn influence the main goals of this text, as follows:

1. **Connecting with today’s students** to help students learn about children’s development more effectively;
2. **Connecting with research on children’s development** to provide students with the best and most recent theory and research in the world today about each of the periods of children’s development;
3. **Connecting development processes** to guide students in making developmental connections across different points in children’s development;
4. **Connecting development to real life** to help students understand ways to apply content about child development to the real world and improve children’s lives, and to motivate students to think deeply about their own personal journey through life and better understand who they were as children and how their experiences and development have influenced who they are today.

Connecting with Today’s Students

In *Children*, I recognize that today’s students are as different in some ways from the learners of the last generation as today’s discipline of child development is different from the field 30 years ago. Students now learn in multiple modalities; rather than sitting down and reading traditional printed chapters in linear fashion from beginning to end, their work preferences tend to be more visual and more interactive, and their reading and study often occur in short bursts. For many students, a traditionally formatted printed textbook is no longer enough when they have instant, 24/7 access to news and information from around the globe. Two features that specifically support today’s students are the adaptive ebook (*Smart-Book*—see pages xv) and the learning goals system.

The Learning Goals System

My students often report that development courses are challenging because so much material is covered. To help today’s students focus on the key ideas, the Learning Goals System

I developed for *Children* provides extensive learning connections throughout the chapters. The learning system connects the chapter-opening

1 Why Is Caring for Children Important?

LG1

Explain why it is important to study children’s development, and identify five areas in which children’s lives need to be improved.

The Importance of Studying Children’s Development

Improving the Lives of Children

reach your learning goals

Introduction

1 Why Is Caring for Children Important?

The Importance of Studying Children's Development

Explain why it is important to study children's development, and identify five areas in which children's lives need to be improved.

- Studying children's development is important because it will help you to better understand your own childhood and provide you with strategies for being a competent parent or educator.
- Health and well-being are important areas in which children's lives can be improved. Today, many children in the United States and around the world need improved health care. We now rec-

end of the chapter. The main headings of each chapter correspond to the learning goals, which are presented in the chapter-opening spread. Mini-chapter maps that link up with the learning goals are presented at the beginning of each major section in the chapter.

Then, at the end of each main section of a chapter, the learning goal is repeated in **Review, Connect, Reflect**, which prompts students to review the key topics in the section, to connect these topics to existing knowledge, and to relate what they have learned to their own personal journey through life. **Reach Your Learning Goals**, at the end of each chapter, guides students through the bulleted chapter review, connecting with the chapter outline/learning goals at the beginning of the chapter and the **Review, Connect, Reflect** material at the end of major chapter sections.

connecting with research

Caregivers' Emotional Expressiveness, Children's Emotion Regulation, and Behavior Problems in Head Start Children

A study by Dana McCoy and Cybele Raver (2011) explored links between caregivers' reports of their positive and negative emotional expressiveness, observations of young children's emotion regulation, and teachers' reports of the children's internalizing and externalizing behavior problems. The study focused on 97 children, most of whom were African American or Latino and whose mean age was 4 years and 3 months. The other participants in the study were the children's primary caregivers (90 mothers, 5 fathers, and 2 grandmothers).

To assess caregiver expressiveness, caregivers were asked to provide ratings on a scale from 1 (never/rarely) to 9 (very frequently) for 7 items that reflect caregiver expressiveness, such as "telling family members how happy you are" and "expressing anger at someone's carelessness." Children's emotion regulation was assessed with (a) the emotion regulation part of the PSRA (preschool self-regulation assessment) in which observers rated young children's behavior on 4 delay tasks, 3 executive function tasks, and 3



What did Dana McCoy and Cybele Raver discover about the importance of caregivers' emotions and children's emotion regulation in children's development?

©Najilah Feanny/Corbis

were linked to more internalizing behavior problems in the young Head Start children. Also, caregivers' reports of their positive emotional expressiveness were associated with a lower level of young

Connecting with Research on Children's Development

Over the years, I have made every effort to include the most up-to-date research available. I continue this tradition in this edition by looking closely at specific areas of research, involving experts in related fields, and updating research throughout. **Connecting with Research** describes a study or program to illustrate how research in child development is conducted and how it influences our understanding of the discipline.

Topics range from "How Can the Newborn's Perception Be Studied?" to "What Are Some Important Findings in the National Longitudinal Study of Child Care in the United States?" to "Caregivers' Emotional Expressiveness, Children's Emotion Regulation, and Behavior Problems in Head Start Children" to "Parenting and Children's Achievement: My Child Is My Report Card, Tiger Moms, and Tiger Babies Strike Back" to "Evaluation of a Family Program Designed to Reduce Drinking and Smoking in Young Adolescents."

The tradition of obtaining detailed, extensive input from a number of leading experts in different areas of child development also continues in this edition. Biographies and photographs of the leading experts in the field of child development appear on pages xii to xiii, and the chapter-by-chapter highlights of new research content are listed on pages xxi to xxxviii. Finally, the research discussions have been updated for each developmental period and topic. I expended every effort to make this edition of *Children* as contemporary and up-to-date as possible. To that end, there are more than 1,200 citations from 2016, 2017, and 2018 in this edition.

Connecting Developmental Processes

Too often we forget or fail to notice the many connections from one point in child development to another. I have substantially increased attention to these connections in the text narrative and included features to help students connect topics across the stages of child development.

outline, learning goals for the chapter, mini-chapter maps that open each main section of the chapter, **Review, Connect, Reflect** questions at the end of each main section, and the chapter summary at the end of each chapter.

The learning system keeps the key ideas in front of the student from the beginning to the

Developmental Connections, which appear multiple times in each chapter, point readers to places where the topic is discussed in a previous, current, or subsequent chapter. This feature highlights links across topics of development *and* connections among biological, cognitive, and socioemotional processes. The key developmental processes are typically discussed in isolation from each other, so students often fail to see the connections among them. Included in **Developmental Connections** is a brief description of the backward or forward connection. For example, the developmental connection to the right appears in the margin next to the discussion of minimizing bias in research.

Furthermore, a Connect question is included in the self-reviews at the end of each section—**Review, Connect, Reflect**—so students can practice making connections among topics. For example:

- In “Cognitive Development in Infancy” and “Cognitive Development in Early Childhood,” you read about the development of attention in infancy and early childhood. How might ADHD be linked to earlier attention difficulties?

Topical Connections: Looking Back and Looking Forward begin and conclude each chapter by placing the chapter's coverage in the larger context of development. The Looking Back section reminds the reader of what happened developmentally in previous periods of development.



Topical Connections *looking forward*

Next you will learn about the birth process and the transition from fetus to newborn, see how the newborn's health and responsiveness are assessed, read about low birth weight and preterm babies and find out about special ways to nurture these fragile newborns, and examine what happens during the postpartum period.

Connecting Development to Real Life

In addition to helping students make research and developmental connections, *Children* shows the important real-life connections to the concepts discussed in the text. In recent years, students in my development course have increasingly told me that they want more of this type of information. In this edition, real-life connections are explicitly made in the chapter-opening vignette as well as in *Caring Connections, Connecting with Diversity*, the *Milestones* video program, *Connecting with Careers, How Would You . . . ?* questions that pertain to five career areas, and *Reflect: Your Own Personal Journey of Life*.

Each chapter begins with a story designed to spark students' interest and motivate them to read the chapter. Among the chapter-opening stories are those involving the journey of pregnancy and the birth of “Mr. Littles,” Reggio Emilia’s children and their early childhood education program, children living in the South Bronx, and Jewel Cash and her amazing contributions to her community.

Caring Connections provides applied information about parenting, education, or health and well-being related to topics ranging from “From Waterbirth to Music Therapy” to “Parenting Strategies for Helping Overweight Children Lose Weight” to “Strategies for Increasing Children’s Creative Thinking.”

Children puts a strong emphasis on diversity. For a number of editions, this text has benefited from having one or more leading experts on diversity to ensure that it provides students with current, accurate, sensitive information related to diversity in children’s development. The diversity expert for this edition of *Children* is James A. Graham.

Diversity is discussed in every chapter. **Connecting with Diversity** interludes also appear in every chapter, focusing on a diversity topic related to

caring connections

Parenting Strategies for Helping Overweight Children Lose Weight

Most parents with an overweight child want to help the child to lose weight but aren't sure of the best ways to accomplish this goal. Keep in mind the research we have discussed that indicates overweight children are likely to become overweight adolescents and adults, so it is important for parents to help their children attain a healthy weight and maintain it. Following are some recommended ways that parents can help their overweight children lose weight (DiLorenzo, 2013; Matthiessen, 2013; Moninger, 2013):

- **Work on a healthy project together and involve the child in the decision-making process.** Get the child involved in an activity that can help him or her lose weight such as purchasing pedometers for all family members and developing goals for how many steps to take each day. By involving the child in making decisions about the family's health, the hope is that the child will begin to take responsibility for his or her own health.
- **Be a healthy model for your child. In many aspects of life, what people do is more influential than what they say.** So if parents are overweight and engaging in unhealthy behaviors such as eating unhealthy fast food and not exercising, then telling their overweight children to lose weight is unlikely to be effective.
- **Engage in physical activities with children.** Parents and children can engage in activities like bicycling, jogging, hiking, and swimming together. Parents might say something like, “Let's take a bike ride after dinner this evening. It would be fun and could help us both get in better shape.”
- **Give children choices in what they want to do to lose weight.** Select the fruits and vegetables they are willing to eat. Let them choose which sport or type of exercise they would like to do.
- **Eat healthy family meals together on a regular basis.** Children who eat meals together with their family are less likely to be overweight.
- **Reduce screen time.** Children who spend large numbers of hours per day in screen time are more likely to be overweight than their counterparts whose screen time takes up a smaller



What are positive strategies parents can adopt to help overweight children lose weight?

©vgajic/Getty Images RF

select the fruits and vegetables they are willing to eat. Let them choose which sport or type of exercise they would like to do.

• **Eat healthy family meals together on a regular basis.** Children who eat meals together with their family are less likely to be overweight.

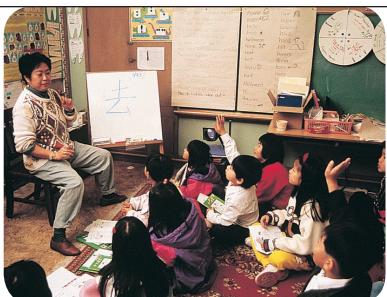
• **Reduce screen time.** Children who spend large numbers of hours per day in screen time are more likely to be overweight than their counterparts whose screen time takes up a smaller

connecting with diversity

What Is the Best Way to Teach English Language Learners?

A current controversy related to dual-language learning involves the millions of U.S. children who come from homes in which English is not the primary language (Echevarria, Vogt, & Short, 2017; Perego & Boyle, 2017). What is the best way to teach these English language learners (ELLs), many of whom in the United States are from immigrant families living in poverty (McCabe & others, 2013)?

ELLs have been taught in one of two main ways: (1) instruction in English only, or (2) a *dual-language* (used to be called *bilingual*) approach that involves instruction in their home language and English (Haley & Austin, 2014). In a dual-language approach, instruction is given in both the ELL child's home language and English for varying amounts of time at certain grade levels. One of the arguments for the



A first- and second-grade bilingual English-Cantonese teacher instructing students in Chinese in Oakland, California. *What have researchers found about the effectiveness of bilingual education?*
©Elizabeth Crews

infancy and watch them achieve major developmental milestones, both physically and cognitively. (See page xiv for further details.)

Connecting with Careers profiles careers ranging from genetic counselor to toy designer to teacher of English Language Learners, all of which require a knowledge of children's development. The careers highlighted extend from the Careers Appendix immediately following "Introduction," which provides a comprehensive overview of careers to show students where knowledge of children's development could lead them.

The *Milestones* video program shows students what developmental concepts look like by letting them watch actual humans develop. Students are able to track several individuals starting from

infancy and watch them achieve major developmental milestones, both physically and cognitively. (See page xiv for further details.)

How Would You . . . ? questions in the margins of each chapter highlight issues involving five main career areas of children's development: psychology, human development and family studies, education, health professions (such as nursing and pediatrics), and social work.

The **How Would You . . . ?** questions

ensure that this book orients students to concepts that are important to their understanding of children's development. I have asked instructors specializing in these fields to contribute **How Would You . . . ?** questions for each chapter. Strategically placed in the margin next to the relevant chapter content, these questions highlight essential ideas for students to take away from chapter content.

Finally, part of applying knowledge of children's development to the real world is understanding how it affects oneself. Accordingly, one of the goals of my child development course and this text is to motivate students to think deeply about their own journey of life. To encourage students to make personal connections to content in the text, I include a **Reflect: Your Own Personal Journey of Life** prompt in the end-of-section review. This question asks students to reflect on some aspect of the discussion in the section they have just read and connect it to their own life. For example, in relation to a discussion of the early-later experience issue in development, students are asked,

- Can you identify an early experience that you believe contributed in important ways to your development? Can you identify a recent or current (later) experience that you think had (is having) a strong influence on your development?



socioeconomic-status families to increase parental involvement in their children's educational activities?



Salvador Tamayo works with dual-language education students.
Courtesy of Salvador Tamayo

xx Preface

Content Revisions

A significant reason why *Children* has been successfully used by instructors for edition after edition is the painstaking effort and review that goes into making sure the text provides the latest research on all topic areas discussed in the classroom. This new edition is no exception, with more than 1,200 citations from 2016, 2017, and 2018.

Below is a sample of the many chapter-by-chapter changes that were made in this new edition of *Children*. Although every chapter has been extensively updated, three chapters (“Cognitive Development in Infancy,” “Cognitive Development in Early Childhood,” and “Socioemotional Development in Middle and Late Childhood”) and the following content areas were especially targeted for revisions based on the results of the Heat Map data (discussed on page xv) and updated and expanded research: diversity and culture; genetics and epigenetics; neuroscience and the brain; identity issues, especially gender and transgender; health; and technology.

Chapter 1: Introduction

- Updated data on the dramatic increase in Latino and Asian American children in the United States, with recent projections from 2014 to 2060 (Colby & Ortman, 2015)
- Updated statistics on the recent increase in the percentage of U.S. children and adolescents under 18 years of age living in poverty, including data reported separately for African American and Latino families (DeNavas-Walt & Proctor, 2015; Proctor, Semega, & Kollar, 2016)
- Expanded content on the early-later experience issue regarding sensitive parenting to include the importance of positive close relationships later in childhood, in adolescence, and in adulthood (Antonucci & others, 2016)
- In the section on physiological methods, new discussion of recent advances in assessing genes, including specific genes linked to childhood obesity (Grigorenko & others, 2016; Moore, 2017)
- Updated and expanded coverage of the increased use of eye-tracking equipment to assess children’s development (Loi & others, 2017; Meng, Uto, & Hashiva, 2017)
- New entries in Resources section: *Cambridge Handbook of International Prevention Science*, edited by Israelashvili and Romano (2017), provides up-to-date coverage of social policy and intervention in children’s lives to improve their well-being and development in the United States and around the world. In *Encyclopedia of Lifespan Development* by Bornstein (2018), leading experts provide up-to-date discussions of many of the topics found in this edition.

Chapter 2: Biological Beginnings

- Revised and updated based on comments by leading experts Elena Grigorenko, David Moore, and Kirby Deater-Deckard
- Due to the increased emphasis on gene × environment interaction, the content on shared and non-shared environmental experiences has been deleted because it is now being given less attention.
- New description of recent research on how exercise, nutrition, and respiration can modify the expression of genes (Done & Traustadottir, 2016; Van Bussel & others, 2016)
- New coverage of the process of methylation, in which tiny atoms attach themselves to the outside of a gene. Researchers have found that exercise, diet, and tobacco use can change whether a gene is expressed or not through the

methylation process (Butts, 2017; Chatterton & others, 2017; Godfrey & others, 2017).

- Updated and expanded discussion of genome-wide association studies, including research on suicide (Sokolowski, Wasserman, & Wasserman, 2016), autism (Connolly & others, 2017), attention deficit hyperactivity disorder (Naaijen & others, 2017), and glaucoma (Springelkamp & others, 2017)
- Expanded content about why recent improvements in next-generation sequencing have led to advances in analysis of genes and their links to various diseases (Bardak & others, 2017)
- Updated and expanded research on gene-gene interaction, including studies of immune system functioning (Heinonen & others, 2015), obesity (Bordoni & others, 2017), type 2 diabetes (Saxena, Srivastava, & Banerjee, 2017), cancer (Wu & others, 2017), and cardiovascular disease (De & others, 2017)
- Inclusion of recent research in which a higher level of maternal responsiveness to children with fragile X syndrome’s adaptive behavior improved the children’s communication skills (Warren & others, 2017)
- New content on how stem cell transplantation is being explored in the treatment of infants with sickle-cell anemia (Azar & Wong, 2017)
- Updated description of how research now supports the use of hydroxyurea therapy for infants with sickle cell anemia beginning at 9 months of age (Nevitt, Jones, & Howard, 2017; Yawn & John-Sawah, 2015)
- Description of a recent research review that concluded many aspects of the developing prenatal brain can be detected in the first trimester using ultrasound, which also can help to identify spina bifida early (Engels & others, 2016)
- Inclusion of information from a recent research review that concluded fetal MRI does not provide good results in the first trimester of pregnancy because of small fetal structures and movement artifacts (Wataganara & others, 2016). In this review, it also was argued that fetal MRI can especially be beneficial in assessing central nervous system abnormalities in the third trimester of pregnancy.
- New commentary that maternal blood screening can be used to detect congenital heart disease risk in the fetus (Sun & others, 2016)

- Inclusion of recent research that found ultrasound can accurately identify the sex of the fetus between 11 and 13 weeks of gestation (Manzanares & others, 2016)
- New content on fertility drugs being more likely to produce multiple births than in vitro fertilization (March of Dimes, 2017)
- New coverage of a recent national study in which low birthweight and preterm birth were significantly higher in infants conceived through assisted reproduction technology (Sunderam & others, 2017)
- Discussion of a recent study of 3- to 5-year-old children in which parents' secure attachment increased their adopted children's secure attachment, with mothers' secure attachment making a stronger contribution to their children's secure attachment than fathers' secure attachment (Barone, Lionetti, & Green, 2017)
- Description of a study of adoptees in emerging adulthood that found perceptions of secure parent-child attachment relationships, as well as sensitive and open communication about birth parent contact, were linked to greater satisfaction for adoptees (Farr, Grant-Marsney, & Grotevant, 2014)
- Coverage of a recent research review of internationally adopted adolescents in which a majority were well adjusted, but adoptees had a higher level of mental health problems than their non-adopted counterparts (Askeland & others, 2017)
- New commentary about the epigenetics of well-being (Szyf & Pluess, 2016)
- New entry in Resources: *The Developing Genome* by David Moore (2015) provides a superb overview of recent thinking and research on epigenetics.

Chapter 3: Prenatal Development

- Changes in the chapter based on feedback from leading expert consultant Janet DiPietro
- Updated data on the average length and weight of the fetus at different points in prenatal development, including revisions involving these data in Figure 10 in "Biological Beginnings"
- Coverage of a recent large-scale study in Brazil in which flour that was fortified with folic acid produced a significant reduction in neural tube defects (Santos & others, 2016)
- Description of a recent study in which higher maternal pre-pregnancy body mass was linked to a higher level of adiposity and inflammation in newborns (McCloskey & others, 2017)
- Discussion of a recent research review that concluded a combination of aerobic and resistance (muscle strength) exercise during pregnancy benefited maternal cardiorespiratory fitness (Perales & others, 2016)
- Inclusion of a recent meta-analysis that concluded regular aerobic exercise during pregnancy is associated with a decrease in preterm birth and a higher incidence of vaginal birth, as well as a lower level of caesarean delivery (Di Mascio & others, 2016)

- Coverage of a recent study that found women who exercised regularly during pregnancy were less likely to have high blood pressure and excessive weight gain (Barakat & others, 2016)
- Description of a recent study that revealed regular exercise by pregnant women was linked to more advanced development in the neonatal brain (Laborte-Lemoyne, Currier, & Ellenberg, 2017)
- Inclusion of recent research in which two weekly 70-minute yoga sessions reduced pregnant women's stress and enhanced their immune system functioning (Chen & others, 2017)
- Discussion of recent research that found isotretinoin (used to treat acne) is one of the most commonly prescribed drugs for adolescent girls seeking contraceptive advice, yet girls were not receiving adequate information about its harmful effects on offspring if they become pregnant (Eltonsy & others, 2016; Stancil & others, 2017)
- Coverage of recent research on negative outcomes for fetal alcohol spectrum disorders (FASD) that include lower executive function (Kingdon, Cardoso, & McGrath, 2016), as well as externalized and internalized behavior problems (Tsang & others, 2016), and a significantly lower life expectancy (Thanh & Johnsson, 2016)
- New description of the French Alcohol Society's (2016) recommendation that women should not consume any alcohol during pregnancy
- Inclusion of recent research indicating that maternal cigarette smoking during pregnancy was linked to increased risk of offspring smoking cigarettes at 16 years of age (De Genna & others, 2016)
- Description of recent research in which daughters whose mothers smoked during pregnancy were more likely to subsequently smoke during their own pregnancy (Ncube & Mueller, 2017)
- Coverage of recent research that found despite the plethora of negative outcomes for maternal smoking during pregnancy, 23 percent of pregnant adolescent and 15 percent of adult pregnant women reported using tobacco in the previous month (Oh & others, 2017)
- New content on the increasing use of e-cigarettes during pregnancy and research on pregnant women's misconceptions about e-cigarettes (Mark, 2015; Spindel & McEvoy, 2016)
- Coverage of recent research in which cocaine use during pregnancy was associated with impaired connectivity of the thalamus and prefrontal cortex in newborns (Salzwedel & others, 2016)
- Discussion of recent research indicating that cocaine use by pregnant women is linked to attention deficit hyperactivity disorder, oppositional defiant disorder, and posttraumatic stress disorder (PTSD) in offspring (Richardson & others, 2016), as well as self-regulation problems at age 12 (Minnes & others, 2016)
- Coverage of a recent meta-analysis that found marijuana use during pregnancy was associated with the following outcomes in offspring: low birth weight and an increased

- likelihood of being placed in a neonatal intensive care unit (Gunn & others, 2016)
- New research indicating that pregnant women have increased their use of marijuana in recent years (Brown & others, 2016)
 - Description of recent research that found cardiac defects, pulmonary problems, and microencephaly were among the most common fetal and neonatal outcomes when pregnant women have rubella (Yazigi & others, 2017)
 - Inclusion of two recent research reviews that concluded maternal obesity during pregnancy is associated with an increased likelihood of offspring becoming obese in childhood and adulthood (Pinto Pereira & others, 2016; Santangeli, Sattar, & Huda, 2015)
 - New research indicating that offspring of mothers who have gestational diabetes are at increased risk for developing cardiovascular disease later in life (Amrithraj & others, 2017)
 - Revised content stating that pregnant women are now being advised to increase their fish consumption, especially low-mercury-content fish such as salmon, shrimp, tilapia, and cod (American Pregnancy Association, 2016; Federal Drug Administration, 2016)
 - Coverage of two recent studies that found very advanced maternal age (40 years and older) was linked to negative perinatal outcomes, including spontaneous abortion, preterm birth, stillbirth, and fetal growth restriction (Traisrisilp & Tongsong, 2015; Waldenstrom & others, 2015)
 - Inclusion of recent research that revealed maternal prenatal stress and anxiety were linked to lower levels of infants' self-regulation (Korja & others, 2017)
 - Description of a recent study in which taking antidepressants early in pregnancy was linked to increased risk of miscarriage (Almeida & others, 2016)
 - Discussion of a recent study that found when fetuses were exposed to serotonin-based antidepressants, they were more likely to be born preterm (Podrebarac & others, 2017)
 - Coverage of a recent study that revealed taking antidepressants in the second or third trimester was associated with increased risk of autism in children (Boukhris & others, 2016)
 - Inclusion of a recent study that found intimate partner violence increased the mother's stress level during her pregnancy (Fonseca-Machado Mde & others, 2015)
 - Description of recent research in which CenteringPregnancy participation was linked to reduced incidence of low birth weight and placement in a neonatal intensive care unit (Gareau & others, 2016)

Chapter 4: Birth

- Revisions based on feedback from leading expert Janet DiPietro
- Update on the percentage of U.S. births that take place in hospitals, at home, and in birthing centers and the percentage of babies born through cesarean delivery (Martin & others, 2017)

- New description of global cesarean delivery rates, with the Dominican Republic and Brazil having the highest rates (56 percent) and New Zealand and the Czech Republic having the lowest (26 percent) (McCullough, 2016). The World Health Organization recommends a cesarean rate of 10 percent or less.
- Discussion of a recent study that found waterbirth was associated with fewer negative outcomes for offspring (Bovbjerg, Cheyney, & Everson, 2016)
- Discussion of a recent research review in which waterbirth neonates experienced fewer negative outcomes than non-waterbirth neonates (Bovbjerg, Cheyney, & Everson, 2016)
- Description of a recent research review that concluded waterbirth is associated with high levels of maternal satisfaction with pain relief and the experience of childbirth (Nutter & others, 2015)
- Inclusion of recent research indicating that both music therapy and Hoku point ice massage were effective in reducing labor pain (Dehcheshmeh & Rafiel, 2015)
- Discussion of a recent study in which acupuncture reduced labor pain 30 minutes after the intervention (Allameh, Tehrani, & Ghasemi, 2015)
- Revised and updated content on cesarean delivery to include two specific reasons for this intervention: failure to progress through labor and fetal distress
- Coverage of recent studies that have found low Apgar scores are linked to higher needs for long-term additional support needs in education and educational attainment (Tweed & others, 2016), risk of developmental vulnerability at five years of age (Razaz & others, 2016), and risk for developing ADHD (Hanc & others, 2016)
- Updated data on the recent decline in the percentage of births in the United States that are preterm, including ethnic variations (Martin & others, 2017)
- Coverage of a recent study that found especially in very preterm infants, the identical twin who was smaller (an index of prenatal environmental experience) than his/her co-twin was far more likely to have poorer working memory and a lower level of self-regulation at 8 years of age (Deater-Deckard, 2016). The most likely explanation of this outcome involves epigenetic influences.
- Description of a recent study that found kangaroo care significantly reduced the amount of crying and increased heart rate stability in preterm infants (Choudhary & others, 2016)
- Inclusion of recent research that revealed kangaroo care was effective in reducing neonatal pain (Johnston & others, 2017; Mooney-Leber & Brummelte, 2017)
- Coverage of a recent study in Great Britain in which the use of kangaroo care in neonatal units resulted in substantial cost savings mainly because of its reductions in diseases such as gastroenteritis and colitis (Lowson & others, 2015)
- Inclusion of a recent study in which massage therapy improved the scores of HIV-exposed infants on both physical and mental scales, as well as improving their hearing and speech (Perez & others, 2015)

- Updated data on the percentage of births in the United States that are preterm, low birth weight, and cesarean section (Hamilton, Martin, & Osterman, 2016)
- Inclusion of a longitudinal study in which the nurturing positive effects of kangaroo care with preterm and low birth weight infants at 1 year of age were still present 20 years later in a number of positive developmental outcomes (Charpak & others, 2017)
- Inclusion of information about a recent study in which kangaroo care and massage therapy were equally effective in improving body weight and reducing hospital stays for low birth weight infants (Rangey & Sheth, 2014)
- Description of recent research that found that women who had a history of depression were 20 times more likely to develop postpartum depression than women who had no history of depression (Silverman & others, 2017)
- Coverage of a recent study in which postpartum depression was associated with an increase in 4-month-olds' unintentional injuries (Yamaoka, Fujiwara, & Tamiva, 2016)
- Inclusion of recent research in which mothers' postpartum depression, but not generalized anxiety, was linked to their children's emotional negativity and behavior problems at 2 years of age (Prenoveau & others, 2017)
- Discussion of a recent study that found depressive symptoms in mothers and fathers were linked to impaired bonding with their infant in the postpartum period (Kerstis & others, 2016)

Chapter 5: Physical Development in Infancy

- Revisions based on feedback from leading expert Karen Adolph
- New discussion of how infant growth is often not smooth and continuous but rather is episodic, occurring in spurts (Adolph & Berger, 2015; Lampl & Schoen, 2017)
- New description indicating that neuronal connections number in the trillions (de Haan, 2015)
- Coverage of a recent study that found higher-quality mother-infant interaction predicted a higher level of frontal lobe functioning when assessed by EEG later in infancy (Bernier, Calkins, & Bell, 2016)
- New description of research done by Mark Johnson and his colleagues (Gliga & others, 2017; Johnson & others, 2015; Milovavljievic & others, 2017; Saez de Urabain, Nuthmann, & Johnson, 2017; Senju & others, 2016) on infant brain development, including their neuroconstructivist approach and studies of the development of the prefrontal cortex and its function, early identification of autism, face processing, and early social experiences
- New discussion of the recent increase in the use of functional near-infrared spectroscopy to assess infants' brain activity, a technique that is portable and allows researchers to monitor infants' brain activity while they are exploring the world around them (de Haan & Johnson, 2016; Emberson & others, 2017b). Also, new Figure 4 shows an infant in an experiment using near-infrared spectroscopy.

- Inclusion of a recent research review of 27 studies that confirmed pacifier use is associated with a lower incidence of SIDS (Alm & others, 2016)
- Description of a recent Swedish study that revealed bed sharing was more common in SIDS deaths (Mollborg & others, 2015)
- New commentary that after prone sleeping position, the two most critical factors in predicting SIDS are maternal smoking and bed sharing (Mitchell & Krous, 2015)
- Coverage of two recent studies that found sleep difficulties in infancy were linked to developmental problems in attention (Geva, Yaron, & Kuint, 2016; Sadeh & others, 2015)
- Inclusion of information about recent longitudinal studies that revealed when mothers participated prenatally and in early childhood in WIC programs, young children showed short-term cognitive benefits and longer-term reading and math benefits (Jackson, 2015)
- Updated data on the continuing increase in breast feeding by U.S. mothers (Centers for Disease Control and Prevention, 2016)
- Description of a recent Danish study that found breast feeding did not protect against allergic sensitization in early childhood and allergy-related diseases at 7 years of age (Jelding-Dannemand, Malby Schoos, & Bisgaard, 2015)
- Coverage of a recent large-scale study of more than 500,000 Scottish children found that those who were exclusively breast fed at 6 to 8 weeks were less likely to ever have been hospitalized through early childhood than their formula fed counterparts (Ajetunmobi & others, 2015)
- Inclusion of recent research that found breast feeding was associated with a small increase in intelligence in children (Kanazawa, 2015)
- New content on a key child undernutrition problem in developing countries: micronutrient deficiencies such as those involving iron, zinc, and iodine (Hwalla & others, 2017; Lazarus, 2017a, b; World Health Organization, 2017)
- New coverage of a recent study of infants' organization of exploratory behaviors in planning locomotion in challenging contexts (Kretch & Adolph, 2017)
- New discussion of how walking skills might produce a developmental cascade of changes in infancy, including increases in language skills (Adolph & Robinson, 2015; He, Walle, & Campo, 2015)
- Discussion of a recent study that examined a number of predictors of motor milestones in the first year (Flensburg-Madsen & Mortensen, 2017)
- Description of recent studies that indicated short-term training involving practice of reaching movements increased both preterm and full-term infants' reaching for and touching objects (Cunha & others, 2016; Guimaraes & Tudelia, 2015)
- Inclusion of recent research in which infants who were not yet engaging in reaching behavior were provided with reaching experiences at 3 months of age, and these infants

- engaged in increased object exploration and attention focusing at 5.5 months (Libertus, Joh, & Needham, 2016)
- New coverage of a recent study that revealed 3-month-old infants who participated in active motor training using sticky mittens that allowed them to pick up toys engaged in more sophisticated object exploration at 5.5 months (Wiesen, Watkins, & Needham, 2016)
- Discussion of a study that found newborns' pain threshold was lower than that of adults (Goksan & others, 2015)
- Three new recommendations in Resources section: *Typical and Atypical Functional Brain Development* by Michelle de Haan and Mark Johnson (2016); *Healthy Sleep Habits, Happy Child* by Marc Weissbluth (2016); and *The Pediatrician's Guide to Feeding Babies and Toddlers* by Anthony Porto and Dina DiMaggio (2016)

Chapter 6: Cognitive Development in Infancy

- New coverage of a recent study of 5-month-olds that found their better performance on an A-not-B task was linked to how well they focused their attention on a different task, indicating that infants' attention may be involved in performance variations on the A-not-B task (Marcovitch & others, 2016)
- Expanded and updated criticism of the innate view of the emergence of infant morality, with an emphasis on the importance of infants' early interaction with others and later transformation through language and reflective thought (Carpendale & Hammond, 2016)
- Coverage of recent research that revealed problems in joint attention as early as 8 months of age were linked to a child being diagnosed with autism by 7 years of age (Veness & others, 2014)
- Inclusion of a recent study in which infants who initiated joint attention at 14 months of age had higher executive function at 18 months of age (Miller & Marcovitch, 2015)
- Coverage of a recent study in which hand-eye coordination involving connection of gaze with manual action on objects rather than gaze following alone predicted joint attention (Yu & Smith, 2017)
- Discussion of recent research by Patricia Bauer and her colleagues regarding when infantile amnesia begins to occur and why (Bauer, 2015; Bauer & Larkina, 2015; Pathman, Doydum, & Bauer, 2015). By 8 to 9 years of age, children's memory of events that occurred at 3 years of age began to significantly fade away (Bauer & Larkina, 2014).
- New coverage of a study that found early language skills at 24 months of age predicted IQ at 6 years of age and were linked to intellectual disability (predicted from 8 months) and giftedness (predicted from 12 months of age) (Peyre & others, 2017)
- Revisions and updates based on feedback from leading experts Roberta Golinkoff and Virginia Marchman
- New opening commentary about the nature of language learning and how it involves comprehending a sound system (or sign system for individuals who are deaf), the

world of objects, actions, and events, and how units such as words and grammar connect sound and world (Pace & others, 2016)

- Revised definition of infinite generativity to include comprehension as well as production
- Expanded description of how statistical regularity of information is involved in infant word learning (Pace & others, 2016)
- Description of recent research in which vocabulary development from 16 to 24 months of age was linked to vocabulary, phonological awareness, reading accuracy, and reading comprehension five years later (Duff & others, 2015)
- New content on the language of Korean children being more verb friendly than noun friendly (Waxman & others, 2013)
- New research on babbling onset predicting when infants would say their first words (McGillion & others, 2017)
- New commentary on why gestures such as pointing promote further advances in language development
- Inclusion of a recent study involving joint attention in which infants' eye-gaze behaviors during Spanish tutoring sessions at 9.5 to 10.5 months of age predicted the infants' second-language phonetic learning at 11 months of age, indicating a strong influence of social interaction at the earliest ages of learning a second language (Convoy & others, 2015)
- New discussion of Patricia Kuhl's (2015) findings that the periods when a baby's brain is most open to learning the sounds of a native language begin at age 6 months for vowels and age 9 months for consonants
- Expanded descriptions of the functions of child-directed speech, such as capturing infants' attention, maintaining social interaction between infants and caregivers, and providing infants with information about their native language through its contrast with speech directed to adults (Golinkoff & others, 2015)
- Coverage of recent research in which child-directed speech in a one-to-one social context for 11- to 14-month-olds was related to productive vocabulary at 2 years of age for Spanish-English bilingual infants for both languages and each language independently (Ramirez-Esparza, Garcia-Sierra, & Kuhl, 2017)
- New emphasis on the importance of social cues in infant language learning (Pace & others, 2016)
- New content on whether infants learn language effectively through television and videos
- Discussion of a recent study of toddlers in which frequent television exposure increased the risk of delayed language development (Lin & others, 2015)
- Coverage of a recent study that found Skype provides some improvement in children's language learning over television and videos (Roseberry, Hirsh-Pasek, & Golinkoff, 2014)
- Description of a recent study in which the quality of early foundational communication between parent and child at age 2 accounted for more variability in language outcomes

- one year later than the amount of parent speech did (Hirsh-Pasek & others, 2015)
- Discussion of how joint engagement and relevant responsiveness by a social partner in infancy predict later growth in language, possibly because they improve the infant's mapping process that connects word and the world (Tamis-LeMonda & others, 2014)
- Coverage of a recent study in which both full term and pre-term infants who heard more caregiver talk based on all-day recordings at 16 months of age had better language skills at 18 months of age (Adams & others, 2017)
- Revised definitions of recasting, expanding, and labeling
- Expanded coverage of how parents can facilitate infants' and toddlers' language development

Chapter 7: Socioemotional Development in Infancy

- New introductory comments about the important role that cognitive processes, in addition to biological and experiential influences, play in children's emotional development, both in the moment and across childhood (Calkins, Perry, & Dollar, 2016)
- Coverage of recent research indicating that smiling and laughter at 7 months of age were associated with self-regulation at 7 years of age (Posner & others, 2014)
- Inclusion of a recent study in which mothers were more likely than fathers to use soothing techniques to reduce infant crying (Dayton & others, 2015)
- Coverage of a recent study that found depressed mothers rocked and touched their crying infants less than non-depressed mothers did (Esposito & others, 2017a)
- New description of a study in which young infants with a negative temperament used fewer emotion regulation strategies, while maternal sensitivity to infants was linked to more adaptive emotion regulation (Thomas & others, 2017)
- New discussion of describing temperament in terms of emotional reactivity and self-regulation (Bates & Pettit, 2015)
- New research that found positive affectivity, surgency, and self-regulation capacity assessed at 4 months of age was linked to school readiness at 4 years of age (Gartstein, Putnam, & Kliewer, 2016)
- Coverage of a recent study in which disinhibition in the toddler years was linked to career stability in middle adulthood (Blatney & others, 2015)
- Description of recent research that found an inhibited temperament at 2 to 3 years of age was related to social phobia related symptoms at 7 years of age (Lahat & others, 2014)
- Inclusion of recent findings indicating that an inhibited temperament in infants and young children is linked to the development of social anxiety disorder in adolescence and adulthood (Perez-Edgar & Guyer, 2014; Rapee, 2014)
- New description of how the use of positive parenting, which includes high levels of warmth and low levels of

- harsh control, increases children's effortful control (Bates & Pettit, 2015)
- Two new research studies that linked a lower level of effortful control at 3 years of age with ADHD symptoms in the first grade (Willoughby, Gottfredson, & Stifter, 2017) and at 13 years of age (Einziger & others, 2017)
- Description of a recent study that revealed if parents had a childhood history of behavioral inhibition, their children who also had a high level of behavioral inhibition were at risk for developing anxiety disorders (Stumper & others, 2017)
- New coverage of recent research in which children who had a difficult temperament at 5 and 14 years were more likely to have mental health problems at 21 years of age (Kingsbury & others, 2017)
- New discussion of the recent interest in the *differential susceptibility* and *biological sensitivity to context* models emphasizing that certain characteristics—such as a difficult temperament—may render children more vulnerable to difficulty in adverse contexts but also make them more susceptible to optimal growth in very supportive conditions (Baptista & others, 2017; Belsky & others, 2015; Belsky & Pluess, 2016; Belsky & van IJzendoorn, 2017; Simpson & Belsky, 2016)
- New commentary about recent advances in infants' understanding of others (Rhodes & others, 2015), including research indicating that infants as young as 13 months of age seem to consider another's perspective when predicting their actions (Choi & Luo, 2015)
- Expanded and updated content on the increasing belief that babies are socially smarter than used to be thought, including information about research by Amanda Woodward and her colleagues (Kroug-Jespersen & Woodward, 2016; Liberman, Woodward, & Kinzler, 2017; Shneidman & Woodward, 2016; Sodian & others, 2016) on how quickly infants understand and respond to others' meaningful intentions
- Inclusion of recent research in which infant attachment insecurity (especially insecure resistant attachment) and early childhood behavioral inhibition predicted adolescent social anxiety symptoms (Lewis-Morarity & others, 2015)
- Inclusion of recent research conducted in Zambia, where siblings were substantially involved in caregiving activities, that revealed infants showed strong attachments to both their mothers and their sibling caregivers, with secure attachment being the most frequent attachment classification for both mother-infant and sibling-infant relationships (Mooya, Sichimba, & Bakermans-Kranenburg, 2016)
- Description of a recent study that did not find support for the view that genes influence mother-infant attachment (Leerkes & others, 2017b)
- Updated and expanded coverage of the neuroscience of attachment to include the role of the brain's neurotransmitter dopamine circuits that provide pleasure and reward when mothers care for their infants and are exposed to their infants' cues; these experiences and brain changes likely

promote mother-infant attachment and sensitive parenting (Feldman, 2017; Kim, Strathearn, & Swain, 2016; Sullivan & Wilson, 2018)

- Discussion of three recent studies on the transition to parenthood that found (1) men, especially men who were avoidantly attached, adapted more poorly to child care tasks (Fillo & others, 2015); (2) in dual-earner couples, after a child was born, women did more than 2 hours of additional work compared with 40 minutes more for men (Yavorsky & others, 2015); and (3) in comparison with married fathers, cohabiting fathers' personal dedication and relationship confidence decreased and their feelings of constraint increased across the transition to parenting (Kamp Dush & others, 2014)
- Expanded coverage of the types of behaviors infants and parents engage in when reciprocal socialization is occurring
- New commentary about how the expectations parents have for their toddlers' behavior are likely higher than the toddlers' ability to control their behavior and impulses based on what is known about the maturation of the prefrontal cortex
- Discussion of a recent study that found when adults used scaffolding, infants were twice as likely to engage in helping behavior (Dahl & others, 2017)
- Coverage of a recent study of disadvantaged families in which an intervention that involved improving early maternal scaffolding was linked to improvement in children's cognitive skills at 4 years of age (Obradovic & others, 2016)
- Description of a recent national poll that estimated there are 2 million stay-at-home dads in the United States, a significant increase from 1.6 million in 2004 and 1.1 million in 1989 (Livingston, 2014)
- Coverage of a recent study in which both paternal and maternal sensitivity assessed when the infant was 10 to 12 months old were linked to the child's cognitive development at 18 months of age and the child's language development at 36 months (Malmburg & others, 2016)
- Discussion of a recent study that found negative outcomes on cognitive development in infancy when fathers were more withdrawn and depressed and positive outcomes on cognitive development when fathers were more engaged and sensitive, as well as less controlling (Sethna & others, 2017)
- Added commentary that infants and toddlers are more likely to be found in family child care and informal care settings while older children are more likely to be in child care centers and preschool and early education programs
- Description of a recent Australian study in which higher-quality child care at 2 to 3 years of age was linked to children's better self-regulation of attention and emotion at 4 to 5 and 6 to 7 years of age (Gialamas & others, 2014)
- New entry in Resources, *Raising a Secure Child* by Kent Hoffman & others (2017), which provides valuable information and strategies for protecting and nurturing infants

Chapter 8: Physical Development in Early Childhood

- Description of a recent study that found positive effects of growth hormone treatment across five years for children born small for gestational age (Ross & others, 2015)
- Coverage of a recent research review that concluded an accurate assessment of growth hormone deficiency is difficult and that many children diagnosed with the deficiency re-test normal later in childhood (Murray, Dattani, & Clayton, 2016)
- Inclusion of recent research on how poverty is linked to maturational lags in children's frontal and temporal lobes, and these lags are associated with lower school readiness skills (Hair & others, 2015)
- Description of a recent study that revealed higher levels of maternal sensitivity in early childhood were related to higher total brain volume in children (Kok & others, 2015)
- Coverage of a recent study in which young children with higher cognitive ability showed increased myelination by 3 years of age (Deoni & others, 2016)
- Inclusion of recent research in which myelination in a number of brain areas was linked to young children's processing speed (Chevalier & others, 2015)
- Discussion of a recent study of 4-year-old girls that found a nine-week motor skill intervention improved the girls' ball skills (Veldman & others, 2017)
- Description of recent research indicating that higher motor skill proficiency in preschool was linked to engaging in a higher level of physical activity in adolescence (Venetsanou & Kambas, 2017)
- Inclusion of recent research that found children with a low level of motor competence had a lower motivation for sports participation and lower global self-worth than their counterparts who had a high level of motor competence (Bardid & others, 2017b)
- Coverage of a recent study of 36- to 42-month-old children in which consistent bedtime routine was linked to more nightly sleep and an increase in nightly sleep minutes across a six-month period (Staples, Bates, & Petersen, 2015)
- Inclusion of recent research in China that revealed preschool children who slept seven hours per day or less had worse school readiness profiles and that children who used electronic devices three hours per day or more had shortened sleep durations (Tso & others, 2015)
- Description of a recent study of 2- to 5-year-olds that revealed each additional hour of daily screen time was associated with a decrease in sleep time, less likelihood of sleeping 10 hours or more per night, and later bedtime (Xu & others, 2016)
- Discussion of a recent study that revealed 2½-year-old children's liking for fruits and vegetables was related to their eating more fruits and vegetables at 7 years of age (Fletcher & others, 2017)

- Updated data on the percentage of U.S. 2- to 5-year-old children who are obese (Ogden & others, 2016)
- Recent description by expert panels from Australia, Canada, the United Kingdom, and the United States that were remarkably similar in recommending that young children get an average of 15 or more minutes of physical activity per hour over a 12-hour period, or about 3 hours total per day (Pate & others, 2015)
- Coverage of recent research in which 60 minutes of physical activity per day in preschool academic contexts improved young children's early literacy (Kirk & Kirk, 2016)
- New discussion of a longitudinal study that revealed when young children were exposed to environmental tobacco smoke they were more likely to engage in antisocial behavior at 12 years of age (Pagani & others, 2017)
- New entry in Resources, *Early Childhood Development Coming of Age: Science through the Life Course* by Maureen Black and her colleagues (2017), which outlines the key features needed in early childhood programs to help at-risk children reach their potential

Chapter 9: Cognitive Development in Early Childhood

- Updates and revisions in this chapter based on feedback from leading expert Megan McClelland
- Inclusion of recent research showing the effectiveness of the Tools of the Mind approach in improving a number of cognitive processes and academic skills in young children (Blair & Raver, 2014)
- Discussion of recent research that found preschool sustained attention was linked to a greater likelihood of completing college by 25 years of age (McClelland & others, 2013)
- Inclusion of recent research that revealed myelination in a number of brain areas was linked to young children's information processing speed (Chevalier & others, 2015)
- Coverage of a recent study of young children that found executive function was associated with emergent literacy and vocabulary development (Becker & others, 2014)
- Description of recent research in which executive function at 3 years of age predicted theory of mind at 4 years of age, and executive function at 4 years of age predicted theory of mind at 5 years of age, but the reverse did not occur—theory of mind at earlier ages did not predict executive function at later ages (Marcovitch & others, 2015)
- New coverage of developmental changes in executive function in early childhood
- Description of recent research on executive function and school readiness (Willoughby & others, 2017)
- Inclusion of research in which secure attachment to mothers during the toddler years was linked to a higher level of executive function at 5 to 6 years of age (Bernier & others, 2015)
- Discussion of a recent observational study that found a higher level of control by fathers predicted a lower level of executive function in 3-year-olds (Meuwissen & Carlson, 2016)

- Coverage of recent research in which experiencing peer problems in early childhood was linked to lower executive function later in childhood (Holmes, Kim-Spoon, & Deater-Deckard, 2016)
- Expanded and updated coverage of factors that influence children's theory of mind development: prefrontal cortex functioning (Powers, Chavez, & Hetherington, 2016); various aspects of social interaction, including secure attachment and mental state talk, parental engagement in mind-mindedness (Hughes, Devine, & Wang, 2017); having older siblings and friends who engage in mental state talk, and living in a family with higher socioeconomic status (Devine & Hughes, 2017)
- New description of recent research indicating that children with an advanced theory of mind are more popular with their peers and have better social skills in peer relations (Peterson & others, 2016; Slaughter & others, 2014)
- Updated statistics on the increase in the estimated percentage of children who have autism spectrum disorders (Christensen & others, 2016)
- Coverage of a recent study in which theory of mind predicted the severity of autism in children (Hoogenhout & Malcolm-Smith, 2017)
- Revisions in the discussion of young children's language development based on feedback from leading experts Roberta Golinkoff and Virginia Marchman
- Update on the increase in publicly funded preschool programs that now occurs in 42 states plus the District of Columbia (National Institute for Early Education Research, 2016)
- Updated information about the dramatic increase in the number of Montessori schools in the United States and the estimated number worldwide (North American Montessori Teachers' Association, 2016)
- Inclusion of a recent study that found Latino children living in low-income communities who began the school year having at-risk pre-academic and behavioral skills benefited from a Montessori public pre-K program, ending the year scoring above national averages for school readiness (Ansari & Winsler, 2014)
- Description of a recent study that revealed neighborhood poverty was linked to lower levels of classroom quality in Head Start programs (McCoy & others, 2015)
- Description of two recent studies that confirmed the importance of improved parenting engagement and skills in the success of Head Start programs (Ansari & Gershoff, 2016; Roggman & others, 2016)
- New entry in *Connecting With Improving the Lives of Children*, "Engage children in activities that will improve their executive function", including a recommended resource for these activities: <http://developingchild.harvard.edu/science/key-concepts/executive-function/>
- New entry in *Connecting with Improving the Lives of Children*: "Monitor young children's ability to delay gratification"

- New entry in Resources, *Becoming Brilliant* by Roberta Golinkoff and Kathy Hirsh Pasek (2016), a terrific book in which two leading developmental psychologists make compelling arguments that education of children needs to place more emphasis on promoting collaboration, communication, critical thinking, creative innovations, and confidence
- New entry in Resources, *Executive Functions in Children's Everyday Lives* (edited by Maureen Hoskyn and her colleagues (2017), which explores many aspects of children's executive function, including the role of parental influence and the importance of executive function in school and academic achievement
- New entry in Resources, *Stop, Act, and Think: Integrating Self-Regulation in the Early Childhood Classroom* by Megan McClelland and Shauna Tominey (2015), which provides a wealth of strategies for improving young children's self-regulation, including the use of various games, songs, and puzzles

Chapter 10: Socioemotional Development in Early Childhood

- New coverage of links between perspective taking and young children's social relationships, including a recent study that found higher perspective taking in 2-year-olds predicted more stable mother-child security later in the preschool years (Meins, Bureau, & Ferryhough, 2017)
- Inclusion of recent research indicating that a broad capacity for self-evaluative emotion was present in the preschool years and was linked to young children's empathetic concern (Ross, 2017)
- Expanded coverage of the importance of emotion regulation in childhood and links between emotion regulation and executive function (Blair, 2016, 2017; Calkins & Perry, 2016; Griffin, Freund, & McCardle, 2015)
- Inclusion of two new key terms—empathy and sympathy—with their definitions (Eisenberg, Spinrad, & Valiente, 2016)
- Coverage of a recent study in which young children's sympathy predicted whether they would share (Ongley & Malti, 2014)
- New commentary about connections between different emotions and how they may influence development, including a recent study in which participants' guilt proneness combined with their empathy to predict an increase in prosocial behavior (Torstevelt, Sutterlin, & Lugo, 2016)
- Coverage of a recent study in Great Britain in which gender non-conforming boys were most at risk for peer rejection (Braun & Davidson, 2017)
- Inclusion of a recent research review of a large number of studies that found authoritarian parenting was associated with a higher level of externalizing problems (Pinquart, 2017)
- Discussion of a recent study that revealed children of authoritative parents engaged in more prosocial behavior than their counterparts whose parents used the other parenting styles discussed in the section (Carlo & others, 2017)

- Description of a recent research review in which authoritative parenting was the most effective parenting style in predicting which children and adolescents would be less likely to be overweight or obese later in their development (Sokol, Qin, & Puti, 2017)
- New commentary about how in many traditional cultures, fathers use an authoritarian style; in such cultures, children benefit more when mothers use an authoritative parenting style
- Inclusion of new information that physical punishment is outlawed in 41 countries (Committee on Rights of the Child, 2014)
- Coverage of a recent review that concluded there is widespread approval of corporal punishment by U.S. parents (Cocca, 2017)
- Discussion of a longitudinal study that found harsh physical punishment in childhood was linked to a higher incidence of intimate partner violence in adulthood (Afifi & others, 2017b)
- Description of a recent Japanese study in which occasional spanking at 3 years of age was associated with a higher level of behavioral problems at 5 years of age (Okunzo & others, 2017)
- Discussion of a recent meta-analysis that found when physical punishment was not abusive, it still was linked to detrimental child outcomes (Gershoff & Grogan-Kaylor, 2016)
- Discussion of a recent study in which experiencing parents' divorce, as well as child maltreatment, in childhood was linked to midlife suicidal ideation (Stansfield & others, 2017)
- Updated data on the number of U.S. children who were victims of child maltreatment in 2013 (U.S. Department of Health and Human Services, 2015)
- Inclusion of a recent study that revealed exposure to either physical or sexual abuse in childhood and adolescence was linked to an increase in 13- to 18-year-olds' suicidal ideation, plans, and attempts (Gomez & others, 2017)
- Coverage of a recent study that indicated a bidirectional association between a child's behavior (conduct problems, for example) and quality of sibling relationships (Pike & Oliver, 2017)
- Discussion of a recent study in which individuals who had experienced their parents' divorce were at greater lifetime risk of engaging in a suicide attempt (Alonzo & others, 2015)
- Inclusion of a 30-year longitudinal study that found offspring of parents who engaged in child maltreatment and neglect are at increased risk for engaging in child neglect and sexual maltreatment themselves (Widom, Czaja, & DuMont, 2015)
- Description of recent research on almost 3,000 adolescents that revealed a negative association of the father's, but not the mother's, unemployment on the adolescents' health (Bacikov-Sleskova, Benka, & Orosova, 2015)
- Coverage of recent research indicating that enriched work-family experiences were positively linked to better parenting quality, which in turn was associated with better child outcomes; by contrast, conflicting work-family experiences

- were related to poorer parenting quality, which in turn was linked to more negative child outcomes (Vieira & others, 2016)
- Inclusion of recent research in which children were more likely to have behavior problems if their post-divorce environment was less supportive and stimulating, their mother was less sensitive and more depressed, and if their household income was lower (Weaver & Schofield, 2015). Also in this study, a higher level of predivorce maternal sensitivity and child IQ served as protective factors in reducing child problems after the divorce.
 - Coverage of a recent study that found interparental hostility was a stronger predictor of children's insecurity and externalizing problems than interparental disagreement and low levels of interparental cooperation (Davies & others, 2016)
 - Inclusion of recent research in which maladaptive marital conflict when children were 2 years old was associated with an increase in internalizing problems eight years later due to an undermining of attachment security in girls, while negative emotional aftermath of conflict increased both boys' and girls' internalizing problems (Brock & Kochanska, 2016)
 - Coverage of a longitudinal study that revealed parental divorce experienced prior to 7 years of age was linked to a lower level of the children's health through 50 years of age (Thomas & Hognas, 2015)
 - Description of recent research on non-residential fathers in divorced families that found high father-child involvement and low interparental conflict were linked to positive child outcomes (Flam & others, 2016)
 - Discussion of a recent study that found co-parenting following divorce was positively associated with better mental health and higher self-esteem and academic achievement (Lamela & Figueiredo, 2016)
 - Updated data on the percentage of gay and lesbian parents who are raising children
 - Inclusion of recent research that revealed no differences in the adjustment of school-aged children adopted in infancy by gay, lesbian, and heterosexual parents (Farr, 2017)
 - Description of a recent study of lesbian and gay adoptive families in which 98 percent of the parents reported their children had adjusted well to school (Farr, Oakley, & Ollen, 2017)
 - Update on the latest national survey of screen time indicating a dramatic shift to greater use of mobile devices by young children (Common Sense Media, 2013)
 - Coverage of a recent study of preschool children in which each additional hour of screen time was linked to less nightly sleep, later bedtime, and reduced likelihood of sleeping 10 or more hours per night (Xu & others, 2016)
 - Inclusion of a recent research review that concluded higher screen time was associated with a lower level of cognitive development in early childhood (Carson & others, 2015)

- Coverage of recent research on children in which higher viewing of TV violence, video game violence, and music video violence was independently associated with a higher level of physical aggression (Coker & others, 2015)
- Inclusion of recent research with 2- to 6-year-olds that indicated increased TV viewing on weekends was associated with a higher risk of being overweight or obese (Kondolot & others, 2017)
- New entry in Resources, *Parents and Digital Technologies* by Suzie Hayman and John Coleman, which provides excellent strategies parents can use to communicate more effectively with children about technology, as well as establish boundaries

Chapter 11: Physical Development in Middle and Late Childhood

- Description of a 14-year longitudinal study in which parental weight gain predicted children's weight change (Andriani, Liao, & Kuo, 2015)
- Coverage of a study that found both a larger waist circumference and a higher body mass index (BMI) combined to place children at higher risk for developing cardiovascular disease (de Koning & others, 2015)
- Discussion of a recent study of elementary school children that revealed 55 minutes or more of daily moderate-to-vigorous physical activity was associated with a lower incidence of obesity (Nemet, 2016)
- Description of a recent meta-analysis that found children who engage in regular physical activity have better cognitive inhibitory control (Jackson & others, 2016)
- Inclusion of recent research on 7- to 9-year-olds that found participating for approximately one year in organized leisure sports was linked to decreased cardiovascular risk (Hebert & others, 2017)
- Updated data on the percentage of 6- to 11-year-old U.S. children who are obese (Ogden & others, 2016)
- Inclusion of a recent Japanese study that revealed the highest incidence of overweight/obesity in children was linked to a family pattern of irregular mealtimes and high amounts of screen time for both parents (Watanabe & others, 2016)
- Discussion of a recent study in which children were less likely to be obese or overweight when they attended schools in states that had a strong policy implementation on healthy food and beverage (Datar & Nicosia, 2017)
- Coverage of a recent research review that concluded the elementary school programs that emphasized increased physical activity, decreased intake of sugar-sweetened beverages, and increased fruit intake were the most effective in reducing BMI measurements in children (Brown & others, 2016)
- Updated research on the Bogalusa Health Study, including these two studies: (1) body fatness and elevated blood pressure beginning in childhood were linked to premature death from coronary heart disease in adulthood (Berenson & others, 2016), and (2) secondhand smoke exposure in childhood was

- associated with increased carotid artery thickness in adulthood (Chen & others, 2015)
- Updated statistics on the percentage of U.S. children who have different types of disabilities and updated version of Figure 4 (National Center for Education Statistics, 2016)
 - Updated statistics on the percentage of U.S. children who have ever been diagnosed with ADHD (Centers for Disease Control and Prevention, 2016)
 - New research that revealed the dopamine transporter gene DAT 1 was involved in decreased cortical thickness in the prefrontal cortex of children with ADHD (Fernandez-Jaen & others, 2015)
 - Description of a recent research review that found girls with ADHD had more problematic peer relations than typically developing girls in a number of areas (Kok & others, 2016)
 - Coverage of a recent research review that concluded ADHD in childhood is linked to a number of long-term outcomes (Erksine & others, 2016)
 - Discussion of a recent study that found childhood ADHD was associated with long-term underachievement in math and reading (Voigt & others, 2017)
 - Coverage of a recent research review that concluded stimulant medications are effective in treating children with ADHD in the short term, but that long-term benefits of such medications are not clear (Rajeh & others, 2017)
 - Inclusion of recent research in which a higher level of physical activity in adolescence was linked to a lower level of ADHD in emerging adulthood (Rommel & others, 2015)
 - Description of a recent meta-analysis that concluded that short-term aerobic exercise is effective in reducing symptoms such as inattention, hyperactivity, and impulsivity (Cerillo-Urbina & others, 2015)
 - Inclusion of a recent meta-analysis that concluded physical exercise is effective in reducing cognitive symptoms of ADHD in individuals 3 to 25 years of age (Tan, Pooley, & Speelman, 2016)
 - Coverage of a recent meta-analysis in which exercise was associated with better executive function in children with ADHD (Vysniauske & others, 2017)
 - Discussion of a recent meta-analysis in which mindfulness training significantly improved the attention of children with ADHD (Cairncross & Miller, 2016)
 - Inclusion of new content on how 3-D printing and haptic devices provide important technology support for students with visual impairments (Pawluck & others, 2015)
 - Updated data on the increasing percentage of children who are diagnosed with autism spectrum disorders (Christensen & others, 2016)
 - Description of a recent study in which an 8-week yoga program improved the sustained attention of children with ADHD (Chou & Huang, 2017)
 - Inclusion of a recent study that revealed a lower level of working memory was the executive function most strongly associated with autism spectrum disorders (Ziermans & others, 2017)
 - New coverage of two recent surveys in which only a minority of parents reported that their child's autism spectrum disorder was identified prior to 3 years of age and that one-third to one-half of the cases were identified after 6 years of age (Sheldrick, Maye, & Carter, 2017)
 - Update on the percentage of children with a disability who spend time in a regular classroom (*Condition of Education*, 2015).
 - New entry in Resources, *Routledge Handbook of Talent Identification and Development in Sport* edited by Joseph Baker and others (2017), which provides extensive information and positive strategies for helping parents become more effective in raising children who are talented in sports; includes chapters on family influences and creating optimal sports environments

Chapter 12: Cognitive Development in Middle and Late Childhood

- Expanded and updated coverage of Alan Baddeley's important concept of working memory, including coverage of its link to improving many aspects of children's cognitive and academic development (Gerst & others, 2016; Peng & Fuchs, 2016)
- Description of recent research indicating that working memory develops slowly; for example, even by 8 years of age, children can hold in memory only half the items that adults can remember (Kharitonova, Winter, & Sheridan, 2015)
- Discussion of a recent study in which children's verbal working memory was linked to these aspects of both first and second language learners: morphology, syntax, and grammar (Verhagen & Leseman, 2016)
- Expansion of the activities that improve executive function to include scaffolding of self-regulation (Bodrova & Leong, 2015)
- Coverage of recent research in which mindfulness training improved children's attention and self-regulation (Poehlmann-Tynan & others, 2016), achievement (Singh & others, 2016), and coping strategies in stressful situations (Dariotis & others, 2016)
- Description of two recent studies that found mindfulness training reduced public school teachers' stress, improved their mood at school and at home, and produced better sleep (Crain, Schonert-Reichl, & Roeser, 2016; Taylor & others, 2016)
- Description of the most recent revision of the Wechsler Intelligence Scale for Children—V, and its increased number of subtests and composite scores (Canivez, Watkins, & Dombrowski, 2017)
- Description of a recent meta-analysis that revealed a correlation of +.54 between intelligence and school grades (Roth & others, 2015)

- Coverage of recent research that found a significant link between children's general intelligence and their self-control (Meldrum & others, 2017)
- Discussion of a recent two-year intervention study with families living in poverty in which maternal scaffolding and positive home stimulation improved young children's intellectual functioning (Obradovic & others, 2016)
- New content on stereotype threat in the section on cultural bias in intelligence tests (Pennington & others, 2016; Spencer, Logel, & Davies, 2016)
- Description of a recent study using Stanford Binet intelligence scales that found no differences between non-Latino White and African American preschool children when they were matched for age, gender, and level of parent education (Dale & others, 2014)
- Coverage of a recent analysis that concluded the underrepresentation of African Americans in STEM subjects and careers is linked to practitioners' expectations that they have less innate talent than non-Latino Whites (Leslie & others, 2015)
- Update on the percentage of U.S. students who are classified as gifted (National Association for Gifted Children, 2017)
- New description of how children who are gifted excel in various aspects of processing information (Ambrose & Sternberg, 2016a, b)
- Discussion of a recent study that revealed parents and teachers rated elementary school children who are not gifted as having more emotional and behavioral problems than children who are gifted (Eklund & others, 2015)
- New content on the importance of encouraging students to monitor their writing progress (Fidalgo, Harris, & Braaksma, 2016)
- Discussion of a recent strategy intervention with struggling second-grade writers and their teachers that provided positive results for a number of writing outcomes (Harris, Graham, & Atkins, 2015)
- Revised and updated content on bilingualism, including information about whether infants and young children benefit from learning two languages simultaneously (Bialystok, 2014, 2015)
- Coverage of a recent study of 6- to 10-year-old children that found early bilingual exposure was a key factor in bilingual children outperforming monolingual children on phonological awareness and word learning (Jasinska & Petitto, 2017)
- Discussion of research that documented bilingual children were better at theory of mind tasks than were monolingual children (Rubio-Fernandez, 2016)
- New description of the rate at which bilingual and monolingual children learn language(s) (Hoff, 2015) and inclusion of a recent study that found by 4 years of age children who continued to learn both Spanish and English had a total vocabulary growth that was greater than that of monolingual children (Hoff & others, 2014)
- Description of a recent study of minority low-SES youth that found their intrinsic motivation (but not their extrinsic motivation) predicted their intention to pursue a health-science-related career (Boekeloo & others, 2015)
- New coverage of contextual factors that influence students' interest and achievement motivation (Linnenbrink-Garcia & Patall, 2016)
- Revisions to the discussion of achievement based on feedback from leading expert Carol Dweck
- Inclusion of recent research that found students from lower-income families were less likely to have a growth mindset than were students from wealthier families but the achievement of students from lower-income families was more likely to be protected if they had a growth mindset (Claro, Paunesku, & Dweck, 2016)
- New coverage of a recent research review that concluded increases in family income for children in poverty were linked to increased achievement in middle school as well as higher educational attainment in adolescence and emerging adulthood (Duncan, Magnuson, & Votruba-Drzal, 2017)
- Updated data on U.S. students' math and science achievement in comparison with their counterparts in other countries (Desilver, 2017; PISA, 2015; TIMMS, 2015)
- Discussion of a recent study in China that found young adolescents with authoritative parents showed better adjustment than their counterparts with authoritarian parents (Zhang & others, 2017)
- New entry in Resources, *Motivation at School*, edited by Kathryn Wentzel and David Miele (2016), which explores many aspects of schools that influence students' achievement

Chapter 13: Socioemotional Development in Middle and Late Childhood

- New description of recent research studies indicating that children and adolescents who do not have good perspective-taking skills are more likely to have difficulty in peer relations and engage in more aggressive and oppositional behavior (Morosan & others, 2017; Nilsen & Basco, 2017; O'Kearney & others, 2017)
- Inclusion of a longitudinal study that revealed the quality of children's home environment (which involved assessment of parenting quality, cognitive stimulation, and the physical home environment) was linked to their self-esteem in early adulthood (Orth, 2017)
- Inclusion of recent research in which higher levels of self-control at 4 years of age were linked to improvements in math and reading achievement in the early elementary school years for children living predominantly in rural and low-income contexts (Blair & others, 2015)
- New description of an app that is effective in improving children's self-control: www.selfregulationstation.com/sr-ipad-app/

- New content on how during middle and late childhood, as part of their understanding of emotions, children can engage in “mental time travel,” in which they anticipate and recall the cognitive and emotional aspects of events (Hjortsvang & Lagattuta, 2017; Kramer & Lagattuta, 2018; Lagattuta, 2014a, b)
- New section, “Social-Emotional Education Programs,” that describes two increasingly implemented programs: (1) Second Step (Committee for Children, 2017) and (2) Collaborative for Academic, Social, and Emotional Learning (CASEL, 2017)
- New commentary on how children who have developed a number of coping techniques have the best chance of adapting and functioning competently in the face of disasters and traumas (Ungar, 2015)
- New section on Jonathan Haidt’s (2013, 2017) criticism of Kohlberg’s view of moral reasoning as always conscious and deliberate, and his lack of attention to the automatic, intuitive precursors of moral reasoning
- New section on criticism of Kohlberg’s theory of moral development for not giving adequate attention to emotional influences (Gui, Gan, & Liu, 2016)
- Expanded and updated discussion of Darcia Narváez’s view on how we need to make better progress in dealing with an increasing array of temptations and possible wrongdoings in a human social world in which complexity is accumulating over time (Christen, Narváez, & Gutzwiller, 2017)
- New commentary added about research indicating that young children’s gender-typing is often rigid but becomes more flexible in middle and late childhood (Halim & others, 2016). Also, in some studies, girls’ gender-typing becomes more flexible than boys’ (Miller & others, 2009).
- New commentary about the multiple factors that may contribute to gender differences in academic achievement in areas such as reading and math (Wentzel & Miele, 2016)
- Inclusion of information from a meta-analysis in which females are better than males at recognizing nonverbal displays of emotion (Thompson & Voyer, 2014)
- Inclusion of recent research with eighth-grade students in 36 countries that revealed girls had more egalitarian attitudes about gender roles than did boys (Dotti Sani & Quaranta, 2017)
- New content on peer rejection being consistently linked to the development and maintenance of conduct problems (Chen, Drabick, & Burgers, 2015)
- Coverage of a recent study of young adolescents in which peer rejection predicted increases in aggressive and rule-breaking behavior (Janssens & others, 2017)
- Substantial expansion and updating of bullying and cyberbullying (Hall, 2017; Muijs, 2017; Zarate-Garza & others, 2017)
- Discussion of a recent analysis that concluded bullying can have long-term effects, including difficulty in establishing long-term relationships and difficulties at work (Wolke & Lereya, 2015)
- Description of a longitudinal study that revealed children who were bullied at 6 years of age were more likely to have excess weight gain when they were 12 to 13 years old (Sutin & others, 2016)
- Inclusion of a longitudinal study that revealed being a victim of bullying in childhood was linked to increased use of mental health services five decades later (Evans-Lacko & others, 2017)
- Description of recent longitudinal studies that indicated victims bullied in childhood and adolescence have higher rates of agoraphobia, depression, anxiety, panic disorder, and suicidality in their early to mid-twenties (Arseneault, 2017; Copeland & others, 2013)
- Coverage of recent research in which adolescents who were bullied in both a direct way and through cyberbullying had more behavioral problems and lower self-esteem than their counterparts who were bullied in only one of these ways (Wolke, Lee, & Guy, 2017)
- Description of a recent teacher intervention in elementary and secondary schools to decrease bullying that focused on increasing bullies’ empathy and condemning their behavior; the intervention was effective in increasing the bullies’ intent to stop bullying, but blaming the bully had no effect (Garandeau & others, 2016)
- New research review that found anti-bullying interventions that focused on the whole school, such as Olweus’, were more effective than interventions involving classroom curricula or social skills training (Cantone & others, 2015)
- New content on the *Every Student Succeeds Act (ESSA)* that became U.S. law in December 2015 (Rothman, 2016). This law replaces *No Child Left Behind* and while not totally eliminating state standards for testing students, reduces their influence. Also, a 2017 update on ESSA with the Trump administration planning to go forward with ESSA but giving states much more flexibility in its implementation (Klein, 2017).
- Coverage of a recent intervention (City Connects program) with first-generation immigrant children attending high-poverty schools that was successful in improving the children’s reading and math skills (Dearing & others, 2016)
- New entry in Resources; *The African American Child* (2nd ed.) by Yvette Harris and James Graham (2014), which provides valuable knowledge about African American children and their families in many different contexts
- New entry in Resources, *Cyberbullying and the Wild, Wild Web* by J.A. Hitchcock (2016), which provides excellent advice about preventing cyberbullying and what to do if it happens

Chapter 14: Physical Development in Adolescence

- Inclusion of a recent study of Chinese girls that confirmed childhood obesity contributed to an earlier onset of puberty (Zhai & others, 2015)

- Description of a recent study that revealed child sexual abuse was linked to earlier pubertal onset (Noll & others, 2017)
- Description of a recent research review that concluded there is insufficient quality research to confirm that changing testosterone levels in puberty are linked to adolescent males' mood and behavior (Duke, Glazer, & Steinbeck, 2014)
- Coverage of a recent Korean study in which early menarche was associated with risky sexual behavior in females (Cheong & others, 2015)
- Inclusion of a recent study that found early maturation predicted a stable higher level of depression for adolescent girls (Rudolph & others, 2014)
- New research indicating that early-maturing girls are at increased risk for physical and verbal abuse in dating (Chen, Rothman, & Jaffee, 2017)
- Discussion of a recent study that revealed early-maturing Chinese boys and girls engaged in delinquency more than their on-time or late-maturing counterparts (Chen & others, 2015)
- New summary of the influence of early and late maturation on adolescent development
- New discussion of neurotransmitter changes in adolescence, focusing especially on an increase in dopamine production (Monahan & others, 2016)
- Coverage of a longitudinal study that found 11- to 18-year-olds who lived in poverty conditions had diminished brain functioning at 25 years of age (Brody & others, 2017). However, those adolescents whose families participated in a supportive parenting intervention did not show this diminished brain functioning.
- New discussion of two recent studies of sexting, one indicating the frequency of sexting by high school students (Strassberg, Cann, & Velarde, 2017), the other documenting that for Latino adolescents, sexting is associated with engaging in oral, vaginal, and anal sex (Romo & others, 2017)
- Updated data on the occurrence of various sexual activities among adolescents according to age, gender, and ethnicity, including updates for Figures 5 and 6 (Kann & others, 2016a)
- New commentary that while the majority of sexual minority adolescents have competent and successful developmental paths through adolescence, a recent large-scale study revealed that sexual minority youth engage in a higher prevalence of health-risk factors than youth who are not part of a sexual minority group (Kann & others, 2016b)
- Updated data on the percentage of adolescent males and females who engage in oral sex (Child Trends, 2015)
- Description of a recent study that found early sexual debut was associated with a number of problems, including sexual risk taking, substance use, violent victimization, and suicidal thoughts and attempts in both sexual minority and heterosexual adolescents (Lowry & others, 2017)
- Discussion of a recent study of Korean girls in which early menarche was associated with earlier initiation of sexual intercourse (Kim & others, 2017)
- Description of a recent Swedish study of more than 3,000 adolescents indicating that sexual intercourse prior to age 14 was linked to a number of risky sexual behaviors at age 18 (Kastbom & others, 2015)
- Inclusion of recent research in which adolescents who in the eighth grade reported greater parental knowledge and more rules about dating were less likely to initiate sex between the eighth and tenth grades (Ethier & others, 2016)
- Discussion of a recent study of parenting practices that found the factor that best predicted a lower level of risky sexual behavior by adolescents was supportive parenting (Simons & others, 2016)
- New research indicating that adolescent males who play sports engage in more risky sexual behavior, while adolescent females who play sports engage in less risky sexual behavior (Lipowski & others, 2016)
- Updated data on the percentage of adolescents who use contraceptives when they have sexual intercourse (Kann & others, 2016)
- Important new section on the increasing number of medical organizations and experts who have recently recommended that adolescents use long-acting reversible contraception (LARC), which consists of intrauterine devices (IUDs) and contraceptive implants (Diedrich, Klein, & Peipert, 2017; Society for Adolescent Medicine, 2017)
- Updated data on the ongoing substantial decrease in adolescent pregnancy rates in the United States, especially among Latinas and African Americans (Martin, Hamilton, & Osterman, 2015)
- Inclusion of a recent cross-cultural study of adolescent pregnancy rates in 21 countries (Sedgh & others, 2015)
- Discussion of a recent study in which a higher level of education for adolescent mothers improved the achievement of their children through the eighth grade (Tang & others, 2016)
- Coverage of a recent study of long-term life outcomes for African American teen versus nonteen mothers and fathers in a number of areas (Assini-Meytim & Green, 2015)
- New research on factors linked to repeated adolescent pregnancy (Dee & others, 2017; Maravilla & others, 2017)
- Updated commentary on recent concerns about increased government funding of abstinence-only sexual education programs (Donovan, 2017)
- Updated data on the percentage of U.S. adolescents who are obese (Centers for Disease Control and Prevention, 2015)
- Description of a recent study in which participation in family meals during adolescence reduced the likelihood of becoming overweight or obese in adulthood (Berge & others, 2015)
- New research indicating that having an increase in Facebook friends across two years in adolescence was

- linked to an enhanced motivation to be thin (Tiggemann & Slater, 2017)
- Updated national data on adolescents' exercise patterns, including gender and ethnic variations (Kann & others, 2016)
 - Updated data on significant gender differences in exercise during adolescence, with females exercising far less than males (YRBSS, 2016)
 - Coverage of recent research indicating that a combination of regular exercise and a diet plan results in weight loss and enhanced executive function in adolescents (Xie & others, 2017)
 - Inclusion of recent research in which an exercise program of 180 minutes per week improved the sleep patterns of obese adolescents (Mendelson & others, 2016)
 - Discussion of a recent study in which a high-intensity exercise program decreased depressive symptoms and improved the moods of depressed adolescents (Carter & others, 2016)
 - Description of a recent research review that identified memory as the cognitive factor that was most often improved by exercise in adolescence (Li & others, 2017)
 - Coverage of a large-scale study of more than 270,000 adolescents from 1991–2012 that found adolescents have been decreasing the amount of sleep they get in recent years (Keyes & others, 2015)
 - Description of recent Swedish studies of 16- to 19-year-olds in which shorter sleep duration was associated with a greater likelihood of school absences, and shorter sleep duration and sleep deficits were linked to having a lower grade point average (Hysing & others, 2015, 2016)
 - Discussion of a recent experimental study in which restricting adolescents' sleep to five hours for five nights and then restoring it to ten hours for two nights negatively affected their sustained attention, especially in the early morning (Agostini & others, 2017)
 - Inclusion of a recent national study of more than 10,000 13- to 18-year-olds that found a number of factors involving sleep timing and duration were associated with increased rates of anxiety, mood, substance abuse, and behavioral disorders (Zhang & others, 2017)
 - Coverage of a longitudinal study of adolescents in which poor sleep patterns were linked to an increased likelihood of drinking alcohol and using marijuana four years later (Miller, Janssen, & Jackson, 2017)
 - Discussion of a recent study that revealed early school start times were linked to a higher vehicle crash rate by adolescent drivers (Vorona & others, 2014)
 - Inclusion of the recent recommendation by the American Academy of Pediatrics that schools institute start times from 8:30 to 9:30 a.m. to improve students' academic performance and quality of life (Adolescent Sleep Working Group, AAP, 2014)
 - Updated coverage of the Monitoring the Future study's assessment of drug use by secondary school students, with 2016 data on U.S. eighth-, tenth-, and twelfth-graders (Johnston & others, 2017)
 - New content on e-cigarette use by adolescents, which now surpasses traditional cigarette smoking among eighth-, tenth-, and twelfth-grade students (Johnston & others, 2017)
 - Description of a longitudinal study in which earlier age at first use of alcohol was linked to increased risk of heavy alcohol use in early adulthood (Liang & Chikritzhs, 2015)
 - New research that revealed early- and rapid-onset trajectories of alcohol, marijuana, and substance use were associated with substance use in early adulthood (Nelson, Van Ryzin, & Dishion, 2015)
 - New website entry in Resources, <http://kidshealth.org/en/parents/adolescence.html#>, which provides excellent advice for parents, helping them understand, guide, and converse with teens about many topics, including puberty, sleep problems, body image, and drugs

Chapter 15: Cognitive Development in Adolescence

- New discussion of a recent meta-analysis that concluded greater use of social networking sites was linked to a higher level of narcissism (Gnambs & Appel, 2017)
- Revised discussion of information processing in adolescence based on recommendations by leading expert Valerie Reyna
- Coverage of a recent study that found adolescent binge drinkers had working memory deficits (Carbia & others, 2017)
- Discussion of a recent study in which adolescents took greater risks when they were with three same-aged peers than when they were alone (Silva, Chein, & Steinberg, 2016)
- Updated coverage of the fuzzy-trace theory dual-process model of adolescent decision making (Brust-Renck & others, 2017; Reyna & others, 2015; Reyna & Zayas, 2014)
- Inclusion of information about a recent experiment that showed encouraging gist-based thinking about risks (along with factual information) reduced self-reported risk taking up to one year after exposure to the curriculum (Reyna & Mills, 2014)
- Updated data on the goals of first-year college students in relation to the relative importance they assign to developing a meaningful philosophy of life versus becoming very well off financially (Eagan & others, 2016)
- Coverage of a recent study of young adolescent Chinese students that revealed engaging in more gratitude was associated with higher well-being at school (Ekema-Agbaw, McCutchen, & Geller, 2016)
- Description of a recent study that revealed adolescents who had a lower level of spirituality were more likely to engage in substance use (Debnam & others, 2016)
- Discussion of recent research on African American adolescent girls that found those who reported that religion was of low or moderate importance to them had an earlier sexual debut than did their counterparts who indicated that religion

- was extremely important to them (George Dalmida & others, 2017)
- New content on why the transition to high school may produce problems for students (Eccles & Roeser, 2015)
- Updated data on school dropouts, including the dramatic decrease in dropout rates for Latino adolescents in recent years (National Center for Education Statistics, 2016)
- Inclusion of new information on the Bill and Melinda Gates Foundation's (2011, 2016) funding of a new generation of digital courseware to improve students' learning
- Updates on the expansion of "I Have a Dream" programs to 28 states plus Washington, DC, and New Zealand ("I Have a Dream Foundation," 2017)
- Coverage of recent research in which immigrant adolescents who participated in extracurricular activities improved their academic achievement and increased their school engagement (Camacho & Fuligni, 2015)
- Discussion of a recent Australian study that found participation in extracurricular activities during the eighth grade was linked to a lower likelihood of binge drinking through the eleventh grade (Modecki, Barber, & Eccles, 2014)

Chapter 16: Socioemotional Development in Adolescence

- Revisions based on recommendations from leading expert Kate McLean
- New coverage of the narrative approach to identity, which involves having individuals tell their life stories and evaluate the extent to which the stories are meaningful and integrated (Adler & others, 2017; Maher, Winston, & Ur, 2017)
- Inclusion of a recent study that examined identity domains using both identity status and narrative approaches with the interpersonal domain (especially dating and friendship aspects) frequently mentioned (McLean & others, 2016). In the narrative approach, family stories were common.
- Coverage of two recent studies that found a strong and positive ethnic identity was linked to a lower incidence of substance abuse and psychiatric problems (Anglin & others, 2017; Grindal & Nieri, 2016)
- New discussion of recent longitudinal studies that revealed the ethnic identity of adolescents is influenced by positive and diverse friendships (Rivas-Drake & others, 2017; Santos & others, 2017)
- New main section on gender classification
- Changes in the discussion of gender based on feedback from leading expert Stephanie Budge
- New coverage of the gender classification category of transgender (Budge & others, 2017; Moradi & others, 2016; Savin-Williams, 2017)
- Inclusion of a recent research review that concluded transgender youth are more likely to have depression, suicide attempts, and eating disorders than their non-transgender peers (Connolly & others, 2016). This discussion also

highlights some of the reasons for the higher rate of these disorders in transgender individuals (Zucker, Lawrence, & Kreukels, 2016).

- Inclusion of recent research with fifth- to eighth-graders in which higher grades were associated with a higher level of parental monitoring (Top, Liew, & Luo, 2017)
- Description of recent research in which higher parental monitoring reduced negative peer influence on adolescent risk-taking (Wang & others, 2016)
- Coverage of a recent meta-analysis that found a higher level of parental monitoring and rule enforcement were linked to later initiation of sexual intercourse and increased use of condoms by adolescents (Dittus & others, 2016)
- New research on 10- to 18-year-olds in which lower disclosure to parents was linked to antisocial behavior (Chriss & others, 2015)
- Description of recent research that found snooping was a relatively infrequent parental monitoring technique (compared with solicitation and control) but was a better indicator of problems in adolescent and family functioning (Hawk, Becht, & Branje, 2016)
- Inclusion of a recent study that revealed from 16 to 20 years of age, adolescents perceived that they had increasing independence and a better relationship with their parents (Hadiwijaya & others, 2017)
- Coverage of a recent study that revealed insecure attachment to mothers was linked to becoming depressed and remaining depressed at 15 to 20 years of age (Agerup & others, 2015)
- Discussion of a recent study of Latino families that revealed a higher level of secure attachment with mothers during adolescence was linked to a lower level of heavy drug use (Gattamorta & others, 2017)
- New research of a longitudinal study that found a secure base of attachment knowledge in adolescence and emerging adulthood was predicted by observations of maternal sensitivity across childhood and adolescence (Waters, Ruiz, & Roisman, 2017)
- Coverage of recent research indicating that most adolescents have a fairly stable attachment style but that attachment stability increases in adulthood (Jones & others, 2017). Also in this study, family conflict and parental separation/divorce were likely candidates for undermining attachment stability.
- Description of a study in which high levels of parent-adolescent conflict were associated with lower levels of empathy across a six-year period (Van Lissa & others, 2015)
- Inclusion of a recent study that found higher levels of parent-adolescent conflict were linked to higher anxiety, depression, and aggression, and lower self-esteem (Smokowski & others, 2017)
- New research on Chinese American families that revealed parent-adolescent conflict was linked to a sense of alienation between parents and adolescents, which in turn was related to more depressive symptoms,

- delinquent behavior, and lower academic achievement (Hou, Kim, & Wang, 2016)
- Discussion of a recent study that found boys were more likely to be influenced by peer pressure involving sexual behavior than were girls (Widman & others, 2016)
 - Coverage of a recent research review that concluded good peer relationships were an important factor in achieving a positive identity (Rageliené, 2016)
 - Description of recent research in which adolescents adapted their smoking and drinking behavior to reflect that of their best friends (Wang & others, 2016b)
 - Inclusion of recent research on adolescent girls that found friends' dieting predicted whether adolescent girls would engage in dieting or extreme dieting (Balantekin, Birch, & Savage, 2017)
 - Discussion of a recent study that found friendship quality was linked to the quality of romantic relationships in adolescence (Kochendorfer & Kerns, 2017)
 - Inclusion of recent research in which having a supportive romantic relationship in adolescence was linked with positive outcomes for adolescents who had a negative relationship with their mother (Szwedo, Hessel, & Allen, 2017)
 - Discussion of recent research that revealed mother-daughter conflict in Mexican American families was linked to an increase in daughters' romantic involvement (Tyrell & others, 2016)
 - Description of a recent study comparing Asian, Latino, and non-Latino immigrant adolescents in which immigrant Asian adolescents had the highest level of depression, lowest self-esteem, and experienced the most discrimination (Lo & others, 2017)
 - Inclusion of a recent research review in which a higher level of media multitasking was linked to lower levels of school achievement, executive function, and growth mindset in adolescents (Cain & others, 2016)
 - Discussion of a recent study in which heavy media multitaskers were less likely to delay gratification and more likely to endorse intuitive, but wrong, answers on a cognitive reflection task (Schutten, Stokes, & Arnell, 2017)
 - Coverage of recent research that found less screen time was linked to adolescents' better health-related quality of life (Wang & others, 2016a) and that a higher level of social media use was associated with a higher level of heavy drinking by adolescents (Brunborg, Andreas, & Kvaavik, 2017)
 - Updated data on the percentage of adolescents who use social networking sites and engage in text messaging daily (Lenhart, 2015a, b)
 - New content indicating that at 12 years of age, 5.2 percent of females and 2 percent of males had experienced first-onset depression (Breslau & others, 2017). Also in this study, the cumulative incidence of depression from 12 to 17 years of age was 36 percent for females and 14 percent for boys.
 - Inclusion of a recent study that revealed adolescents who were isolated from their peers and whose caregivers emotionally neglected them were at significant risk for developing depression (Christ, Kwak, & Lu, 2017)

- Inclusion of recent research in which both depression and hopelessness were predictors of whether adolescents would repeat a suicide attempt across a six-month period (Consoli & others, 2015)
- Description of two recent studies that revealed maltreatment during childhood was linked with suicide attempts in adulthood (Park, 2017; Turner & others, 2017)
- Coverage of a recent study that found child maltreatment was linked to adolescent suicide attempts (Hadland & others, 2015)
- New research in which a lower level of school connectedness was associated with increased suicidal ideation in female and male adolescents, and with suicide attempts by female adolescents (Langille & others, 2015)
- New coverage of the most recent research on the Fast Track program in which one-third of its reduction in later crime outcomes in emerging adulthood was accounted for by improvements in social and self-regulation skills at 6 to 11 years of age (Sorensen, Dodge, and the Conduct Problems Prevention Research Group, 2016)
- New entry in Resources, *Age of Opportunity* by Laurence Steinberg (2014), which provides valuable information for parents, teachers, and other adults who work with adolescents

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As I develop a new edition of this text, I consult with leading experts in their respective areas of child and adolescent development. Their invaluable feedback ensures that the latest research, understandings, and perspectives are presented throughout the text. Their willingness to devote their time and expertise to this endeavor is greatly appreciated. Coverage of the Expert Consultants who contributed to this edition, along with their biographies and commentary, can be found on pages xii–xiii.

REVIEWERS

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chapter 6



COGNITIVE DEVELOPMENT IN INFANCY

chapter outline

① What Is Piaget's Theory of Infant Development?

Learning Goal 1 Summarize and evaluate Piaget's theory of infant development.

Cognitive Processes
The Sensorimotor Stage
Evaluating Piaget's Sensorimotor Stage

② How Do Infants Learn, Remember, and Conceptualize?

Learning Goal 2 Describe how infants learn, remember, and conceptualize.

Conditioning
Attention
Memory
Imitation
Concept Formation

③ How Are Individual Differences in Infancy Assessed, and Do These Assessments Predict Intelligence?

Learning Goal 3 Discuss infant assessment measures and the prediction of intelligence.

Measures of Infant Development
Predicting Intelligence

④ What Is the Nature of Language, and How Does It Develop in Infancy?

Learning Goal 4 Describe the nature of language and how it develops in infancy.

Defining Language
Language's Rule Systems
How Language Develops
Biological and Environmental Influences
An Interactionist View

Jean Piaget, the famous Swiss psychologist, was a meticulous observer of his three children: Laurent, Lucienne, and Jacqueline. His books on cognitive development are filled with these observations. Here are a few of Piaget's observations of his children in infancy (Piaget, 1952):

- At 21 days of age, "Laurent found his thumb after three attempts: prolonged sucking begins each time. But, once he has been placed on his back, he does not know how to coordinate the movement of the arms with that of the mouth and his hands draw back even when his lips are seeking them" (p. 27).
- "During the third month, thumb sucking becomes less important to Laurent because of new visual and auditory interests. But, when he cries, his thumb goes to the rescue."
- Toward the end of Lucienne's fourth month, while she is lying in her crib, Piaget hangs a doll above her feet. Lucienne thrusts her feet at the doll and makes it move. "Afterward, she looks at her motionless foot for a second, then recommences. There is no visual control of her foot, for the movements are the same when Lucienne only looks at the doll or when I place the doll over her head. On the other hand, the tactile control of the foot is apparent: after the first shakes, Lucienne makes slow foot movements as though to grasp and explore" (p. 159).
- At 11 months, "Jacqueline is seated and shakes a little bell. She then pauses abruptly in order to delicately place the bell in front of her right foot; then she kicks hard. Unable to recapture it, she grasps a ball which she then places at the same spot in order to give it another kick" (p. 225).
- At 1 year, 2 months, "Jacqueline holds in her hands an object which is new to her: a round, flat box which she turns all over, shakes, [and] rubs against the bassinet. . . . She lets it go and tries to pick it up. But she only succeeds in touching it with her index finger, without grasping it. She nevertheless makes an attempt and presses on the edge. The box then tilts up and falls again" (p. 273). Jacqueline shows an interest in this result and studies the fallen box.

topical connections *looking back*

Impressive advances occur in the development of the brain during infancy. Engaging in various physical, cognitive, and socioemotional activities strengthens the baby's neural connections. Motor and perceptual development also are key aspects of the infant's development. An important part of this development is the coupling of perceptions and actions. The nature-nurture issue continues to be debated in relation to the infant's perceptual development. In this chapter, you will build on your understanding of the infant's brain, motor, and perceptual development by further examining how infants develop their competencies, focusing on how advances in their cognitive development help them adapt to their world, and how the nature-nurture issue applies to the infant's cognitive and language development.

For Piaget, these observations reflect important changes in the infant's cognitive development. Piaget believed that infants go through a series of substages as they rapidly gain new skills during their first two years.

preview

Piaget's descriptions of infants are just the starting point for our exploration of cognitive development. Excitement and enthusiasm about the study of infant cognition have been fueled by an interest in what newborns and infants know, by continued fascination about innate and learned factors in the infant's cognitive development, and by controversies about whether infants construct their knowledge (Piaget's view) or know their world more directly. In this chapter, you will study not only Piaget's theory of infant development but also the development of learning, remembering, and conceptualizing by infants; individual differences in cognitive capabilities; and language development.

1 What Is Piaget's Theory of Infant Development?

LG1

Summarize and evaluate Piaget's theory of infant development.

Cognitive Processes

The Sensorimotor Stage

Evaluating Piaget's Sensorimotor Stage

We are born capable of learning.

—JEAN-JACQUES ROUSSEAU

Swiss-born French Philosopher, 18th Century



In Piaget's view, what is a scheme? What schemes might this young infant be displaying?

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schemes In Piaget's theory, actions or mental representations that organize knowledge.

Poet Nora Perry once asked, "Who knows the thoughts of a child?" As much as anyone, Piaget knew. Through careful observations of his own three children—Laurent, Lucienne, and Jacqueline—and observations of and interviews with other children, Piaget changed perceptions of the way children think about the world.

Piaget's theory is a general, unifying story of how biology and experience sculpt cognitive development. Piaget thought that just as our physical bodies have structures that enable us to adapt to the world, we build mental structures that help us to adapt to the world. Adaptation involves adjusting to new environmental demands. Piaget stressed that children actively construct their own cognitive worlds; information is not just poured into their minds from the environment. He sought to discover how children at different points in their development think about the world and how systematic changes in their thinking occur.

COGNITIVE PROCESSES

What processes do children use as they construct their knowledge of the world? Piaget developed several concepts to answer this question; especially important are schemes, assimilation, accommodation, organization, equilibrium, and equilibration.

Schemes As the infant or child seeks to construct an understanding of the world, said Piaget (1954), the developing brain creates **schemes**. These are actions or mental representations that organize knowledge. In Piaget's theory, behavioral schemes (physical activities) characterize infancy and mental schemes (cognitive activities) develop in childhood (Lamb, Bornstein, & Teti, 2002). A baby's schemes are structured by simple actions that can be performed on objects, such as sucking, looking, and grasping. Older children have schemes that include strategies and plans for solving problems. For example, in the descriptions at the opening of this chapter, Laurent displayed a scheme for sucking; Jacqueline displayed a scheme for investigating when she examined the box. By the time we have reached adulthood, we have constructed an enormous number of diverse schemes, ranging from driving a car to balancing a budget to understanding the concept of fairness.

Assimilation and Accommodation To explain how children use and adapt their schemes, Piaget offered two concepts: assimilation and accommodation. **Assimilation** occurs when children use their existing schemes to deal with new information or experiences.

Accommodation occurs when children adjust their schemes to take new information and experiences into account.

Think about a toddler who has learned the word *car* to identify the family's car. The toddler might call all moving vehicles on roads "cars," including motorcycles and trucks; the child has assimilated these objects to his or her existing scheme. But the child soon learns that motorcycles and trucks are not cars and fine-tunes the category to exclude motorcycles and trucks, thus accommodating the scheme.

Assimilation and accommodation operate even in very young infants. Newborns reflexively suck everything that touches their lips; they assimilate all sorts of objects into their sucking scheme. By sucking different objects, they learn about their taste, texture, shape, and so on. After several months of experience, though, they construct their understanding of the world differently. Some objects, such as fingers and the mother's breast, can be sucked, and others, such as fuzzy blankets, should not be sucked. In other words, they accommodate their sucking scheme.

Organization To make sense of their world, said Piaget, children cognitively organize their experiences. **Organization** in Piaget's theory is the grouping of isolated behaviors and thoughts into a higher-order system. Continual refinement of this organization is an inherent part of development. A boy who has only a vague idea about how to use a hammer may also have a vague idea about how to use other tools. After learning how to use each one, he relates these uses, organizing his knowledge.

Equilibration and Stages of Development Assimilation and accommodation always take the child to a higher ground, according to Piaget. In trying to understand the world, the child inevitably experiences cognitive conflict, or *disequilibrium*. That is, the child is constantly faced with counterexamples to his or her existing schemes and with inconsistencies. For example, if a child believes that pouring water from a short and wide container into a tall and narrow container changes the amount of water, then the child might be puzzled by where the "extra" water came from and whether there is actually more water to drink. The puzzle creates disequilibrium; for Piaget, an internal search for equilibrium creates motivation for change. The child assimilates and accommodates, adjusting old schemes, developing new schemes, and organizing and reorganizing the old and new schemes. Eventually, the organization is fundamentally different from the old organization; it is a new way of thinking.

In short, according to Piaget, children constantly assimilate and accommodate as they seek *equilibrium*. There is considerable movement between states of cognitive equilibrium and disequilibrium as assimilation and accommodation work in concert to produce cognitive change. **Equilibration** is the name Piaget gave to this mechanism by which children shift from one stage of thought to the next.

The result of these processes, according to Piaget, is that individuals go through four stages of development. A different way of understanding the world makes each stage more advanced than the one before it. Cognition is *qualitatively* different in one stage compared with another. In other words, the way children reason at one stage is different from the way they reason at another stage. In this chapter, our focus is on Piaget's stage of infant cognitive development. In later chapters, when we study cognitive development in early, middle, and late childhood, and in adolescence, we explore the last three Piagetian stages.

THE SENSORIMOTOR STAGE

The **sensorimotor stage** lasts from birth to about 2 years of age. In this stage, infants construct an understanding of the world by coordinating sensory experiences (such as seeing and hearing) with physical, motoric actions—hence the term "sensorimotor." At the beginning of this stage, newborns have little more than reflexes with which to work. At the end of the sensorimotor stage, 2-year-olds can produce complex sensorimotor patterns and use primitive symbols. We first summarize Piaget's descriptions of how infants develop. Later we consider criticisms of his view.

Substages Piaget divided the sensorimotor stage into six substages: (1) simple reflexes; (2) first habits and primary circular reactions; (3) secondary circular reactions; (4) coordination

developmental connection

Cognitive Theory

Recall the main characteristics of Piaget's four stages of cognitive development. Connect to "Introduction."

assimilation Piagetian concept involving incorporation of new information into existing schemes.

accommodation Piagetian concept of adjusting schemes to fit new information and experiences.

organization Piaget's concept of grouping isolated behaviors and thoughts into a higher-order system, a more smoothly functioning cognitive system.

equilibration A mechanism that Piaget proposed to explain how children shift from one stage of thought to the next.

sensorimotor stage The first of Piaget's stages, which lasts from birth to about 2 years of age, in which infants construct an understanding of the world by coordinating sensory experiences with motoric actions.

Substage	Age	Description	Example
1 Simple reflexes	Birth to 1 month	Coordination of sensation and action through reflexive behaviors.	Rooting, sucking, and grasping reflexes; newborns suck reflexively when their lips are touched.
2 First habits and primary circular reactions	1 to 4 months	Coordination of sensation and two types of schemes: habits (reflex) and primary circular reactions (reproduction of an event that initially occurred by chance). Main focus is still on the infant's body.	Repeating a body sensation first experienced by chance (sucking thumb, for example); then infants might accommodate actions by sucking their thumb differently from how they suck on a nipple.
3 Secondary circular reactions	4 to 8 months	Infants become more object-oriented, moving beyond self-preoccupation; repeat actions that bring interesting or pleasurable results.	An infant coos to make a person stay near; as the person starts to leave, the infant coos again.
4 Coordination of secondary circular reactions	8 to 12 months	Coordination of vision and touch—hand-eye coordination; coordination of schemes and intentionality.	Infant manipulates a stick in order to bring an attractive toy within reach.
5 Tertiary circular reactions, novelty, and curiosity	12 to 18 months	Infants become intrigued by the many properties of objects and by the many things they can make happen to objects; they experiment with new behavior.	A block can be made to fall, spin, hit another object, and slide across the ground.
6 Internalization of schemes	18 to 24 months	Infants develop the ability to use primitive symbols and form enduring mental representations.	An infant who has never thrown a temper tantrum before sees a playmate throw a tantrum; the infant retains a memory of the event, then throws one himself the next day.

FIGURE 1
PIAGET'S SIX SUBSTAGES OF SENSORIMOTOR DEVELOPMENT



This 7-month-old is in Piaget's substage of secondary circular reactions. *What might the infant do to suggest he is in this substage?*

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simple reflexes Piaget's first sensorimotor substage, which corresponds to the first month after birth. In this substage, sensation and action are coordinated primarily through reflexive behaviors.

first habits and primary circular reactions Piaget's second sensorimotor substage, which develops between 1 and 4 months of age. In this substage, the infant coordinates sensation and two types of schemes: habits and primary circular reactions.

primary circular reaction A scheme based on the attempt to reproduce an event that initially occurred by chance.

of secondary circular reactions; (5) tertiary circular reactions, novelty, and curiosity; and (6) internalization of schemes (see Figure 1).

Simple reflexes, the first sensorimotor substage, correspond to the first month after birth. In this substage, sensation and action are coordinated primarily through reflexive behaviors such as rooting and sucking. Soon the infant produces behaviors that resemble reflexes in the absence of the usual stimulus for the reflex. For example, a newborn will suck a nipple or bottle only when it is placed directly in the baby's mouth or touched to the lips. Even in the first month of life, the infant is initiating action and actively structuring experiences.

First habits and primary circular reactions is the second sensorimotor substage, which develops between 1 and 4 months of age. In this substage, the infant coordinates sensation and two types of schemes: habits and primary circular reactions. A habit is a scheme based on a reflex that has become completely separated from its eliciting stimulus. For example, infants in substage 1 suck when bottles are put to their lips or when they see a bottle. Infants in substage 2 might suck even when no bottle is present. A circular reaction is a repetitive action.

A primary circular reaction is a scheme based on the attempt to reproduce an event that initially occurred by chance. For example, suppose an infant accidentally sucks his fingers when they are placed near his mouth. Later, he searches for his fingers to suck them again, but the fingers do not cooperate because the infant cannot coordinate visual and manual actions.

Habits and circular reactions are stereotyped—that is, the infant repeats them the same way each time. During this substage, the infant's own body remains the infant's center of attention. There is no outward pull by environmental events.

Secondary circular reactions is the third sensorimotor substage, which develops between 4 and 8 months of age. In this substage, the infant becomes more object-oriented, moving beyond preoccupation with the self. The infant's schemes are not intentional or goal-directed, but they are repeated because of their consequences. By chance, an infant might shake a rattle. The infant repeats this action for the sake of its fascination. This is a *secondary circular reaction*: an action repeated because of its consequences. The infant also imitates some simple actions, such as the baby talk or burbling of adults, and some physical gestures. However, the baby imitates only actions that he or she is already able to produce.

Coordination of secondary circular reactions is Piaget's fourth sensorimotor substage, which develops between 8 and 12 months of age. To progress into this substage, the infant must coordinate vision and touch, eye and hand. Actions become more outwardly directed. Significant changes during this substage involve the coordination of schemes and intentionality.

Infants readily combine and recombine previously learned schemes in a coordinated way. They might look at an object and grasp it simultaneously, or they might visually inspect a toy, such as a rattle, and finger it simultaneously, exploring it tactiley. Actions are even more outwardly directed than before. Related to this coordination is the second achievement—the presence of intentionality. For example, infants might manipulate a stick in order to bring a desired toy within reach or they might knock over one block to reach and play with another one. Similarly, when 11-month-old Jacqueline, as described in the chapter opening, placed the ball in front of her and kicked it, she was demonstrating intentionality.

Tertiary circular reactions, novelty, and curiosity is Piaget's fifth sensorimotor substage, which develops between 12 and 18 months of age. In this substage, infants become intrigued by the many properties of objects and by the many things that they can make happen to objects. A block can be made to fall, spin, hit another object, and slide across the ground. *Tertiary circular reactions* are schemes in which the infant purposely explores new possibilities with objects, continually doing new things to them and exploring the results. Piaget says that this stage marks the starting point for human curiosity and interest in novelty.

Internalization of schemes is Piaget's sixth and final sensorimotor substage, which develops between 18 and 24 months of age. In this substage, the infant develops the ability to use primitive symbols. For Piaget, a symbol is an internalized sensory image or word that represents an event. Primitive symbols permit the infant to think about concrete events without directly acting them out or perceiving them. Moreover, symbols allow the infant to manipulate and transform the represented events in simple ways. In a favorite Piagetian example, Piaget's young daughter saw a matchbox being opened and closed. Later, she mimicked the event by opening and closing her mouth. This was an obvious expression of her image of the event.

Object Permanence Imagine how chaotic and unpredictable your life would be if you could not distinguish between yourself and your world. This is what the life of a newborn must be like, according to Piaget. There is no differentiation between the self and world; objects have no separate, permanent existence.

By the end of the sensorimotor period, objects are both separate from the self and permanent. **Object permanence** is the understanding that objects continue to exist even when they cannot be seen, heard, or touched. Acquiring the sense of object permanence is one of the infant's most important accomplishments, according to Piaget.

How could anyone know whether an infant had developed a sense of object permanence? The principal way that object permanence is studied is by watching an infant's reaction when an interesting object disappears (see Figure 2). If infants search for the object, it is assumed that they believe it continues to exist.

Object permanence is just one of the basic concepts about the physical world developed by babies. To Piaget, children, even infants, are much like little scientists, examining the world to see how it works. How do adult scientists try to discover what these "baby scientists" are finding out about the world? The *Connecting with Research* interlude describes some of the ways.



FIGURE 2

OBJECT PERMANENCE. Piaget argued that object permanence is one of infancy's landmark cognitive accomplishments. For this 5-month-old boy, "out-of-sight" is literally out of mind. The infant looks at the toy monkey (*left*), but, when his view of the toy is blocked (*right*), he does not search for it. Several months later, he will search for the hidden toy monkey, an action reflecting the presence of object permanence.

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This 17-month-old is in Piaget's stage of tertiary circular reactions. *What might the infant do to suggest that she is in this stage?*

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developmental connection

Cognitive Processes

What are some changes in symbolic thought in young children? Connect to "Cognitive Development in Early Childhood."

secondary circular reactions Piaget's third sensorimotor substage, which develops between 4 and 8 months of age. In this substage, the infant becomes more object-oriented, moving beyond preoccupation with the self.

coordination of secondary circular reactions Piaget's fourth sensorimotor substage, which develops between 8 and 12 months of age. Actions become more outwardly directed, and infants coordinate schemes and act with intentionality.

tertiary circular reactions, novelty, and curiosity Piaget's fifth sensorimotor substage, which develops between 12 and 18 months of age. In this substage, infants become intrigued by the many properties of objects and by the many things that they can make happen to objects.

internalization of schemes Piaget's sixth and final sensorimotor substage, which develops between 18 and 24 months of age. In this substage, the infant develops the ability to use primitive symbols.

connecting with research

How Do Researchers Study Infants' Understanding of Object Permanence and Causality?

Two accomplishments of infants that Piaget examined were the development of object permanence and the child's understanding of causality. Let's examine two research studies that address these topics.

In both studies, Renée Baillargeon and her colleagues used a research method that involves violation of expectations. In this method, infants see an event happen as it normally would. Then the event is changed, often in a way that creates a physically impossible event. Infants look longer at the changed event, indicating that they are surprised by it. In other words, the infant's reaction is interpreted to indicate that the infant had certain expectations about the world that were violated.

In one study focused on object permanence, researchers showed infants a toy car that moved down an inclined track, disappeared behind a screen, and then reemerged at the other end, still on the track (Baillargeon & DeVos, 1991). After this sequence was repeated several times, something different occurred: A toy mouse was placed behind the tracks but was hidden by the screen while the car rolled by. This was the "possible" event. Then, the researchers created an "impossible event": The toy mouse was placed on the tracks but was secretly removed after the screen was lowered so that the car seemed to go through the mouse. In this study, infants as young as 3½ months of age looked longer at the impossible event than at the possible event, an indication that they were surprised by it. Their surprise suggested that they remembered not only the existence of the toy mouse (object permanence) but also its location.

Another study focused on the infant's understanding of causality (Kotovsky & Baillargeon, 1994). In this research, a cylinder rolls down

a ramp and hits a toy bug at the bottom of the ramp. By 5½ and 6½ months of age, after infants have seen how far the bug will be pushed by a medium-sized cylinder, their reactions indicate that they understand that the bug will roll farther if it is hit by a large cylinder than if it is hit by a small cylinder. Thus, by the middle of the first year of life, these infants understand that the size of a moving object determines how far it will move a stationary object that it collides with.

In Baillargeon's (2008, 2014; Baillargeon & others, 2012; Luo & Baillargeon, 2010) view, infants have a preadapted, innate bias called the principle of persistence that explains their assumption that objects don't change their properties—including how solid they are, their location, their color, and their form—unless some external factor (a person who moves the object, for example) obviously intervenes. Shortly, we revisit the extent to which nature and nurture are at work in the changes that take place in the infant's cognitive development.

The research findings discussed in this interlude and other research indicate that infants develop object permanence and causal reasoning much earlier than Piaget proposed (Baillargeon & others, 2011). Indeed, as you will see in the next section, a major theme of infant cognitive development today is that infants are more cognitively competent than Piaget envisioned.

How does the discovery of infants' early cognitive competence affect our understanding of Piaget's research on infant development?

Infants know that objects are substantial and permanent at an earlier age than Piaget envisioned.

—RENÉE BAILLARGEON

Contemporary Psychologist, University of Illinois

object permanence Piagetian term for understanding that objects continue to exist, even when they cannot directly be seen, heard, or touched.

A-not-B error This occurs when infants make the mistake of selecting the familiar hiding place (A) rather than the new hiding place (B) of an object as they progress into substage 4 in Piaget's sensorimotor stage.

EVALUATING PIAGET'S SENSORIMOTOR STAGE

Piaget opened up a new way of looking at infants with his view that their main task is to coordinate their sensory impressions with their motor activity. However, the infant's cognitive world is not as neatly packaged as Piaget portrayed it, and some of Piaget's explanations of the causes of change are debated. In the past several decades, sophisticated experimental techniques have been devised to study infants, and there have been a large number of research studies on infant development. Much of the new research suggests that Piaget's view of sensorimotor development needs to be modified (Adolph, 2018; Baillargeon, 2016; Bremner & others, 2017; Carpendale & Hammond, 2016; Needham, 2016; Spelke, 2016a, b; Van de Vandervoort & Hamlin, 2016, 2018).

The A-not-B Error One modification concerns Piaget's claim that certain processes are crucial in transitions from one stage to the next. The data do not always support his explanations. For example, in Piaget's theory, an important feature in the progression into substage 4, *coordination of secondary circular reactions*, is an infant's inclination to search for a hidden object in a familiar location rather than to look for the object in a new location. Thus, if a toy is hidden twice, initially at location A and subsequently at location B, 8- to 12-month-old infants search correctly at location A initially. But when the toy is subsequently hidden at location B, they make the mistake of continuing to search for it at location A. **A-not-B error** is the term used to describe this common mistake. Older infants are less likely to make the A-not-B error because their concept of object permanence is more complete.

Researchers have found, however, that the A-not-B error does not show up consistently (Sophian, 1985). The evidence indicates that A-not-B errors are sensitive to the delay between

hiding the object at B and the infant's attempt to find it (Diamond, 1985). Thus, the A-not-B error might be due to a failure in memory. And A-not-B performance may be linked to attention as well. For example, in a recent study, 5-month-olds' more focused attention on a separate task involving a puppet was linked to better performance on an A-not-B task that involved locating an object after it was hidden from view (Marcovitch & others, 2016). Another explanation is that infants tend to repeat a previous motor behavior (Clearfield & others, 2006; Smith, 1999).

Perceptual Development and Expectation A number of theorists, such as Eleanor Gibson (2001) and Elizabeth Spelke (2011, 2013), maintain that infants' perceptual abilities are highly developed very early in life. Spelke argues that young infants interpret the world as having predictable occurrences. For example, earlier we discussed research that demonstrated the presence of intermodal perception—the ability to coordinate information from two or more sensory modalities, such as vision and hearing—by 3½ months of age, much earlier than Piaget would have predicted (Spelke & Owsley, 1979).

Research also suggests that infants develop the ability to understand how the world works at a very early age (Baillargeon, 2014, 2016; Spelke, 2016a, b). What kinds of expectations do infants form? Are we born expecting the world to obey basic physical laws, such as gravity? If not, when do we learn how the world works? Experiments by Elizabeth Spelke and her colleagues (Dillon & others, 2015; Spelke, 1991, 2000, 2003, 2016a, b; Spelke, Bernier, & Sneiderker, 2013; Spelke & Hespos, 2001) have addressed these questions. She placed babies before a puppet stage and showed them a series of actions that are unexpected if you know how the physical world works—for example, one ball seemed to roll through a solid barrier, another seemed to leap between two platforms, and a third appeared to hang in midair (Spelke, 1979). Spelke measured and compared the babies' looking times for unexpected and expected actions. She concluded that, by 4 months of age, even though infants do not yet have the ability to talk about objects, move around objects, manipulate objects, or even see objects with high resolution, they expect objects to be solid and continuous. However, at 4 months of age, infants do not expect an object to obey gravitational constraints (Spelke & others, 1992). Similarly, research by Renée Baillargeon (1995, 2004, 2014) documents that infants as young as 3 to 4 months expect objects to be *substantial* (in the sense that other objects cannot move through them) and *permanent* (in the sense that objects continue to exist when they are hidden).

In sum, researchers such as Baillargeon and Spelke conclude that infants see objects as bounded, unitary, solid, and separate from their background, possibly at birth or shortly thereafter, but definitely by 3 to 4 months of age, much earlier than Piaget envisioned. Young infants still have much to learn about objects, but the world appears both stable and orderly to them.

By 6 to 8 months, infants have learned to perceive gravity and support—that an object hanging on the end of a table should fall, that ball bearings will travel farther when rolled down a longer rather than a shorter ramp, and that cup handles will not fall when attached to a cup (Slater, Field, & Hernandez-Reif, 2007). As infants develop, their experiences and actions on objects help them to understand physical laws (Johnson & Hannon, 2015).

The Nature-Nurture Issue In considering the big issue of whether nature or nurture plays the more important role in infant development, Elizabeth Spelke (Spelke, 2000, 2003, 2011, 2013, 2016a, b) comes down clearly on the side of nature. Spelke endorses a **core knowledge approach**, which states that infants are born with domain-specific innate knowledge systems. Among these domain-specific knowledge systems are those involving space, number sense, object permanence, and language (which we discuss later in this chapter). Strongly influenced by evolution, the core knowledge domains are theorized to be prewired to allow infants to make sense of their world (Coubart & others, 2014). After all, Spelke concludes, how could infants possibly grasp the complex world in which they live if they didn't come into the world equipped with core sets of knowledge? In this approach, the innate core knowledge domains form a foundation around which more mature cognitive functioning and learning develop. The core knowledge approach argues that Piaget greatly underestimated the cognitive abilities of infants, especially young infants (Huang & Spelke, 2015; Spelke, 2016a, b).

Recently, researchers also have explored whether preverbal infants might have a built-in, innate sense of morality (Steckler & Hamlin, 2016; Van de Vandervoort & Hamlin, 2016, 2018). In this research, infants as young as 4 months of age are more likely to make visually

developmental connection

Perception

Eleanor Gibson was a pioneer in crafting the ecological view of development. Connect to "Physical Development in Infancy."

developmental connection

Nature and Nurture

The nature-nurture issue is also important in understanding perceptual development. Connect to "Physical Development in Infancy."

core knowledge approach View that infants are born with domain-specific innate knowledge systems.



What revisions in Piaget's theory of sensorimotor development do contemporary researchers recommend? What characterizes the nature-nurture controversy in infant cognitive development?

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guided reaches toward a puppet who has acted as a helper (such as helping someone get up a hill, assisting in opening a box, or giving a ball back) rather than toward a puppet who has acted as a hinderer to others' efforts to achieve such goals (Hamlin, 2013, 2014). And recently, the view that the emergence of morality in infancy is innate was described as problematic (Carpendale & Hammond, 2016). Instead it was argued that morality may emerge through infants' early interaction with others and later transformation through language and reflective thought.

In criticizing the core knowledge approach, British developmental psychologist Mark Johnson (2008) says that the infants Spelke assesses in her research already have accumulated hundreds, and in some cases even thousands, of hours of experience in grasping what the world is about, which gives considerable room for the environment's role in the development of infant cognition (Highfield, 2008). According to Johnson (2008), infants likely come into the world with "soft biases to perceive and attend to different aspects of the environment, and to learn about the world in particular ways." A major criticism is that nativists completely neglect the infant's social immersion in the world and instead focus only on what happens inside the infant's head, apart from the environment (Nelson, 2013).

Although debate about the cause and course of infant cognitive development continues, most developmentalists today agree that Piaget underestimated the early cognitive accomplishments of infants and that both nature and nurture are involved in infants' cognitive development (Bell & others, 2018; Bremner & others, 2017; Gomez, 2017).

Conclusions In sum, many researchers conclude that Piaget wasn't specific enough about how infants learn about their world and that infants, especially young infants, are more competent than Piaget thought (Baillargeon, 2016; Needham, 2016; Spelke, 2016a, b; Van de Vandervoort & Hamlin, 2016, 2018; Xie & Richards, 2017). As researchers have examined the specific ways that infants learn, the field of infant cognition has become very specialized. There are many researchers working on different questions, with no general theory emerging that can connect all of the different findings (Nelson, 1999). Their theories often are local theories, focused on specific research questions, rather than grand theories like Piaget's (Kuhn, 1998).

Among the unifying themes in the study of infant cognition are seeking to understand more precisely how developmental changes in cognition take place, to answer questions about the relative importance of nature and nurture, and to examine the brain's role in cognitive development. As they seek to assess more precisely the contributions of nature and nurture to infant development, researchers face the difficult task of determining whether the course of acquiring information, which is very rapid in some domains, is better accounted for by an innate set of biases (that is, core knowledge), or by the extensive input of environmental experiences to which the infant is exposed (Aslin, 2009). Also, recall that exploring connections between brain, cognition, and development is the focus of the recently emerging field of *developmental cognitive neuroscience* (Bell & others, 2018; de Haan & Johnson, 2016; Gliga & others, 2017; Saez de Urabain & others, 2017).

Review Connect Reflect

LG1 Summarize and evaluate Piaget's theory of infant development.

Review

- What cognitive processes are important in Piaget's theory?
- What are some characteristics of Piaget's stage of sensorimotor development?
- What are some contributions and criticisms of Piaget's sensorimotor stage?

Connect

- You just read that by the age of 6 to 8 months infants have learned to

perceive gravity and support. What physical development occurring around this same time period might contribute to the infant's understanding of these concepts?

Reflect Your Own Personal Journey of Life

- What are some implications of Piaget's theory of infant development for parenting?

2 How Do Infants Learn, Remember, and Conceptualize?

LG2 Describe how infants learn, remember, and conceptualize.

Conditioning

Attention

Memory

Imitation

Concept Formation

When Piaget hung a doll above 4-month-old Lucienne's feet, as described at the beginning of the chapter, would she remember the doll? If Piaget had rewarded her for moving the doll with her foot, would the reward have affected Lucienne's behavior? If he had shown her how to shake the doll's hand, could she have imitated him? If he had shown her a different doll, could she have formed the concept of a "doll"?

Questions like these might be examined by researchers taking behavioral and social cognitive or information processing approaches. In contrast with Piaget's theory, these approaches do not describe infant development in terms of stages. Instead, they document gradual changes in the infant's ability to understand and process information about the world. In this section, we explore what researchers using these approaches can tell us about how infants learn, remember, and conceptualize.

CONDITIONING

Earlier, we described Pavlov's classical conditioning (in which, as a result of pairing, a new stimulus comes to elicit a response previously given to another stimulus) and Skinner's operant conditioning (in which the consequences of a behavior produce changes in the probability of the behavior's occurrence). Infants can learn through both types of conditioning. For example, if an infant's behavior is followed by a rewarding stimulus, the behavior is likely to recur.

Operant conditioning has been especially helpful to researchers in their efforts to determine what infants perceive (Rovee-Collier & Barr, 2010; Rovee-Collier & Cuevas, 2009). For example, infants will suck faster on a nipple when the sucking behavior is followed by a visual display, music, or a human voice (Rovee-Collier, 2008).

Carolyn Rovee-Collier (1987) also demonstrated how infants can retain information from the experience of being conditioned. She placed a 2½-month-old baby in a crib under an elaborate mobile (see Figure 3). She then tied one end of a ribbon to the baby's ankle and the other end to the mobile. Subsequently, she observed that the baby kicked and made the mobile move. The movement of the mobile was the reinforcing stimulus (which increased the baby's kicking behavior) in this experiment. Weeks later, the baby was returned to the crib, but its foot was not tied to the mobile. The baby kicked, which suggests it had retained the information that if it kicked a leg, the mobile would move.

ATTENTION

Attention, the focusing of mental resources on select information, improves cognitive processing on many tasks (Benitez & others, 2017; Reynolds & Romano, 2016; Salley & Colombo, 2016; Salley & others, 2016; Wu & Scerif, 2018; Yu & Smith, 2016, 2017). At any one time, though, people can pay attention to only a limited amount of information. Even newborns can detect a contour and fix their attention on it. Older infants scan patterns more thoroughly. By 4 months, infants can selectively attend to an object. A recent study examined 7- and 8-month-old infants' visual attention to sequences of events that varied in complexity (Kidd, Piantadosi, & Aslin, 2012). The infants tended to look away from events that were overly simple or complex, preferring instead to attend to events of intermediate complexity. Also, in recent research, 5-month-olds whose attention involved more efficient speed of processing information (called "short lookers") engaged in a higher level of executive function (higher-level cognitive functioning, such as being cognitively flexible and having better inhibitory control) during the preschool years than their counterparts who were less efficient in attending to information (referred to as "long lookers") (Cuevas & Bell, 2014).

Attention in the first year of life is dominated by an *orienting/investigative process* (Colombo & Salley, 2015). This process involves directing attention to potentially important

developmental connection

Theories

The behavioral and social cognitive approaches emphasize continuity rather than discontinuity in development. Connect to "Introduction."



FIGURE 3
CONDITIONING AND MEMORY IN INFANTS. In Rovee-Collier's experiment, operant conditioning was used to demonstrate that infants as young as 2½ months of age can retain information from the experience of being conditioned. *What did infants recall in Rovee-Collier's experiment?*
©Dr. Carolyn Rovee-Collier

attention The focusing of mental resources on select information.

developmental connection

Attention

In early childhood, children make significant advances in sustained attention. Connect to “Cognitive Development in Early Childhood.”

locations in the environment (that is, *where*) and recognizing objects and their features (such as color and form) (that is, *what*) (Richards, 2011). Orienting attention to an object or event involves the parietal lobes in the cerebral cortex (Ellison & others, 2014).

From 3 to 9 months of age, infants can deploy their attention more flexibly and quickly. Another important type of attention is *sustained attention*, also referred to as *focused attention* (Richards, 2011). New stimuli typically elicit an orienting response followed by sustained attention. It is sustained attention that allows infants to learn about and remember characteristics of a stimulus as it becomes familiar. Researchers have found that infants as young as 3 months of age can engage in 5 to 10 seconds of sustained attention. From this age through the second year, the length of sustained attention increases (Courage & Richards, 2008).

Habituation and Dishabituation Closely linked with attention are the processes of habituation and dishabituation. If you say the same word or show the same toy to a baby several times in a row, the baby usually pays less attention to it each time. This is *habituation*—decreased responsiveness to a stimulus after repeated presentations of the stimulus. *Dishabituation* is the increase in responsiveness after a change in stimulation. Some of the measures that researchers use to study whether habituation is occurring include sucking behavior (sucking stops when an infant attends to a novel object), heart rates, and the length of time the infant looks at an object.

Infants’ attention is strongly governed by novelty and habituation (Snyder & Torrence, 2008). When an object becomes familiar, attention becomes shorter, making infants more vulnerable to distraction.



This young infant’s attention is riveted on the yellow toy duck that has just been placed in front of him. His attention to the toy duck will be strongly regulated by the processes of habituation and dishabituation.

What characterizes these processes?

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Researchers study habituation to determine the extent to which infants can see, hear, smell, taste, and experience touch (Colombo & Mitchell, 2009). Studies of habituation can also indicate whether infants recognize something they have previously experienced. Habituation provides a measure of an infant’s maturity and well-being. Infants who have brain damage do not habituate well.

Knowing about habituation and dishabituation can help parents interact effectively with infants. Infants respond to changes in stimulation. Wise parents sense when an infant shows an interest and realize that they may have to repeat something many times for the infant to process information. But if the stimulation is repeated often, the infant stops responding to the parent. In parent-infant interaction, it is important for parents to do novel things and to

repeat them often until the infant stops responding. The parent stops or changes behaviors when the infant redirects his or her attention (Rosenblith, 1992).

Joint Attention Another aspect of attention that is an important part of infant development is **joint attention**, in which individuals focus on the same object or event. Joint attention requires (1) an ability to track another’s behavior, such as following someone’s gaze; (2) one person directing another’s attention; and (3) reciprocal interaction. Early in infancy, joint attention usually involves a caregiver pointing or using words to direct an infant’s attention. Emerging forms of joint attention occur at about 7 to 8 months, but it is not until toward the end of the first year that joint attention skills are frequently observed (Heimann & others, 2006). In a study conducted by Rechele Brooks and Andrew Meltzoff (2005), at 10 to 11 months of age infants first began engaging in “gaze following,” looking where another person has just looked (see Figure 4). And by their first birthday, infants have begun to direct adults’ attention to objects that capture their interest (Heimann & others, 2006). Also, a recent study found that problems in joint attention as early as 8 months of age were linked to a child being diagnosed with autism by 7 years of age (Veness & others, 2014). Also, another recent study involving the use of eye-tracking equipment with 11- to 24-month-olds revealed that infants’ hand-eye coordination involving the connection of gaze with manual actions on objects rather than gaze following alone predicted joint attention (Yu & Smith, 2017).

Joint attention plays important roles in many aspects of infant development and considerably increases infants’ ability to learn from other people (Brooks & Meltzoff, 2014; Salley & Colombo, 2016; Salley & others, 2016). Nowhere is this more apparent than in

joint attention Occurs when individuals focus on the same object or event and are able to track each other’s behavior; one individual directs another’s attention, and reciprocal interaction is present.

memory A central feature of cognitive development, involving the retention of information over time.



(a)



(b)

FIGURE 4

GAZE FOLLOWING IN INFANCY. Researcher Rechele Brooks shifts her eyes from the infant to a toy in the foreground (a). The infant then follows her eye movement to the toy (b). Brooks and colleague Andrew Meltzoff (2005) found that infants begin to engage in this kind of behavior called “gaze following” at 10 to 11 months of age. *Why might gaze following be an important accomplishment for an infant?*

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A mother and her infant daughter engaging in joint attention. *What about this photograph tells you that joint attention is occurring? Why is joint attention an important aspect of infant development?*

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observations of interchanges between caregivers and infants while the infants are learning language (Tomasello, 2011). When caregivers and infants frequently engage in joint attention, infants say their first word earlier and develop a larger vocabulary (Beuker & others, 2013; Mastin & Vogt, 2017). Later in this chapter in our discussion of language, we further discuss joint attention as an early predictor of language development in older infants and toddlers (Tomasello, 2011).

Joint attention skills in infancy also are associated with the development of self-regulation later in childhood. For example, one study revealed that responding to joint attention at 12 months of age was linked to self-regulation skills at 3 years of age that involved delaying gratification for an attractive object (Van Hecke & others, 2012). And in other research, infants who initiated joint attention at 14 months of age had higher executive function at 18 months of age (Miller & Marcovitch, 2015).

MEMORY

Memory involves retaining information over time. Attention plays an important role in memory as part of a process called *encoding*, which is the process by which information gets into memory. What can infants remember, and when?

Some researchers such as Rovee-Collier (2008) have concluded that infants as young as 2 to 6 months of age can remember some experiences through 1½ to 2 years of age. However, critics such as Jean Mandler (2004), a leading expert on infant cognition, argue that the infants in Rovee-Collier’s experiments are displaying only implicit memory. **Implicit memory** refers to memory without conscious recollection—memories of skills and routine procedures that are performed automatically. In contrast, **explicit memory** refers to the conscious memory of facts and experiences.

When people think about memory, they are usually referring to explicit memory. Most researchers find that babies do not show explicit memory until the second half of the first year (Bauer, 2013; Bauer & Fivush, 2014; Bauer & Larkina, 2016; Bauer & others, 2003; Mandler & McDonough, 1993). Then explicit memory improves substantially during the second year of life (Bauer, 2013; Bauer & Fivush, 2014; Carver & Bauer, 2001; Lukowski & Bauer, 2014). In a longitudinal study, infants were assessed several times during their second year (Bauer & others, 2000). Older infants showed more accurate memory and required fewer prompts to demonstrate their memory than younger infants. Figure 5 summarizes how long infants of different ages can remember information (Bauer, 2009a, b). As indicated in Figure 5, researchers have documented that 6-month-olds can remember



How Would You...?

If you were a **human development and family studies professional**, what strategies would you

recommend to help parents improve an infant’s development of attention?

implicit memory Memory without conscious recollection; involves skills and routine procedures that are automatically performed.

explicit memory Conscious memory of facts and experiences.

Age Group	Length of Delay
6-month-olds	24 hours
9-month-olds	1 month
10–11-month-olds	3 months
13–14-month-olds	4–6 months
20-month-olds	12 months

FIGURE 5

AGE-RELATED CHANGES IN THE LENGTH OF TIME OVER WHICH MEMORY OCCURS

From *Learning and the Infant Mind* edited by Amanda Woodward and Amy Needham (2008), p. 12, Table 1. ©2005 by Amanda Woodward and Amy Needham. By permission of Oxford University Press, Inc.

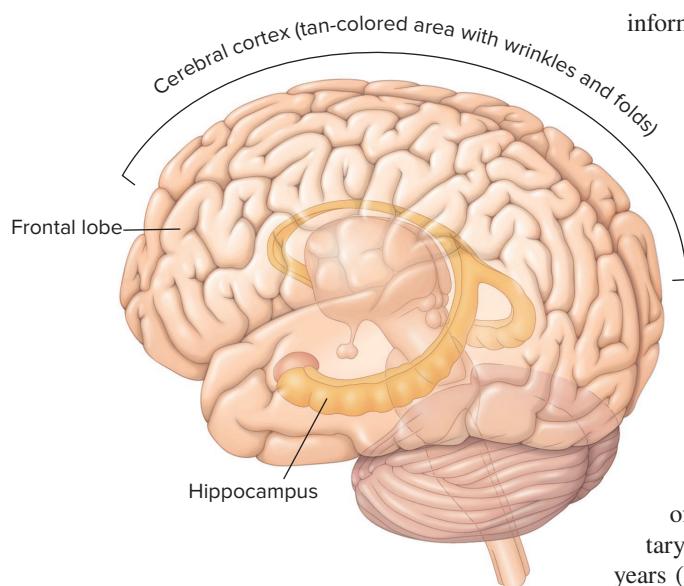


FIGURE 6
KEY BRAIN STRUCTURES INVOLVED IN EXPLICIT MEMORY DEVELOPMENT IN INFANCY

deferred imitation Imitation that occurs after a delay of hours or days.



FIGURE 7
INFANT IMITATION. Infant development researcher Andrew Meltzoff protrudes his tongue in an attempt to get the infant to imitate his behavior. *How do Meltzoff's findings about imitation compare with Piaget's descriptions of infants' abilities?*
©Dr. Andrew Meltzoff

information for 24 hours, but by 20 months of age infants can remember information they encountered 12 months earlier (Bauer, Larkina, & Deocampo, 2011).

What changes in the brain are linked to infants' memory development? From about 6 to 12 months of age, the maturation of the hippocampus and the surrounding cerebral cortex, especially the frontal lobes, makes the emergence of explicit memory possible (Morasch & Bell, 2009; Nelson, 2013) (see Figure 6). Explicit memory continues to improve in the second year as these brain structures further mature and connections between them increase.

Less is known about the areas of the brain involved in implicit memory in infancy.

Let's examine another aspect of memory. Do you remember your third birthday party? Probably not. Most adults can remember little if anything from the first three years of their life (Riggins, 2012). This is called *infantile, or childhood, amnesia*. The few reported adult memories of life at age 2 or 3 are at best very sketchy (Newcombe, 2008). Elementary school children also do not remember much from their early childhood years (Lie & Newcombe, 1999).

What is the cause of infantile amnesia? One reason older children and adults have difficulty recalling events from their infant and early childhood years is that during these early years the prefrontal lobes of the brain are immature; this area of the brain is believed to play an important role in storing memories of events (Boyer & Diamond, 1992).

Patricia Bauer and her colleagues (Bauer & Larkina, 2014, 2016; Pathman, Doydum, & Bauer, 2013) have been recently studying when infantile amnesia begins to occur. In one study, children's memory for events that occurred at 3 years of age was periodically assessed through age 9 (Bauer & Larkina, 2014). By 8 to 9 years of age, children's memory of events that occurred at 3 years of age began to significantly fade away. In Bauer's (2015) view, the processes that account for these developmental changes are early, gradual development of the ability to form, retain, and later retrieve memories of personally relevant past events followed by an accelerated rate of forgetting in childhood.

In sum, most of young infants' conscious memories appear to be rather fragile and short-lived, although their implicit memory of perceptual-motor actions can be substantial (Bauer, Larkina, & Deocampo, 2011; Mandler, 2004). By the end of the second year, long-term memory is more substantial and reliable (Lukowski & Bauer, 2014).

IMITATION

Can infants imitate someone else's emotional expressions? If an adult smiles, will the baby follow with a smile? If an adult protrudes her lower lip, wrinkles her forehead, and frowns, will the baby show a sad face?

Infant development researcher Andrew Meltzoff (2004, 2007, 2011; Meltzoff & Moore, 1999; Meltzoff & Williamson, 2013) has conducted numerous studies of infants' imitative abilities. He sees infants' imitative abilities as biologically based, because infants can imitate a facial expression within the first few days after birth. He also emphasizes that the infant's imitative abilities do not resemble a hardwired response but rather involve flexibility and adaptability. In Meltzoff's observations of infants across the first 72 hours of life, the infants gradually displayed more complete imitation of an adult's facial expression, such as protruding the tongue or opening the mouth wide (see Figure 7).

Meltzoff (2007, 2011; Meltzoff & Williamson, 2013; Meltzoff, Williamson, & Marshall, 2013) concludes that infants don't blindly imitate everything they see and often make creative errors. He also argues that beginning at birth there is an interplay between learning by observing and learning by doing (Piaget emphasized learning by doing).

Not all experts on infant development accept Meltzoff's conclusions that newborns are capable of imitation. Some say that these babies were engaging in little more than automatic responses to a stimulus.

Meltzoff (2005, 2011) also has studied **deferred imitation**, which occurs after a time delay of hours or days. Piaget held that deferred imitation doesn't occur until about 18 months of age. Meltzoff's research suggested that it occurs much earlier. In one study, Meltzoff (1988) demonstrated that 9-month-old infants could imitate actions—such as pushing a recessed button in a box, which produced a beeping sound—that they had seen performed 24 hours earlier. Also, in a recent study, engagement in deferred imitation at 9 months of age was a strong predictor of more extensive production of communicative gestures at 14 months of age (Heimann & others, 2006). Two of the most common infant gestures are (1) extending the arm to show the caregiver something the infant is holding, and (2) pointing with the arm and index finger extended at some interesting object or event.

CONCEPT FORMATION

Along with attention, memory, and imitation, concepts are key aspects of infants' cognitive development (Gelman, 2013; Quinn, 2016; Rakison & Lawson, 2013). **Concepts** are cognitive groupings of similar objects, events, people, or ideas. Without concepts, you would see each object and event as unique; you would not be able to make any generalizations.

Do infants have concepts? Yes, they do, although we do not know just how early concept formation begins (Mandler, 2009; Quinn, 2016; Quinn & others, 2013). Using habituation experiments like those described earlier in the chapter, some researchers have found that infants as young as 3 to 4 months of age can group together objects with similar appearances, such as animals (Quinn, 2016; Rakison & Lawson, 2013). This research capitalizes on the knowledge that infants are more likely to look at a novel object than a familiar object.

Jean Mandler (2004, 2010) argues that these early categorizations are best described as *perceptual categorization*. That is, the categorizations are based on similar perceptual features of objects, such as size, color, and movement, as well as parts of objects, such as legs for animals. Mandler (2004) concludes that it is not until about 7 to 9 months of age that infants form *conceptual* categories rather than just making perceptual discriminations between different categories. In one study of 9- to 11-month-olds, infants classified birds as animals and airplanes as vehicles even though the objects were perceptually similar—airplanes and birds with their wings spread (Mandler & McDonough, 1993) (see Figure 8).

In addition to infants categorizing items on the basis of external, perceptual features such as shape, color, and parts, they also may categorize items on the basis of prototypes, or averages, that they extract from the structural regularities of items (Rakison & Lawson, 2013).

Further advances in categorization occur in the second year of life (Rakison & Lawson, 2013). Many infants' "first concepts are broad and global in nature, such as 'animal' or 'indoor thing.' Gradually, over the first two years these broad concepts become more differentiated into concepts such as 'land animal,' then 'dog,' or to 'furniture,' then 'chair'" (Mandler, 2009, p. 1). Also in the second year, infants often categorize objects on the basis of their shape (Landau, Smith, & Jones, 1998).

Learning to put things into the correct categories—what makes something one kind of thing rather than another kind of thing, such as what makes a bird a bird, or a fish a fish—is an important aspect of cognitive development. As infant development researcher Alison Gopnik (2010, p. 159) recently pointed out, "If you can sort the world into the right categories—put things in the right boxes—then you've got a big advance on understanding the world."

Do some very young children develop an intense, passionate interest in a particular category of objects or activities? A study

Infants are creating concepts and organizing their world into conceptual domains that will form the backbone of their thought throughout life.

—JEAN MANDLER

Contemporary Psychologist, University of California–San Diego



How Would You...?

If you were an educator, how would you talk with parents about the importance of their infant developing concepts?

concepts Cognitive groupings of similar objects, events, people, or ideas.



FIGURE 8

CATEGORIZATION IN 9- TO 11-MONTH-OLDS. These are the stimuli used in the study that indicated 9- to 11-month-old infants categorize perceptually similar objects as different (birds and planes) (Mandler & McDonough, 1993).

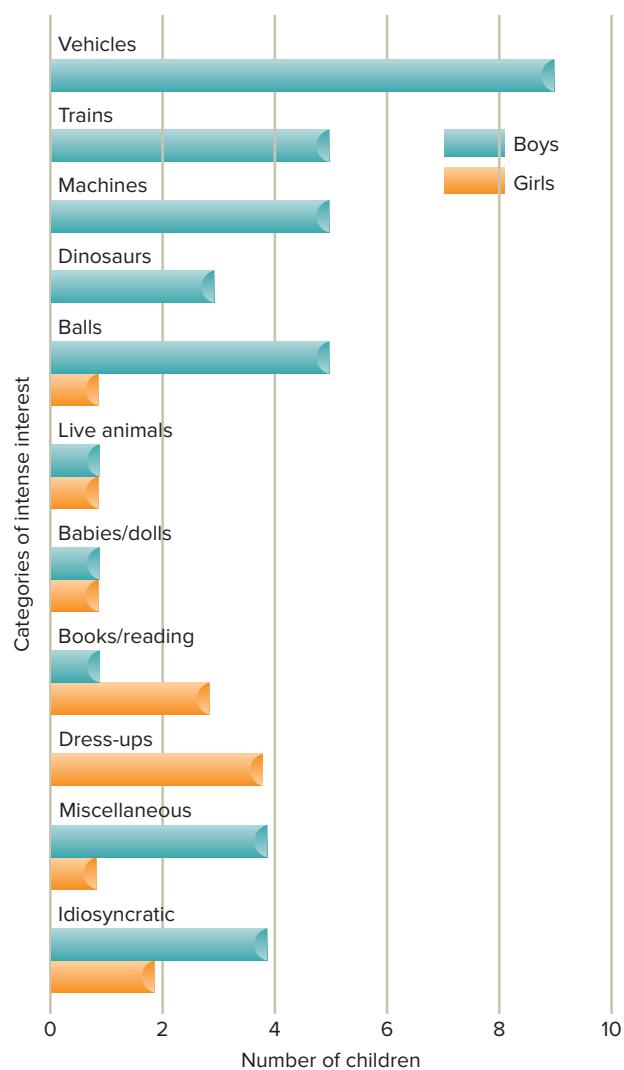


FIGURE 9
CATEGORIZATION OF BOYS' AND GIRLS' INTENSE
INTERESTS

of 11-month-old to 6-year-old children confirmed that they do (DeLoache, Simcock, & Macari, 2007). A striking finding was the large gender difference in categories, with an intense interest in particular categories stronger among boys than among girls. Categorization of boys' intense interests focused on vehicles, trains, machines, dinosaurs, and balls; girls' intense interests were more likely to involve dress-ups and books/reading (see Figure 9). When your author's grandson Alex was 18 to 24 months old, he already had developed an intense, passionate interest in the category of vehicles. He categorized vehicles into such subcategories as cars, trucks, earthmoving equipment, and buses. In addition to common classifications of cars into police cars, jeeps, taxis, and such, and trucks into fire trucks, dump trucks, and the like, his categorical knowledge of earthmoving equipment included bulldozers and excavators, and he categorized buses into school buses, London buses, and funky Malta buses (retro buses on the island of Malta). Later, at 2 to 3 years of age, Alex developed an intense, passionate interest in categorizing dinosaurs.

In sum, the infant's advances in processing information—through attention, memory, imitation, and concept formation—is much richer, more gradual, and less stage-like and occurs earlier than was envisioned by earlier theorists, such as Piaget (Bell & others, 2018; Bremner & others, 2017; Gomez, 2017; Xie & Richards, 2017).

As leading infant researcher Jean Mandler (2004) concluded, “The human infant shows a remarkable degree of learning power and complexity in what is being learned and in the way it is represented” (p. 304).



The author's grandson Alex at 2 years of age showing his intense, passionate interest in the category of vehicles while playing with a London taxi and a funky Malta bus.

Courtesy of Dr. John Santrock

Review Connect Reflect

LG2 Describe how infants learn, remember, and conceptualize.

Review

- How do infants learn through conditioning?
- What is attention? What characterizes attention in infants?
- What is memory?
- To what extent can infants remember?
- How is imitation involved in infant learning?
- When do infants develop concepts, and how does concept formation change during infancy?

Connect

- In this section, you learned that explicit memory develops in the

second year as the hippocampus and frontal lobes mature and connections between them increase. What did you learn in the text associated with Figure 6 in the chapter “Physical Development in Infancy” that might also contribute to improvements in a cognitive process like memory during this same time frame?

Reflect Your Own Personal Journey of Life

- If a friend told you that she remembers being abused by her parents when she was 2 years old, would you believe her? Explain your answer.

3 How Are Individual Differences in Infancy Assessed, and Do These Assessments Predict Intelligence?

LG3

Discuss infant assessment measures and the prediction of intelligence.

Measures of Infant Development

Predicting Intelligence

So far in this chapter, we have discussed how the cognitive development of infants generally progresses. We have emphasized what is typical of the largest number of infants or the average infant, but the results obtained for most infants do not apply to all infants. It is advantageous to know whether an infant is developing at a slow, normal, or advanced pace during the course of infancy. If an infant advances at an especially slow rate, then some form of enrichment may be necessary. If an infant develops at an advanced pace, parents may be advised to provide toys that stimulate cognitive growth in slightly older infants. How is an infant's cognitive development assessed?

MEASURES OF INFANT DEVELOPMENT

Individual differences in infant cognitive development have been studied primarily through the use of developmental scales or infant intelligence tests. For example, the Brazelton Neonatal Behavioral Assessment Scale (NBAS) and the Neonatal Intensive Care Unit Network Neurobehavioral Scale (NNNS) are used to evaluate newborns. To read about the work of one infant assessment specialist, see the *Connecting with Careers* profile.

The most important early contributor to the testing of infants was Arnold Gesell (1934a, b). He developed a measure that helped to sort out potentially normal babies from abnormal ones. This was especially useful to adoption agencies, which had large numbers of babies

connecting with careers

Toosje Thyssen Van Beveren, Infant Assessment Specialist

Toosje Thyssen Van Beveren is a developmental psychologist at the University of Texas Medical Center in Dallas and a senior lecturer at the University of Texas at Dallas. She has a master's degree in child clinical psychology and a Ph.D. in human development. Recently, Van Beveren has been involved in a 12-week program called New Connections, a comprehensive intervention for young children who were affected by substance abuse prenatally and for their caregivers.

In the New Connections program, Van Beveren assesses infants' developmental status and progress. She might refer the infants to a speech, physical, or occupational therapist and monitor the infants' services and progress. Van Beveren trains the program staff and encourages them to use the exercises she recommends. She also discusses the child's problems with the primary caregivers, suggests activities, and assists them in enrolling infants in appropriate programs.

During her graduate work at the University of Texas at Dallas, Van Beveren was author John Santrock's teaching assistant in his undergraduate course on life-span development for four years. As a teaching assistant, she attended classes, graded exams, counseled



Toosje Thyssen Van Beveren conducts an infant assessment.

Courtesy of Dr. John Santrock

students, and occasionally gave lectures. Currently, Van Beveren is a senior lecturer in the psychology department at UT–Dallas, teaching an undergraduate course in child development and a graduate course in infant development. In Van Beveren's words, "My days are busy and full. My work with infants is often challenging. There are some disappointments, but mostly the work is enormously gratifying."



Items in the Bayley-III Scales of Infant Development.

©Amy Kiley Photography

awaiting placement. Gesell's examination was used widely for many years and still is frequently employed by pediatricians to distinguish between normal and abnormal infants. The current version of the Gesell test has four categories of behavior: motor, language, adaptive, and personal-social. The **developmental quotient (DQ)** combines subscores in these categories to provide an overall score.

The widely used **Bayley Scales of Infant Development** were developed by Nancy Bayley (1969) in order to assess infant behavior and predict later development. The current version, the Bayley Scales of Infant and Toddler Development—Third Edition (Bayley-III), has five scales: cognitive, language, motor, socio-emotional, and adaptive (Bayley, 2005). The first three scales are administered directly to the infant, and the latter two are questionnaires given to the caregiver. The Bayley-III also is more appropriate for use in clinical settings than the two previous editions (Lennon & others, 2008).

How should a 6-month-old perform on the Bayley cognitive scale? The 6-month-old infant should be able to vocalize pleasure and displeasure, persistently search for objects that are just out of immediate reach, and approach a mirror that is placed in front of the infant by the examiner. By 12 months of age, the infant should be able to inhibit behavior when commanded to do so, imitate words the examiner says (such as *Mama*), and respond to simple requests (such as "Take a drink").

The explosion of interest in infant development has produced many new measures, especially tasks that evaluate the ways infants process information (Rose, Feldman, & Wallace, 1992). The Fagan Test of Infant Intelligence is increasingly being used (Fagan, 1992). This test focuses on the infant's ability to process information in such ways as encoding the attributes of objects, detecting similarities and differences between objects, forming mental representations, and retrieving these representations. For example, it estimates babies' intelligence by comparing the amount of time they look at a new object with the amount of time they spend looking at a familiar object.

PREDICTING INTELLIGENCE

The infant-testing movement grew out of the tradition of IQ testing. However, IQ tests of older children pay more attention to verbal ability. Tests for infants contain far more items related to perceptual-motor development and include measures of social interaction.

A longitudinal study examined the intelligence of 200 children from 12 months (using the Bayley scales) to 4 years (using the Stanford-Binet test) of age (Blaga & others, 2009). The results indicated considerable stability from late infancy through the preschool years. However, overall scores on tests such as the Gesell and the Bayley scales in infancy do not correlate highly with IQ scores obtained later in childhood. This is not surprising, because the components tested in infancy are not the same as the components assessed by IQ tests later in childhood.

Unlike the Gesell and Bayley scales, the Fagan test is correlated with measures of intelligence in older children. In fact, evidence is accumulating that measures of habituation and dishabituation are linked to intelligence in childhood and adolescence (Fagan, Holland, & Wheeler, 2007; Kavsek, 2004). One study revealed that habituation at 3 or 6 months of age was linked to verbal skills and intelligence assessed at 32 months of age (Domsch, Lohaus, & Thomas, 2009). And a longitudinal study revealed that four information-processing domains (attention, processing speed, memory, and representational competence) assessed in infancy and early childhood were linked to general intelligence scores on the Wechsler Intelligence Scale for Children-III assessed at 11 years of age (Rose & others, 2012).

Also, a longitudinal study found that developmental milestones at 24 months of age were strongly linked to IQ at 5 to 6 years of age, but milestones at 4, 8, and 12 months were only slightly associated with IQ at 5 to 6 years (Peyre & others, 2017). Of the four developmental milestones (language, gross motor skills, fine motor skills, and socialization), early language skills were the best predictor of IQ. Further, early language skills were linked to which children had an IQ lower than 70 (intellectual disability) (predicted from 8 months of age) or higher than 130 (gifted) (predicted from 12 months of age) at 5 to 6 years of age.

developmental connection

Intelligence

The two most widely used tests of intelligence in older children, adolescents, and adults are the Stanford-Binet tests and the Wechsler scales. Connect to "Cognitive Development in Middle and Late Childhood."

developmental quotient (DQ) An overall score that combines subscores in motor, language, adaptive, and personal-social domains in the Gesell assessment of infants.

Bayley Scales of Infant Development Scales developed by Nancy Bayley that are widely used in assessing infant development. The current version, the Bayley Scales of Infant and Toddler Development—Third Edition (Bayley-III), has five components: a cognitive scale, a language scale, a motor scale, a socio-emotional scale, and an adaptive scale.

language A form of communication, whether spoken, written, or signed, that is based on a system of symbols.

It is important not to go too far and think that connections between cognitive development in early infancy and later cognitive development are so strong that no discontinuity takes place. Some important changes in cognitive development occur after infancy—changes that we describe in later chapters.

Review Connect Reflect

LG3 Discuss infant assessment measures and the prediction of intelligence.

Review

- What are some measures of individual differences in infancy?
- Do tests of infants predict intelligence later in life?

Connect

- In this section, you learned that measures of habituation and dishabituation are linked to intelligence. In the second section of this chapter, what advice was given to

parents regarding habituation and dishabituation?

Reflect Your Own Personal Journey of Life

- Suppose your sister and her husband have their 1-year-old daughter assessed with a developmental scale, and the infant does very well on it. How confident should they be that your niece will be a genius when she grows up?

4 What Is the Nature of Language, and How Does It Develop in Infancy?

LG4 Describe the nature of language and how it develops in infancy.

Defining Language

Language's Rule Systems

How Language Develops

Biological and Environmental Influences

An Interactionist View

In 1799, a nude boy was observed running through the woods in France. The boy was captured when he was 11 years old. He was called the Wild Boy of Aveyron and was believed to have lived in the woods alone for six years (Lane, 1976). When found, he made no effort to communicate. He never learned to communicate effectively. A modern-day wild child named Genie was discovered in Los Angeles in 1970. Sadly, despite intensive intervention, Genie has never acquired more than a primitive form of language. Both cases—the Wild Boy of Aveyron and Genie—raise questions about the biological and environmental determinants of language, topics that we also examine later in the chapter. First, though, we need to define language.

DEFINING LANGUAGE

Language is a form of communication—whether spoken, written, or signed—that is based on a system of symbols. Language consists of the words used by a community and the rules for varying and combining them.

Think how important language is in our everyday lives. We need language to speak with others, listen to others, read, and write. Our language enables us to describe past events in detail and to plan for the future. Language lets us pass down information from one generation to the next and create a rich cultural heritage. Language learning involves comprehending a sound system (or sign system for individuals who are deaf), the world of objects, actions, and events, and how units such as words and grammar connect sound and world (Pace & others, 2016; van der Hulst, 2017; Wilcox & Occhino, 2017).

All human languages have some common characteristics (Clark, 2017; Waxman & others, 2014). These include infinite generativity and organizational rules. **Infinite generativity** is the ability to produce and comprehend an endless number of meaningful sentences using a finite set of words and rules. Rules describe the way language works. Let's explore what these rules involve.



Language allows us to communicate with others. *What are some important characteristics of language?*

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Infinite generativity The ability to produce an endless number of meaningful sentences using a finite set of words and rules.

LANGUAGE'S RULE SYSTEMS

When nineteenth-century American writer Ralph Waldo Emerson said, “The world was built in order and the atoms march in tune,” he must have had language in mind. Language is highly ordered and organized. The organization involves five systems of rules: phonology, morphology, syntax, semantics, and pragmatics.

Phonology Every language is made up of basic sounds. **Phonology** is the sound system of the language, including the sounds that are used and how they may be combined (Goswami & Bryant, 2016; Swingley, 2017). For example, English has the initial consonant cluster *spr* as in *spring*, but no words begin with the cluster *rsp*.

Phonology provides a basis for constructing a large and expandable set of words out of two or three dozen phonemes (Nathan, 2017; Zamuner & Kharlamov, 2017). A phoneme is the basic unit of sound in a language; it is the smallest unit of sound that affects meaning. For example, in English the sound represented by the letter *p*, as in the words *pot* and *spot*, is a phoneme. The /*p*/ sound is slightly different in the two words, but this variation is not distinguished in English, and therefore the /*p*/ sound is a single phoneme. In some languages, such as Hindi, the variations of the /*p*/ sound represent separate phonemes.

Morphology **Morphology** refers to the units of meaning involved in word formation. A *morpheme* is a minimal unit of meaning; it is a word or a part of a word that cannot be broken into smaller meaningful parts (Lems, Miller, & Soro, 2017; Payne, 2017). Every word in the English language is made up of one or more morphemes. Some words consist of a single morpheme (for example, *help*), whereas others are made up of more than one morpheme (for example, *helper* has two morphemes, *help* and *er*, with the morpheme *-er* meaning “one who,” in this case “one who helps”). Thus, not all morphemes are words by themselves; for example, *pre-*, *-tion*, and *-ing* are morphemes.

Just as the rules that govern phonology describe the sound sequences that can occur in a language, the rules of morphology describe the way meaningful units (morphemes) can be combined in words (Beck, 2017; Deevy, Leonard, & Marchman, 2017). Morphemes have many jobs in grammar, such as marking tense (for example, *she walks* versus *she walked*) and number (*she walks* versus *they walk*).

Syntax **Syntax** involves the way words are combined to form acceptable phrases and sentences (Langacker, 2017; Narrog, 2017). If someone says to you, “Bob slugged Tom” or “Bob was slugged by Tom,” you know who did the slugging and who was slugged in each case because you have a syntactic understanding of these sentence structures. You also understand that the sentence “You didn’t stay, did you?” is a grammatical sentence but that “You didn’t stay, didn’t you?” is unacceptable and ambiguous.

If you learn another language, English syntax will not get you very far. For example, in English an adjective usually precedes a noun (as in *blue sky*), whereas in Spanish the adjective usually follows the noun (*cielo azul*). Despite the differences in their syntactic structures, however, syntactic systems in all of the world’s languages have some common ground (Hoffmann, 2017; Koeneman & Zeijstra, 2017). For example, no language we know of permits sentences like the following one:

The mouse the cat the farmer chased killed ate the cheese.

It appears that language users cannot process subjects and objects arranged in too complex a fashion in a sentence.

Semantics **Semantics** refers to the meaning of words and sentences (McKeown & others, 2017). Every word has a set of semantic features, which are required attributes related to meaning. *Girl* and *woman*, for example, share many semantic features but differ semantically in regard to age.

Words have semantic restrictions on how they can be used in sentences (Taylor, 2017). The sentence *The bicycle talked the boy into buying a candy bar* is syntactically correct but semantically incorrect. The sentence violates our semantic knowledge that bicycles don’t talk.

phonology The sound system of the language, including the sounds that are used and how they may be combined.

morphology Units of meaning involved in word formation.

syntax The ways words are combined to form acceptable phrases and sentences.

semantics The meaning of words and sentences.

pragmatics The appropriate use of language in different contexts.

Rule System	Description	Examples
Phonology	The sound system of a language. A phoneme is the smallest sound unit in a language.	The word <i>chat</i> has three phonemes or sounds: /ch/ /ä/ /t/. An example of a phonological rule in the English language is that while the phoneme /r/ can follow the phonemes /t/ or /d/ in an English consonant cluster (such as <i>track</i> or <i>drab</i>), the phoneme /l/ cannot follow these letters.
Morphology	The system of meaningful units involved in word formation.	The smallest sound units that have a meaning are called morphemes, or meaning units. The word <i>girl</i> is one morpheme, or meaning unit; it cannot be broken down any further and still have meaning. When the suffix <i>s</i> is added, the word becomes <i>girls</i> and has two morphemes because the <i>s</i> changed the meaning of the word, indicating that there is more than one girl.
Syntax	The system that involves the way words are combined to form acceptable phrases and sentences.	Word order is very important in determining meaning in the English language. For example, the sentence "Sebastian pushed the bike" has a different meaning than "The bike pushed Sebastian."
Semantics	The system that involves the meaning of words and sentences.	Vocabulary involves knowing the meaning of individual words. For example, semantics includes knowing the meaning of such words as <i>orange</i> , <i>transportation</i> , and <i>intelligent</i> .
Pragmatics	The system of using appropriate conversation and knowledge of how to effectively use language in context.	An example is using polite language in appropriate situations, such as being mannerly when talking with one's teacher. Taking turns in a conversation involves pragmatics.

Pragmatics A final set of language rules involves **pragmatics**, the appropriate use of language in different contexts. Pragmatics covers a lot of territory (Clark, 2014, 2017; Wilce, 2017). When you take turns speaking in a discussion or use a question to convey a command ("Why is it so noisy in here? What is this, Grand Central Station?"), you are demonstrating knowledge of pragmatics. You also apply the pragmatics of English when you use polite language in appropriate situations (for example, when talking to your teacher) or tell stories that are interesting, jokes that are funny, and lies that convince. In each of these cases, you are demonstrating that you understand the rules of your culture for adjusting language to suit the context.

At this point, we have discussed five important rule systems involved in language. An overview of these rule systems is presented in Figure 10.

HOW LANGUAGE DEVELOPS

According to an ancient historian, in the thirteenth century Emperor Frederick II of Germany had a cruel idea. He wanted to know what language children would speak if no one talked to them. He selected several newborns and threatened their caregivers with death if they ever talked to the infants. Frederick never found out what language the children spoke because they all died. Today, we are still curious about infants' development of language, although our experiments and observations are, to say the least, far more humane than the evil Frederick's.

Whatever language they learn, infants all over the world follow a similar path in language development. What are some key milestones in this development?

Recognizing Language Sounds Long before they begin to learn words, infants can make fine distinctions among the sounds of the language (Masapollo, Polka, & Menard, 2016). In Patricia Kuhl's (1993, 2000, 2007, 2009, 2011, 2015) research, phonemes from languages all over the world are piped through a speaker for infants to hear (see Figure 11). A box with a toy bear in it is placed where the infant can see it. A string of identical syllables is played, and then the syllables are changed (for example, *ba ba ba ba* and then *pa pa pa pa*). If the infant turns its head when the syllables change, the box lights up and the bear dances and drums, and the infant is rewarded for noticing the change.

Kuhl's (2007, 2009, 2011, 2013) research has demonstrated that from birth up to about 6 months of age, infants are "citizens of the world": they recognize when sounds change most of the time, no matter what language the syllables come from. But over the next six months, infants get even better at perceiving the changes in sounds from their "own" language, the one their parents speak, and they gradually lose the ability to recognize differences that are not important in their own language. Recently, Kuhl (2015) found that the developmental stage when a baby's brain is most open to learning the sounds of a native language begins at 6 months for vowels and at 9 months for consonants.

FIGURE 10
THE RULE SYSTEMS OF LANGUAGE



FIGURE 11
FROM UNIVERSAL LINGUIST TO LANGUAGE-SPECIFIC LISTENER. In Patricia Kuhl's research laboratory, babies listen to recorded voices that repeat syllables. When the sounds of the syllables change, the babies quickly learn to look at the bear. Using this technique, Kuhl has demonstrated that babies are universal linguists until about 6 months of age, but in the next six months become language-specific listeners. Does Kuhl's research give support to the view that either "nature" or "nurture" is the source of language acquisition?

©Dr. Patricia Kuhl, Institute for Learning and Brain Science, University of Washington



Long before infants speak recognizable words, they communicate by producing a number of vocalizations and gestures. *At approximately what ages do infants begin to produce different types of vocalizations and gestures?*

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making sounds, to communicate, and to attract attention (Ramsdell & others, 2012). Babies' sounds go through this sequence during the first year:

- *Crying.* Babies cry even at birth. Crying can signal distress, but different types of cries signal different things.
- *Cooing.* Babies first coo at about 1 to 2 months. These gurgling sounds are made in the back of the throat and usually express pleasure during interaction with the caregiver.
- *Babbling.* In the middle of the first year babies babble—that is, they produce strings of consonant-vowel combinations, such as *ba ba ba ba*. In a recent study, babbling onset predicted when infants would say their first words (McGillion & others, 2017a).

Gestures Infants start using gestures, such as showing and pointing, at about 8 to 12 months of age. They may wave bye-bye, nod to mean “yes,” show an empty cup to ask for more milk, and point to a dog to draw attention to it. Some early gestures are symbolic, as when an infant smacks her lips to indicate food/drink. Pointing is considered by language experts to be an important index of the social aspects of language, and it follows a specific developmental sequence: from pointing without checking on adult gaze to pointing while looking back and forth between an object and the adult (Cooperrider & Goldin-Meadow, 2017; Goldin-Meadow, 2014a, b, 2015, 2017a, b).

Lack of pointing is a significant indicator of problems in the infant's communication system (Brentari & Goldin-Meadow, 2017; Cochet & Byrne, 2016; Walle, 2016). For example, failure to engage in pointing characterizes many autistic children. The ability to use the pointing gesture effectively improves in the second year of life as advances in other aspects of language communication occur (Colonnesi & others, 2011).

One study found that in families of high socioeconomic status (SES), parents were more likely to use gestures when communicating with their 14-month-old infants (Rowe & Goldin-Meadow, 2009). Further, the infants' use of gestures at 14 months of age in high-SES families was linked to a larger vocabulary at 54 months of age.

Why might gestures such as pointing promote further language development? An infant's gestures advance their language development since caregivers often talk to them about what they are pointing to. Also, babies' first words often are for things they have previously pointed to.

First Words Babies understand their first words earlier than they speak them (Harris, Golinkoff, & Hirsh-Pasek, 2012; Pace & others, 2016). As early as 5 months of age, infants recognize their name when someone says it. And as early as 6 months, they recognize “Mommy” and “Daddy.” On average, infants understand about 50 words at about 13 months, but they can't say this many words until about 18 months (Menyuk, Liebergott, & Schultz, 1995). Thus, in infancy *receptive vocabulary* (words the child understands) considerably

exceeds *spoken vocabulary* (words the child uses). One study revealed that 6-month-olds understand words that refer to body parts, such as “hand” and “feet,” even though they cannot yet speak these words (Tincoff & Jusczyk, 2012).

A child’s first words include those that name important people (*dada*), familiar animals (*kitty*), vehicles (*car*), toys (*ball*), food (*milk*), body parts (*eye*), clothes (*hat*), household items (*clock*), and greeting terms (*bye*). These were the first words of babies 50 years ago. They are the first words of babies today. Children often express various intentions with their single words, so that “cookie” might mean, “That’s a cookie” or “I want a cookie.”

The infant’s spoken vocabulary rapidly increases once the first word is spoken (Fenson & others, 2007). The average 18-month-old can speak about 50 words, but the average 2-year-old can speak about 200 words. This rapid increase in vocabulary that begins at approximately 18 months is called the *vocabulary spurt* (Bloom, Lifter, & Broughton, 1985).

Like the timing of a child’s first word, the timing of the vocabulary spurt varies (Lieven, 2008). Figure 12 shows the range for these two language milestones in 14 children. On average, these children said their first word at 13 months and had a vocabulary spurt at 19 months. However, the ages for the first word of individual children varied from 10 to 17 months and for their vocabulary spurt from 13 to 25 months.

The spurt actually involves the increase in the rate at which words are learned. That is, early on, a few words are learned every few days, then later on, a few words are learned each day, and eventually many words each day.

Does early vocabulary development predict later language development? A recent study found that infant vocabulary development at 16 to 24 months of age was linked to vocabulary, phonological awareness, reading accuracy, and reading comprehension five years later (Duff, Tomblin, & Catts, 2015).

Cross-linguistic differences occur in word learning (Waxman & others, 2013). Children who are learning Mandarin Chinese, Korean, and Japanese acquire more verbs earlier in their development than do children learning English. This cross-linguistic difference reflects the greater use of verbs in the language input to children in these Asian languages. Indeed, the language of Korean children is often described as verb friendly and the language of English as noun friendly (Waxman & others, 2013).

Children sometimes overextend or underextend the meanings of the words they use (Woodward & Markman, 1998). *Overextension* is the tendency to apply a word to objects that are inappropriate for the word’s meaning by going beyond the set of referents an adult would use. For example, children at first may say “*dada*” not only for “father” but also for other men, strangers, or boys. Another example of overextension is calling any animal with four legs a “dog.” With time, overextensions decrease and eventually disappear. *Underextension* is the tendency to apply a word too narrowly; it occurs when children fail to use a word to name a relevant event or object. For example, a child might use the word *boy* to describe a 5-year-old neighbor but not apply the word to a male infant or to a 9-year-old male.

Two-Word Utterances By the time children are 18 to 24 months of age, most of their communication consists of two-word utterances (Tomasello, 2011). To convey meaning with just two words, the child relies heavily on gesture, tone, and context. The wealth of meaning children can communicate with a two-word utterance includes the following (Slobin, 1972):

- Identification: “See doggie.”
- Location: “Book there.”
- Repetition: “More milk.”
- Negation: “Not wolf.”
- Possession: “My candy.”
- Attribution: “Big car.”
- Agent-action: “Mama walk.”
- Action-direct object: “Hit you.”
- Action-indirect object: “Give Papa.”
- Action-instrument: “Cut knife.”
- Question: “Where ball?”



What characterizes the infant’s early word learning?

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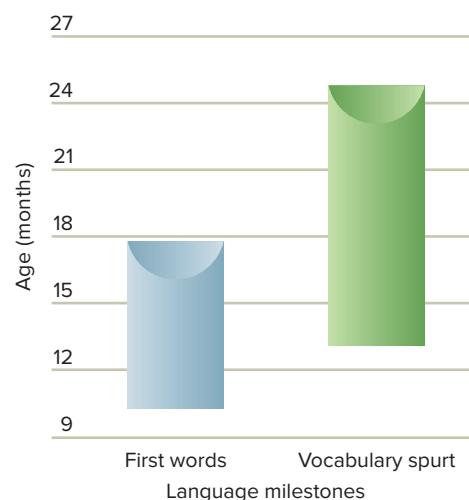


FIGURE 12

VARIATION IN LANGUAGE MILESTONES.

What are some possible explanations for variations in the timing of these milestones?

Source: Bloom, L. “Variation in Language Milestones,” in *Handbook of Child Psychology*, 5e, New York: Wiley, 1998, 309–370.



Around the world, most young children learn to speak in two-word utterances at about 18 to 24 months of age. *What are some examples of these two-word utterances?*

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Typical Age	Language Milestones
Birth	Crying
2 to 4 months	Cooing begins
5 months	Understands first word
6 months	Babbling begins
7 to 11 months	Change from universal linguist to language-specific listener
8 to 12 months	Uses gestures, such as showing and pointing Comprehension of words appears
13 months	First word spoken
18 months	Vocabulary spurt starts
18 to 24 months	Uses two-word utterances Rapid expansion of understanding of words

FIGURE 13

SOME LANGUAGE MILESTONES IN INFANCY.

Despite great variations in the language input received by infants, around the world they follow a similar path in learning to speak.

These examples are from children whose first language is English, German, Russian, Finnish, Turkish, or Samoan.

Notice that the two-word utterances omit many parts of speech and are remarkably succinct. In fact, in every language, a child's first combinations of words have this economical quality; they are telegraphic. **Telegraphic speech** is the use of content words without grammatical markers such as articles, auxiliary verbs, and other connectives. Telegraphic speech is not limited to two words. "Mommy give ice cream" and "Mommy give Tommy ice cream" also are examples of telegraphic speech.

BIOLOGICAL AND ENVIRONMENTAL INFLUENCES

We have discussed a number of language milestones in infancy; Figure 13 summarizes the approximate time at which infants typically reach these milestones. But what makes this amazing development possible? Everyone who uses language in some way "knows" its rules and has the ability to create an infinite number of words and sentences. Where does this knowledge come from? Is it the product of biology? Is language learned and influenced by experiences?

Biological Influences The ability to speak and understand language requires a certain vocal apparatus as well as a nervous system with certain capabilities. The nervous system and vocal apparatus of humanity's predecessors changed over hundreds of thousands or millions of years. With advances in the nervous system and vocal structures, *Homo sapiens* went beyond the grunting and shrieking of other animals to develop speech (Lieberman, 2016). Although estimates vary, many experts believe that humans acquired language about 100,000 years ago, which in evolutionary time represents a very recent acquisition. It gave humans an enormous edge over other animals and increased the chances of human survival (McMurray, 2016).

Some language scholars view the remarkable similarities in how children acquire language all over the world as strong evidence that language has a biological basis. There is evidence that particular regions of the brain are predisposed to be used for language (Coulson, 2017; Schutze, 2017). Two regions involved in language were first discovered in studies of brain-damaged individuals: **Broca's area**, an area in the left frontal lobe of the brain involved in producing words (Zhang & others, 2017), and **Wernicke's area**, a region of the brain's left hemisphere involved in language comprehension (Bruckner & Kammer, 2017) (see Figure 14). Damage to either of these areas produces types of **aphasia**, which is a loss or impairment of language processing. Individuals with damage to Broca's area have difficulty producing words correctly; individuals with damage to Wernicke's area have poor comprehension and often produce incomprehensible speech.

Linguist Noam Chomsky (1957) proposed that humans are biologically prewired to learn language at a certain time and in a certain way. He said that children are born into the world with a **language acquisition device (LAD)**, a biological endowment that enables the child to detect certain features and rules of language, including phonology, syntax, and semantics (McGilvray, 2017). Children are prepared by nature with the ability to detect the sounds of language, for example, and to follow rules such as how to form plurals and ask questions.

Chomsky's LAD is a theoretical construct, not a physical part of the brain. Is there evidence for the existence of a LAD? Supporters of the LAD concept cite the uniformity of language milestones across languages and cultures, evidence that children create language even in the absence of well-formed input, and biological substrates of language. But, as we will see, critics argue that even if infants have something like a LAD, it cannot explain the whole story of language acquisition.

Environmental Influences Decades ago, behaviorists opposed Chomsky's hypothesis and argued that language represents nothing more than chains of responses acquired through reinforcement (Skinner, 1957). A baby happens to babble "Ma-ma"; Mama rewards the baby with hugs and smiles; the baby says "Mama" more and more. Bit by bit, said the behaviorists, the baby's language is built up. According to behaviorists, language is a complex learned skill, much like playing the piano or dancing.

There are several problems with the behaviorist view of language learning. First, it does not explain how people create novel sentences—sentences that people have never heard or

spoken before. Second, children learn the syntax of their native language even if they are not reinforced for doing so. Social psychologist and psycholinguist Roger Brown (1973) spent long hours observing parents and their young children. He found that parents did not directly or explicitly reward or correct the syntax of most children's utterances. That is, parents did not say "good," "correct," "right," "wrong," and so on. Also, parents did not offer direct corrections such as "You should say two shoes, not two shoe." However, as we will see shortly, many parents do expand on their young children's grammatically incorrect utterances and recast many of those that have grammatical errors.

The behavioral view is no longer considered a viable explanation of how children acquire language (Pace, Hirsh-Pasek, & Golinkoff, 2016). But a great deal of research describes ways in which children's environmental experiences influence their language skills (Vallotton & others, 2017; Yazejian & others, 2017). Many language experts argue that a child's experiences, the particular language to be learned, and the context in which learning takes place can strongly influence language acquisition (Clark, 2017; Marchman & others, 2017; Wilce, 2017).

Language is not learned in a social vacuum. Most children are bathed in language from a very early age (Kuhl, 2009, 2011, 2013, 2015). The Wild Boy of Aveyron who never learned to communicate effectively had lived in social isolation for years.

Thus, social cues play an important role in infant language learning (McGillion & others, 2017b; Pace & others, 2016). Joint engagement and relevant responsiveness by a social partner predict better growth in language later in development, possibly because they improve the infant's mapping process between words and the world (Tamis-LeMonda, Kurchenko, & Song, 2014).

The support and involvement of caregivers and teachers greatly facilitate a child's language learning (Pace & others, 2016; Vallotton & others, 2017). In a recent study, the quality of early foundational communication between parent and child at age 2 accounted for more variability in language outcomes one year later than the amount of parent speech did (Hirsh-Pasek & others, 2015). In another study, both full-term and preterm infants who heard more caregiver talk based on all-day recordings at 16 months of age had better language skills (receptive and expressive language, language comprehension) at 18 months of age (Adams & others, 2017). And in yet another study, when mothers immediately smiled and touched their 8-month-old infants after they babbled, the infants subsequently made more complex speech-like sounds than when mothers responded to their infants in a random manner (Goldstein, King, & West, 2003) (see Figure 15).

Given that social interaction is a critical component for infants to learn language effectively, might they also be able to learn language effectively through television and videos? Researchers have found that infants and young children cannot effectively learn language (phonology or words) from television or videos (Kuhl, 2007; Roseberry & others, 2009; Zosh & others, 2017). A recent study of toddlers found that frequent viewing of television increased the risk of delayed language development (Lin & others, 2015). Thus, just hearing language is not enough, even when infants seemingly are fully engaged in the experience. However, a recent study revealed that Skype provides some improvement in child language learning over videos and TV (Roseberry, Hirsh-Pasek, & Golinkoff, 2014), and older children can use information from television in their language development.

FIGURE 15

SOCIAL INTERACTION AND BABBLING. One study focused on two groups of mothers and their 8-month-old infants (Goldstein, King, & West, 2003). One group of mothers was instructed to smile and touch their infants immediately after the babies cooed and babbled; the other group was also told to smile and touch their infants but in a random manner, unconnected to sounds the infants made. The infants whose mothers immediately responded in positive ways to their babbling subsequently made more complex, speechlike sounds, such as "da" and "gu." The research setting for this study, which underscores how important caregivers are in the early development of language, is shown here.

Courtesy of Dr. Michael H. Goldstein, Cornell University

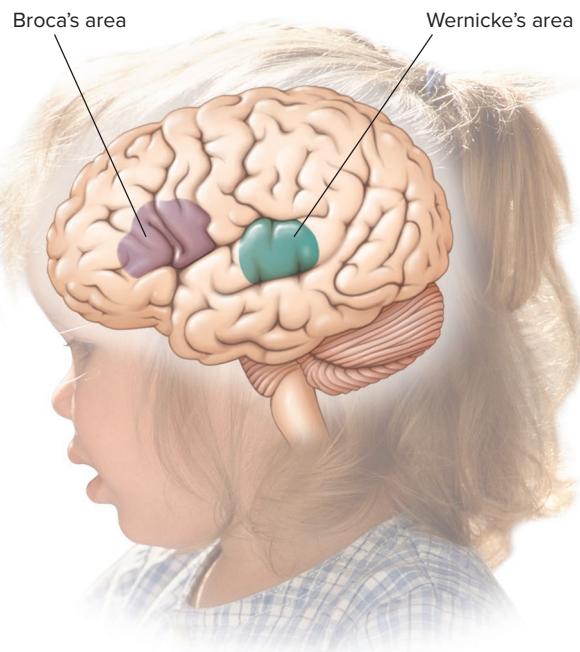


FIGURE 14

BROCA'S AREA AND WERNICKE'S AREA. Broca's area is located in the frontal lobe of the brain's left hemisphere, and it is involved in the control of speech. Wernicke's area is a portion of the left hemisphere's temporal lobe that is involved in understanding language. *How does the role of these areas of the brain relate to lateralization?*

telegraphic speech The use of content words without grammatical markers such as articles, auxiliary verbs, and other connectives.

Broca's area An area in the brain's left frontal lobe that is involved in speech production.

Wernicke's area An area of the brain's left hemisphere that is involved in language comprehension.

aphasia A loss or impairment of language processing caused by brain damage in Broca's area or Wernicke's area.

language acquisition device (LAD) Chomsky's term describing a biological endowment that enables the child to detect the features and rules of language, including phonology, syntax, and semantics.



Michael Tomasello (2003, 2006, 2011, 2014; Tomasello & Vaish, 2013) stresses that young children are intensely interested in their social world and that early in their development they can understand the intentions of other people. He emphasizes that children learn language in specific interactive contexts. For example, when a toddler and a father are jointly focused on a book, the father might say, "See the birdie." In this case, even a toddler understands that the father intends to name something and knows to look in the direction of the pointing. Through this kind of joint attention, early in their development children are able to use their social skills to acquire language (Carpenter, 2011; Tomasello, 2014). For example, one study revealed that joint visual attention behavior at 10 to 11 months of age (before children spoke their first words) was linked to vocabulary growth at 14, 18, and 24 months of age (Brooks & Meltzoff, 2008). Another study revealed that joint attention at 12 and 18 months predicted language skills at 24 months of age (Mundy & others, 2007). Also, in a recent study involving joint attention, infants' eye-gaze behaviors during Spanish tutoring sessions at 9.5 to 10.5 months of age predicted their second-language phonetic learning at 11 months of age, indicating a strong influence of social interaction at the earliest ages of learning a second language (Conboy & others, 2015).

In particular, researchers have found that the child's vocabulary development is linked to the family's socioeconomic status and the type of talk that parents direct to their children (Pan & Uccelli, 2009). To read about these links, see the *Connecting with Diversity* interlude that follows.

One intriguing component of the young child's linguistic environment is **child-directed speech** (also referred to as *parentese*), which is language spoken in a higher pitch, slower tempo, and exaggerated intonation than normal, with simple words and sentences (Broesch & Bryant, 2017; Hayashi & Mazuka, 2017; Kuhl, 2015). It is hard to use child-directed speech

child-directed speech Language spoken in a higher pitch than normal, with simple words and sentences.

connecting with diversity

Language Environment, Poverty, and Language Development

What characteristics of a family make a difference to a child's language development? Socioeconomic status has been linked with how much parents talk to their children and with young children's vocabulary (Leffel & Suskind, 2013; McGillion & others, 2017b). Betty Hart and Todd Risley (1995) observed the language environments of children whose parents were professionals and children whose parents were on welfare. Compared with the professional parents, the parents on welfare talked much less to their young children, talked less about past events, and provided less elaboration. The children of the professional parents had a much larger vocabulary at 36 months of age than the children of the welfare parents. A recent study also found that at 18 to 24 months of age, infants in low-SES families already had a smaller vocabulary and less efficient language processing than their infant counterparts in middle-SES families (Fernald, Marchman, & Weisleder, 2013).

Other research has linked how much mothers speak to their infants with the size of the infants' vocabularies. For example, in one study by Janellen Huttenlocher and her colleagues (1991), infants whose mothers spoke more often to them had markedly larger vocabularies. By the second birthday, vocabulary differences were substantial. However, a study of 1- to 3-year-old children living in low-income families found that the sheer amount of maternal talk was not the best predictor of a child's vocabulary growth (Pan & others, 2005). Rather, it was maternal language and literacy skills, and mothers' use of diverse vocabulary, that best predicted children's vocabulary development. Also, mothers who frequently used pointing gestures had children with a larger vocabulary. Pointing usually occurs in concert with speech and it may enhance the meaning of mothers' verbal input to their children.

One study revealed that maternal sensitivity (responding warmly to the child's bids and anticipating her child's emotional needs, for example), regardless of socioeconomic status and ethnicity, was positively linked with growth in young children's receptive and expressive language development from 18 to 36 months of age (Pungello & others, 2009). In this study, negative intrusive parenting (physically restraining the child or dominating interaction with the child with unnecessary verbal direction, for example) was related to slower growth of receptive language.

These research studies and others (NICHD Early Child Care Research Network, 2005; Perkins, Finegood, & Swain, 2013) demonstrate the important effect that early speech input and poverty can have on the development of a child's language skills. Children in low-income families are more likely to have less educated parents, have inadequate nutrition, live in low-income communities, and attend substandard schools than children in middle- and high-income families (Snow, Burns, & Griffin, 1998). However, living in a low-income family should not be used as the sole identifier in predicting whether children will have difficulties in language development, such as a low vocabulary and reading problems. If children growing up in low-income families experience effective instruction and support, they can develop effective language skills (Hirsh-Pasek & Golinkoff, 2014; Perkins, Finegood, & Swain, 2013).

How can parents in low-income families improve their infants' language development?

when not in the presence of a baby. As soon as we start talking to a baby, though, most of us shift into child-directed speech. Much of this is automatic and something most parents are not aware they are doing. Child-directed speech serves the important functions of capturing the infant's attention, maintaining communication and social interaction between infants and caregivers, and providing infants with information about their native language by heightening differences between speech directed to children and adults (Golinkoff & others, 2015). Even 4-year-olds speak in simpler ways to 2-year-olds than to their 4-year-old friends.

Child-directed speech has the important function of capturing the infant's attention and maintaining communication (Ratner, 2013). A recent study found that child-directed speech in a one-to-one social context at 11 to 14 months of age was linked to greater word production at 2 years of age than standard speech and speech in a group setting (Ramirez-Esparza, Garcia-Sierra, & Kuhl, 2014). In recent research, child-directed speech in a one-to-one social context for 11 to 14 years of age was also related to productive vocabulary at 2 years of age for Spanish-English bilingual infants across languages and in each individual language (Ramirez-Esparza, Garcia-Sierra, & Kuhl, 2017). Yet another recent study of low-SES Spanish-speaking families revealed that infants who experienced more child-directed speech were better at processing words in real time and had larger vocabularies at 2 years of age (Weisleder & Fernald, 2013).

Adults often use strategies other than child-directed speech to enhance the child's acquisition of language, including recasting, expanding, and labeling:

- *Recasting* occurs when an adult rephrases something the child has said that might lack the appropriate morphology or contain some other error. The adult restates the child's immature utterance in the form of a fully grammatical sentence. For example, when a 2-year-old says, "Dog bark," the adult may respond by saying, "Oh, you heard the dog barking!" The adult sentence acknowledges that the child was heard and then adds the morphology (/ing/) and the article (the) that the child's utterance lacked.
- *Expanding* involves adding information to a child's incomplete utterance. For example, a child says, "Doggie eat," and the parent replies, "Yes, the dog is eating his food out of his special dish."
- *Labeling* is naming objects that children seem interested in. Young children are forever being asked to identify the names of objects. Roger Brown (1958) called this "the original word game." Children want more than the names of objects, though; they often want information about the object as well.

Parents use these strategies naturally and in meaningful conversations. Parents do not need to use a particular method to teach their children to talk, even for children who are slow in learning language. Children usually benefit when parents follow the child's lead, talking about things the child is interested in at the moment, and when parents provide information in ways that children can process effectively (Pan, 2008). If children are not ready to take in some information, they are likely to tell you (perhaps by turning away). Thus, giving the child more information is not always better.

Infants, toddlers, and young children benefit when adults read books to and with them (shared reading) (Chaco & others, 2017; Marjanovic-Umek, Fekonja-Peklaj, & Socan, 2017; Wesseling, Charistmann, & Lachmann, 2017). In one study, a majority of U.S. mothers in low-income families reported that they were reading to their infants and toddlers with some regularity (Raikes & others, 2006). In this study, non-Latino White, more highly educated mothers who were parenting a firstborn child were more likely to read books to their infants and toddlers than were African American and Latino mothers who were parenting later-born children. Reading daily to children at 14 to 24 months of age was positively related to the children's language and cognitive development at 36 months of age.

Remember that encouragement of language development, not drill and practice, is the key. Language development is not a simple matter of imitation and reinforcement. To read further about ways that parents can facilitate children's language development, see the applications in the *Caring Connections* interlude.



What is shared reading and how might it benefit infants and toddlers?

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AN INTERACTIONIST VIEW

If language acquisition depended only on biology, then the Wild Boy of Aveyron and Genie (discussed earlier in the chapter) should have talked without difficulty. A child's experiences

caring connections

How Parents Can Facilitate Infants' and Toddlers' Language Development

Linguist Naomi Baron (1992) in *Growing Up with Language*, developmental psychologists Roberta Golinkoff and Kathy Hirsh-Pasek (2000) in *How Babies Talk*, and more recently Ellen Galinsky (2010) in *Mind in the Making*, provided ideas to help parents facilitate their infants' and toddlers' language development. Their suggestions are summarized below:

- **Be an active conversational partner.** Talk to your baby from the time it is born. Initiate conversation with the baby. If the baby is in a day-long child-care program, ensure that the baby receives adequate language stimulation from adults.
- **Talk in a slowed-down pace and don't worry about how you sound to other adults when you talk to your baby.** Talking in a slowed-down pace will help your baby detect words in the sea of sounds they experience. Babies enjoy and attend to the high-pitched sound of child-directed speech.
- **Narrate your daily activities to the baby as you do them.** For example, talk about how you will put the baby in a high chair for lunch and ask what she would like to eat, and so on.
- **Use parent-look and parent-gesture, and name what you are looking at.** When you want your child to pay attention to something, look at it and point to it. Then name it—for example, by saying "Look, Alex, there's an airplane."
- **When you talk with infants and toddlers, be simple, concrete, and repetitive.** Don't try to talk to them in abstract,



It is a good idea for parents to begin talking to their babies at the start. The best language teaching occurs when the talking is begun before infants become capable of their first intelligible speech. *What are some other guidelines for parents to follow in helping their infants and toddlers develop their language skills?*

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high-level ways or think you have to say something new or different all of the time. Using familiar words often will help them remember the words.

- **Play games.** Use word games like peek-a-boo and pat-a-cake to help infants learn words.
- **Remember to listen.** Since toddlers' speech is often slow and laborious, parents are often tempted to supply words and thoughts for them. Be patient and let toddlers express themselves, no matter how painstaking the process is or how great a hurry you are in.
- **Expand and elaborate language abilities and horizons with infants and toddlers.** Ask questions that encourage answers other than "Yes" and "No." Actively repeat, expand, and recast the utterances. Your toddler might say, "Dada." You could follow with "Where's Dada?", and then you might continue, "Let's go find him."
- **Adjust to your child's idiosyncrasies instead of working against them.** Many toddlers have difficulty pronouncing words and making themselves understood. Whenever possible, make toddlers feel that they are being understood.
- **Resist making normative comparisons.** Be aware of the ages at which your child reaches specific milestones (such as the first word, first 50 words), but do not measure this development rigidly against that of other children. Such comparisons can bring about unnecessary anxiety.

influence language acquisition. But we have seen that language does have strong biological foundations. No matter how much you converse with a dog, it won't learn to talk. In contrast, children are biologically prepared to learn language. Children all over the world acquire language milestones at about the same time and in about the same order. However, there are cultural variations in the type of support given to children's language development. For example, caregivers in the Kaluli culture prompt young children to use a loud voice and particular morphemes that direct the speech act performed (calling out) and to refer to names, kinship relations, and places where there has been a shared past experience that indicates a closeness to the person being addressed (Ochs & Schieffelin, 2008; Schieffelin, 2005).

Environmental influences are also very important in developing competence in language. Children whose parents provide them with a rich verbal environment show many positive benefits (Marchman & others, 2017; Vallotton & others, 2017). Parents who pay attention to what their children are trying to say, expand their children's utterances, read to them, and label things in the environment, are providing valuable benefits for them (Yazejian & others, 2017).

An interactionist view emphasizes that both biology and experience contribute to language development. How much of the language is biologically determined and how much depends on interaction with others is a subject of debate among linguists and psychologists (Adams & others, 2017; McGillion & others, 2017b). However, all agree that both biological capacity and relevant experience are necessary (Green & others, 2017; Peterson & others, 2017; Warren & others, 2017).

Review Connect Reflect

LG4 Describe the nature of language and how it develops in infancy.

Review

- What is language?
- What are language's rule systems?
- How does language develop in infancy?
- What are some biological and environmental influences on language?
- To what extent do biological and environmental influences interact to produce language development?

Connect

- The more years children spend living in poverty, the more their physiological indices of stress are elevated. In this chapter, you learned about the role of

SES in children's language acquisition and vocabulary building. How might these factors influence children's performance when they go to school?

Reflect Your Own Personal Journey of Life

- Would it be a good idea for you as a parent to hold large flash cards of words in front of your baby for several hours each day to help the baby learn language and improve the baby's intelligence? Why or why not? What do you think Piaget would say about this activity?

topical connections *looking forward*

Advances in infants' cognitive development are linked to their socioemotional development. For example, you will learn about the infant's developing social orientation and understanding, which involve perceiving people as engaging in intentional and goal-directed behavior, joint attention, and cooperation. Also in "Socioemotional Development in Infancy" you will study many aspects of the infant's emotional development, temperament, attachment, and child care. And in "Cognitive Development in Early Childhood" you will read about two major theorists—Piaget and Vygotsky—and their views of how young children's thinking advances. You will see how young children become more capable of sustaining their attention; learn about the astonishing rate at which preschool children's vocabulary expands; and explore variations in early childhood education.

reach your learning goals

Cognitive Development in Infancy

1 What Is Piaget's Theory of Infant Development?

Cognitive Processes

LG1

Summarize and evaluate Piaget's theory of infant development.

- In Piaget's theory, children construct their own cognitive worlds, building mental structures to adapt to their world.
- Schemes are actions or mental representations that organize knowledge. Behavioral schemes (physical activities) characterize infancy, whereas mental schemes (cognitive activities) develop in childhood. Assimilation occurs when children incorporate new information into existing schemes; accommodation refers to children's adjustment of their schemes in the face of new information.
- Through organization, children group isolated behaviors into a higher-order, more smoothly functioning cognitive system.

The Sensorimotor Stage**Evaluating Piaget's Sensorimotor Stage**

- Equilibration is a mechanism Piaget proposed to explain how children shift from one stage of thought to the next. As children experience cognitive conflict in trying to understand the world, they use assimilation and accommodation to attain equilibrium. The result is a new stage of thought. According to Piaget, there are four qualitatively different stages of thought.
- In sensorimotor thought, the first of Piaget's four stages, the infant organizes and coordinates sensory experiences with physical movements. The stage lasts from birth to about 2 years of age.
- The sensorimotor stage has six substages: simple reflexes; first habits and primary circular reactions; secondary circular reactions; coordination of secondary circular reactions; tertiary circular reactions, novelty, and curiosity; and internalization of schemes. One key accomplishment of this stage is object permanence, the ability to understand that objects continue to exist even though the infant is no longer observing them. Another aspect involves infants' understanding of cause and effect.
- Piaget opened up a whole new way of looking at infant development in terms of coordinating sensory input with motoric actions. In the past decades, revisions of Piaget's view have been proposed based on research. For example, researchers have found that a stable and differentiated perceptual world is established earlier than Piaget envisioned, and infants begin to develop concepts as well. The nature-nurture issue in regard to infant cognitive development continues to be debated. Spelke endorses a core knowledge approach, which states that infants are born with domain-specific innate knowledge systems. Critics argue that Spelke has not given adequate attention to the influence of early experiences on infants' cognitive development.

2 How Do Infants Learn, Remember, and Conceptualize?**LG2**

Describe how infants learn, remember, and conceptualize.

Conditioning**Attention****Memory****Imitation****Concept Formation**

- Both classical and operant conditioning occur in infants. Operant conditioning techniques have especially been useful to researchers in demonstrating infants' perception and retention of information about perceptual-motor actions.
- Attention is the focusing of mental resources on select information, and in infancy attention is closely linked with habituation. In the first year, much of attention is of the orienting/investigative type, but sustained attention also becomes important.
- Habituation is the repeated presentation of the same stimulus, causing reduced attention to the stimulus. If a different stimulus is presented and the infant pays increased attention to it, dishabituation is occurring. Joint attention plays an important role in infant development, especially in the infant's acquisition of language.
- Memory is the retention of information over time. Infants as young as 2 to 6 months of age can retain information about some experiences. However, many experts argue that what we commonly think of as memory (consciously remembering the past, or explicit memory) does not occur until the second half of the first year of life. By the end of the second year, explicit memory continues to improve.
- The hippocampus and frontal lobes of the brain are involved in development of explicit memory in infancy.
- The phenomenon of not being able to remember events that occurred before the age of 2 or 3—known as infantile, or childhood, amnesia—may be due to the immaturity of the pre-frontal lobes of the brain at that age.
- Meltzoff has shown that newborns can match their behaviors (such as protruding their tongue) to a model. His research also shows that deferred imitation occurs as early as 9 months of age.
- Concepts are cognitive groupings of similar objects, events, people, or ideas. Mandler argues that it is not until about 7 to 9 months of age that infants form conceptual categories, although we do not know precisely when concept formation begins. Infants' first concepts are broad. Over the first two years of life, these broad concepts gradually become more differentiated. Many infants and young children develop an intense interest in a particular category (or categories) of objects.



3 How Are Individual Differences in Infancy Assessed, and Do These Assessments Predict Intelligence?

LG3

Discuss infant assessment measures and the prediction of intelligence.

Measures of Infant Development

Predicting Intelligence

- Developmental scales for infants grew out of the tradition of IQ testing of older children. These scales are less verbal than IQ tests. Gesell's test is still widely used by pediatricians to distinguish between normal and abnormal infants; it provides a developmental quotient (DQ). The Bayley scales, developed by Nancy Bayley, continue to be widely used today to assess infant development. The current version, the Bayley-III, consists of cognitive, language, motor, socioemotional, and adaptive scales. Increasingly used, the Fagan Test of Infant Intelligence assesses how effectively the infant processes information.
- Global scores on the Gesell and Bayley scales are not good predictors of childhood intelligence. However, measures of information processing such as speed of habituation and degree of dishabituation do correlate with intelligence later in childhood. There is both continuity and discontinuity between infant cognitive development and cognitive development later in childhood.

4 What Is the Nature of Language, and How Does It Develop in Infancy?

LG4

Describe the nature of language and how it develops in infancy.

Defining Language

Language's Rule Systems

How Language Develops

Biological and Environmental Influences

An Interactionist View

- Language is a form of communication, whether spoken, written, or signed, that is based on a system of symbols. Language consists of all the words used by a community and the rules for varying and combining them. It is marked by infinite generativity.
- Phonology is the sound system of the language, including the sounds that are used and how they may be combined. Morphology refers to the units of meaning involved in word formation. Syntax is the way words are combined to form acceptable phrases and sentences. Semantics involves the meaning of words and sentences. Pragmatics is the appropriate use of language in different contexts.
- Among the milestones in infant language development are crying (birth), cooing (1 to 2 months), babbling (6 months), making the transition from universal linguist to language-specific listener (7 to 11 months), using gestures (8 to 12 months), comprehending words (8 to 12 months), speaking of first word (13 months), vocabulary spurt (18 months), rapid expansion of understanding words (18 to 24 months), and two-word utterances (18 to 24 months).
- In evolution, language clearly gave humans an enormous advantage over other animals and increased their chance of survival. Broca's area and Wernicke's area are important locations for language processing in the brain's left hemisphere. Chomsky argues that children are born with the ability to detect basic features and rules of language. In other words, they are biologically prepared to learn language with a prewired language acquisition device (LAD). The behaviorists' view—that children acquire language as a result of reinforcement—has not been supported.
- Adults help children acquire language through child-directed speech, recasting, expanding, and labeling. Environmental influences are demonstrated by differences in the language development of children as a consequence of being exposed to different language environments in the home. Parents should talk extensively with an infant, especially about what the baby is attending to.
- Today, most language researchers believe that children everywhere are born with special social and linguistic capacities that make language acquisition possible. How much of the language is biologically determined and how much depends on interaction with others is a subject of debate among linguists and psychologists. However, all agree that both biological capacity and relevant experience are necessary.

key terms

A-not-B error	core knowledge approach	language	secondary circular reactions
accommodation	deferred imitation	language acquisition device (LAD)	semantics
aphasia	developmental quotient (DQ)	memory	sensorimotor stage
assimilation	equilibration	morphology	simple reflexes
attention	explicit memory	object permanence	syntax
Bayley Scales of Infant Development	first habits and primary circular reactions	organization	telegraphic speech
Broca's area	implicit memory	phonology	tertiary circular reactions, novelty, and curiosity
child-directed speech	infinite generativity	pragmatics	Wernicke's area
concepts	internalization of schemes	primary circular reaction	
coordination of secondary circular reactions	joint attention	schemes	

key people

Renée Baillargeon	Arnold Gesell	Patricia Kuhl	Todd Risley
Naomi Baron	Eleanor Gibson	Jean Mandler	Carolyn Rovee-Collier
Nancy Bayley	Roberta Golinkoff	Andrew Meltzoff	Elizabeth Spelke
Roger Brown	Betty Hart	Kathy Hirsh-Pasek	Michael Tomasello
Noam Chomsky	Janellen Huttenlocher	Jean Piaget	

connecting with improving the lives of children

STRATEGIES

Nourishing the Infant's Cognitive Development

What are some good strategies for helping infants develop in cognitively competent ways?

- *Provide the infant with many play opportunities in a rich and varied environment.* Give the infant extensive opportunities to experience objects of different sizes, shapes, textures, and colors. Recognize that play with objects stimulates the infant's cognitive development.
- *Actively communicate with the infant.* Don't let the infant spend long bouts of waking hours in social isolation. Infants need caregivers who actively communicate with them. This active communication with adults is necessary for the infant's competent cognitive development.
- *Don't try to accelerate the infant's cognitive development.* Most experts stress that infants cognitively benefit when they learn concepts naturally. The experts emphasize that restricting infants to a passive role and showing them flash cards to accelerate their cognitive development are not good strategies.

RESOURCES

Mind in the Making (2010)

Ellen Galinsky
New York: HarperCollins

A must-read book for parents of infants and young children. Galinsky interviewed a number of leading experts in children's development and

distilled their thoughts in easy-to-read fashion. The book provides abundant examples of how to improve infants' attention, communication, cognitive skills, and learning.

Growing Up with Language (1992)

Naomi Baron
Reading, MA: Addison-Wesley

Baron focuses on three representative children and their families. She explores how children put their first words together, struggle to understand meaning, and use language as a creative tool. She shows parents how they play a key role in their child's language development.

How Babies Talk (2000)

Roberta Golinkoff and Kathy Hirsh-Pasek
New York: Plume

Targeted to parents, this book by leading experts details the fascinating world of infant language. Included are activities parents can use with their infants and indicators of delayed language that can alert parents to possible language problems.

The Development of Language (7th ed., 2009)

Jean Berko Gleason and Nan Ratner
Boston: Allyn & Bacon

A number of leading experts provide up-to-date discussion of many aspects of language development, including the acquisition of language skills, language rule systems, and communication in infancy.