CHILD & ADOLESCENT DEVELOPMENT IN CONTEXT

TARA L. KUTHER

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CHILD & ADOLESCENT DEVELOPMENT IN CONTEXT

To FHM

With love always, TKM

CHILD & ADOLESCENT DEVELOPMENT IN CONTEXT

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55 City Road
London, EC1Y 1SP
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B 1/I 1 Mohan Cooperative Industrial Area
Mathura Road, New Delhi 110 044
India

SAGE Publications Asia-Pacific Pte. Ltd.
18 Cross Street #10-10/11/12
China Square Central
Singapore 048423

Printed in Canada

Library of Congress Cataloging-in-Publication Data

Names: Kuther, Tara L., author.

Title: Child and adolescent development : lives in context / Tara L. Kuther, Western Connecticut State University.

Description: Los Angeles, : SAGE, [2020] | Includes bibliographical references.

Identifiers: LCCN 2019030603 | ISBN 9781544324814 (hardcover) | ISBN 9781544324791 (epub) | ISBN 9781544324807 (epub) | ISBN 9781544324821 (ebook)

Subjects: LCSH: Child psychology. | Child development. | Adolescent psychology. | Adolescence.

Classification: LCC BF721 .K88 2020 | DDC 155.4—dc23 LC record available at https://lccn.loc.gov/2019030603

This book is printed on acid-free paper.

Acquisitions Editor: Lara Parra
Content Development Editor: Jennifer Thomas
Production Editor: Olivia Weber-Stenis
Copy Editor: Christina West
Typesetter: Hurix Digital
Proofreader: Scott Oney
Indexer: Jeanne R. Busemeyer
Cover Designer: Gail Buschman
Marketing Manager: Katherine Hepburn

20 21 22 23 24 10 9 8 7 6 5 4 3 2 1

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PREFACE

Child and Adolescent Development in Context has its origins in 24 years of interactions with students, in and out of class. The most central tenet of development is that it occurs in context. At all points in life, human development is the result of dynamic interactions among individuals and the many interacting contexts in which they are embedded. The most rapid developmental changes occur from infancy through adolescence. One of the greatest challenges child and adolescent development instructors face is helping students understand the complex influences on development, that outcomes do not vary randomly or simply "depend on the person." With enough information, we can predict and understand development. My goal in writing this text is to explain the sophisticated interactions that constitute development in a way that is comprehensive yet concise.

Child and Adolescent Development in Context focuses on two key themes that promote understanding of how infants, children, and adolescents develop: the centrality of context and the applied value of developmental science. These two themes are highlighted throughout the text as well as in boxed features. This text also conveys findings from current and classic research in a student-friendly writing style.

CONTEXTUAL PERSPECTIVE

Development does not occur in a vacuum but is a function of dynamic transactions among individuals, their physical, cognitive, and socioemotional capacities, and a multitude of contextual influences. We are all embedded in many interacting layers of context, including tangible and intangible circumstances that influence and are influenced by our development, such as family, ethnicity, culture, neighborhood, community, norms, values, and historical events. *Child and Adolescent Development in Context* explains this process, emphasizing how individual factors combine with the places, sociocultural environments, and ways in which we are raised to influence children's development.

The contextual theme is infused throughout the text and highlighted specifically in Lives in Context boxed features that appear in each chapter. The Lives in Context features are labeled to illustrate the various contexts in which children and adolescents are immersed: Family and Peer Context, Community Context, Cultural Context, and Media and Technology. Examples of these features include the effects of parental military deployment (Family and Peer Context), the effects of exposure to community violence (Community Context), and culture and theory of mind (Cultural Context). Advances in technology and the advent of social media have led to a new but highly relevant online context that is depicted in Lives in Context features labeled Media and Technology, such as the effects of screen time on children's health or screen use and infant motor development. Finally, when considering context, it is tempting to overlook biology, but our biology influences and is influenced by our contexts. The Lives in Context feature labeled Biological Influences calls attention to the role of biology in development. Sample topics include pregnancy and the maternal brain, genetic engineering, and the effects of poverty on brain development.

APPLIED EMPHASIS

The field of developmental science is unique because so much of its content has immediate relevance to our daily lives. Students may wonder: Do the first 3 years shape the brain for a lifetime of experiences? Can we teach babies to communicate through sign language? Is learning more than one language beneficial to children? What does it mean to be a transgender child? Developmental science is increasingly applied to influence social policy. For example, why vaccinate infants? Can we outlaw bullying? Research in child and adolescent development can inform our understanding of each of these topics. Moreover, these topics fascinate students because they illustrate clear-cut examples of why developmental science matters. The Applying Developmental Science feature highlights the above topics and more.

CURRENT RESEARCH

Developmental science instructors face the challenge of covering the growing mass of research findings within the confines of a single semester. *Child and Adolescent Development in Context* integrates recently published and classic findings. Rather than present an exhaustive review of current work simply for the sake of including recent references, I carefully select the most relevant findings. I integrate cutting-edge and classic research to present a unified story of what is currently known in developmental psychology.

ACCESSIBLE WRITING STYLE

Having taught at a regional public university for 24 years, I write in a style intended to engage undergraduate readers like my own students. This text is intended to help them understand challenging concepts in language that will not overwhelm: I have avoided jargon but maintained the use of professional and research terms that students need to know in order to digest classic and current literature in the lifespan development field. I attempt to write in the same voice as I teach, carefully structuring sections to build explanations and integrating content with examples that are relevant to students. I regularly use my own texts in class, students work with me in preparing elements of each text, and my students' responses and learning guide my writing.

ORGANIZATION

Child and Adolescent Development in Context is organized into 15 chronological chapters, within five units, that depict the wide range of developments that occur over the lifespan. Unit 1 (Foundations of Child and Adolescent Development) includes Chapters 1, 2, and 3. Chapter 1 combines developmental theory and research design within a single chapter. I chose this approach because, given limited class time, many instructors do not cover stand-alone research chapters. The streamlined approach combines comprehensive coverage of methods of data collection, research design, developmental designs (such as sequential designs), and ethical issues in research with full coverage of the major theories in developmental psychology. Chapter 2 presents the biological foundations of development, including patterns of genetic inheritance, gene–environment interactions, and epigenetics. Chapter 3 describes prenatal development and birth, from conception to the newborn, including the emerging family system. I chose to present prenatal development, birth, and the newborn as a single chapter (rather than birth and the newborn as a stand-alone chapter) to reflect continuity in the perinatal period.

The remaining units contain three chapters each on physical development, cognitive development, and socioemotional development to reflect the major areas of development during infancy (Unit 2, Chapters 4 to 6), early childhood (Unit 3, Chapters 7 to 9), middle childhood (Unit 4, Chapters 10 to 12), and adolescence (Unit 5, Chapters 13 to 15). Therefore, *Child and Adolescent Development in Context* contains 15 chapters that correspond to the 15 weeks of the typical college semester.

PEDAGOGY

My day-to-day experiences in the classroom have helped me to keep college students' interests and abilities at the forefront. Unlike many textbook authors, I teach four classes each semester at a comprehensive regional public university (and have done so since 1996). I taught my first online course in 2002 and have taught online and hybrid courses regularly since. My daily exposure to multiple classes and many students helps keep me grounded in the ever-changing concerns and interests of college students. I teach a diverse group of students. Some live on campus but most commute. Most of my students are ages 18 to 24, but my classes also include many so-called adult learners over the age of 24. Many are veterans, a rapidly increasing population at my institution with unique perspectives and needs. I have many opportunities to try new examples and activities. I believe that what works in my classroom will be helpful to readers and instructors. I use the pedagogical elements of *Child and Adolescent Development in Context* in my own classes and modify them based on my experiences.

LEARNING OBJECTIVES AND SUMMARIES

Core learning objectives are listed at the beginning of each chapter. The end-of-chapter summary returns to each learning objective, recapping the key concepts presented in the chapter related to that objective.

CRITICAL THINKING

Critical Thinking Questions: At the end of each main section within the chapter, these Thinking in Context critical thinking questions encourage readers to compare concepts, apply theoretical perspectives, and consider applications of research findings presented.

A Lives in Context box program illustrate contexts drawn from the real world and their connections to one another, including international adoption and child outcomes, exposure to war and terrorism and children's development, the effects of neighborhood on development, HIV infection in newborns, and the impact of family stress on health.

Lives in Context: Biological Influences boxes tied to each chapter's learning objectives cover cutting-edge biological topics and prompt students to think critically about each concept.

Lives in Context: Community Context boxes raise issues related to the context of community and push students to consider real world implications of concepts connected to chapter learning objectives.

Lives in Context: Cultural Context boxes ask students to consider traditions from the cultural context and then to think critically about how culture affects development.

Lives in Context: Family and Peer Context boxes discuss the family context related to each chapter and challenge learners to apply chapter content to the real world.

Lives in Context: Media and Technology boxes address media and technology and their effects on development at each stage. Learners are prompted to synthesize chapter learning and apply knowledge to real world examples.

Case-Based Application: Each chapter closes with a case scenario, Apply Your Knowledge, followed by questions that require students to apply their understanding to address a particular situation or problem.

SUPPLEMENTS

SAGE vantage™

Engage, Learn, Soar with **SAGE vantage**, an intuitive digital platform that delivers ***Child and Adolescent Development in Context*** textbook content in a learning experience carefully designed to ignite student engagement and drive critical thinking. With evidence-based instructional design at the core, SAGE vantage creates more time for engaged learning and empowered teaching, keeping the classroom where it belongs—in your hands.

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LMS integration provides single sign-on with streamlined grading capabilities and course management tools.

Auto-graded assignments include:

formative knowledge checks for each major section of the text that quickly reinforce what students have read and ensure they stay on track;

dynamic, hands-on **multimedia activities** that tie real world examples and motivate students to read, prepare for class;

summative **chapter tests** that reinforce important themes; and

helpful hints and feedback (provided with all assignments) that offer context and explain why an answer is correct or incorrect, allowing students to study more effectively.

Compelling polling questions bring concepts to life and drive meaningful comprehension and classroom discussion.

Short-answer questions provide application and reflection opportunities connected to key concepts.

Instructor reports track student activity and provide analytics so you can adapt instruction as needed.

A student dashboard offers easy access to grades, so students know exactly where they stand in your course and where they might improve.

Honest value gives students access to quality content and learning tools at a price they will appreciate.

SAGE coursepacks

SAGE COURSEPACKS FOR INSTRUCTORS

The **SAGE coursepack** for *Child and Adolescent Development in Context* makes it easy to import our quality instructor materials and student resources into your school's learning management system (LMS), such as Blackboard, Canvas, Brightspace by D2L, or Moodle. Intuitive and simple to use, **SAGE coursepack** allows you to integrate only the content you need, with minimal effort, and requires no access code. Don't use an LMS platform? You can still access many of the online resources for *Child and Adolescent Development in Context* via the **SAGE edge** site.

Within the SAGE coursepack content are pedagogically robust **assessment tools** that foster review, practice, and critical thinking, offering a more complete way to measure student engagement, including:

Diagnostic **coursepack chapter quizzes** that identify opportunities for improvement, track student progress, and ensure mastery of key learning objectives.

Test banks built on Bloom's taxonomy that provide a diverse range of test items.

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Editable, chapter-specific **PowerPoint®** slides that offer flexibility when creating multimedia lectures so you don't have to start from scratch but can customize to your exact needs.

Instructions on how to use and integrate the comprehensive assessments and resources provided.

SAGE edge™

SAGE edge is a robust online environment featuring an impressive array of tools and resources for review, study, and further exploration, keeping both instructors and students on the cutting edge of teaching and learning. SAGE edge content is open access and available on demand. Learning and teaching has never been easier!

SAGE edge for Students at **http://edge.sagepub.com/kutherchild1e** provides a personalized approach to help students accomplish their course learning objectives.

ACKNOWLEDGMENTS

Books such as this are not solitary endeavors. I am fortunate to work with a talented team at SAGE and I am grateful for their support. I thank Lara Parra, Reid Hester, Jennifer Thomas, Olivia Weber-Stenis, and Katherine Hepburn. Christina West's copyediting is very much appreciated.

I thank my students for asking the questions and engaging in the discussions that inform these pages. I am especially appreciative of those who have shared their feedback and helped me to improve this book. Lauren Schwarz provided invaluable brainstorming assistance and I appreciate Ed Lindblom's input on the boxed features. Thank you to the many instructors who have reviewed and provided feedback on these chapters.

Finally, I thank my family, especially my parents, Phil and Irene Kuther. Most of all, I am thankful for the support of my husband, Fred, for his encouragement, optimism, and support, both tangible and intangible, and for our exciting, impromptu road trips.

SAGE wishes to thank the following reviewers for their valuable contributions to the development of this manuscript:

Brenda Beagle, *John Tyler Community College*
Cassendra Bergstrom, *University of Northern Colorado*
Brian Bramstedt, Professor, *Georgia Gwinnett College*
Connie Casha, *Middle Tennessee State University*
Elaine Cassel, *Lord Fairfax Community College*
Chun Chu, *Fayetteville State University*
Ryan Clayton, *Bunker Hill Community College*
Carmen Culotta, *Wright State University*
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Gina Wilson, *RTI International*

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UNIT I

Foundations of Child and Adolescent Development

CHAPTER 1:
Understanding Human Development: Approaches and Theories

CHAPTER 2:
Biological and Environmental Foundations of Development

CHAPTER 3:
The Prenatal Period, Birth, and the Newborn

1 Understanding Human Development

Approaches and Theories

It was a sunny day. I looked up at the bright sky as I leaned back in my stroller and pulled my hat down onto my head. The simplest of events, but it is one of my first memories. How old was I? Probably on the brink of early childhood. What is your first memory? Is it similarly vague? Were you engaging in an activity? Do you recall your surroundings and the people around you? How have you changed in the time since that early memory? Are there ways in which you remain the same? We will examine these questions and more throughout this book.

Learning Objectives

1.1 Describe the periods, domains, and contexts of development.

Video Activity 1.1: Sociocultural Influences on Development: Desegregation

1.2 Explain three basic issues in developmental science.

Video Activity 1.2: How Poverty Affects Development Across Lifespan

1.3 Summarize six theoretical perspectives on human development.

1.4 Describe the methods and research designs used to study human development and the ethical principles that guide researchers' work.

Chapter Contents

UNDERSTANDING DEVELOPMENT

Individuals undergo innumerable changes as they progress through infancy, childhood, and adolescence, a process known as **development**. Development refers to the processes by which we grow and change, as well as the ways in which we stay the same over time. The field of **developmental science** studies human development at all points in life, from conception to death. In this book we will examine child development; however, individuals undergo complex changes at every period in life, beginning before birth and continuing throughout adulthood.

Periods of Development

One of the challenges of studying infants and children is that a great many changes occur over just a few years. Researchers divide the time between conception and adolescence into a series of periods, summarized below. Each developmental period is characterized by a predictable pattern of physical, cognitive, and social abilities, or **domains of development**.

Prenatal Period (Conception to Birth)

Upon conception a single cell is formed. This cell multiples repeatedly to form the body structures and organs that will compose the newborn.

Infancy and Toddlerhood (Birth to 2 Years)

Newborns' senses and early learning abilities enable them to adapt to the world. Dramatic changes occur in physical growth as well as motor, perceptual, and intellectual abilities. Infants begin to use language and form emotional bonds with caregivers. Infancy comprises the first year of life; toddlerhood spans the second.

Early Childhood (2 to 6 Years)

Children's muscles strengthen and they become more coordinated. As thinking, language, and self-regulation improve, children establish ties with peers and engage in make-believe play.

Middle Childhood (6 to 11 Years)

As children enter school, their memory and reasoning improve and they learn academic skills such as reading, writing, and arithmetic. As children advance cognitively and gain social experience, their self-understanding and self-control improves. Friendships develop and become more complex and peer group memberships become more important.

Adolescence (11 to 18 Years)

With puberty, adolescents become physically and sexually mature. Adolescents' thinking becomes more complex and abstract. Adolescents spend more time with peers and friendships become more important. They are driven to learn about themselves, become independent from their parents, and define their values and goals. Whether adolescence ends at age 18 is debated by developmental scientists. Some argue that adolescence persists through the college years, ending at about age 21. Others propose an additional period of development called **emerging adulthood**, extending from the completion of secondary education at about age 18 to the adoption of adult roles at about age 25 (Arnett, 2000).

Domains of Development

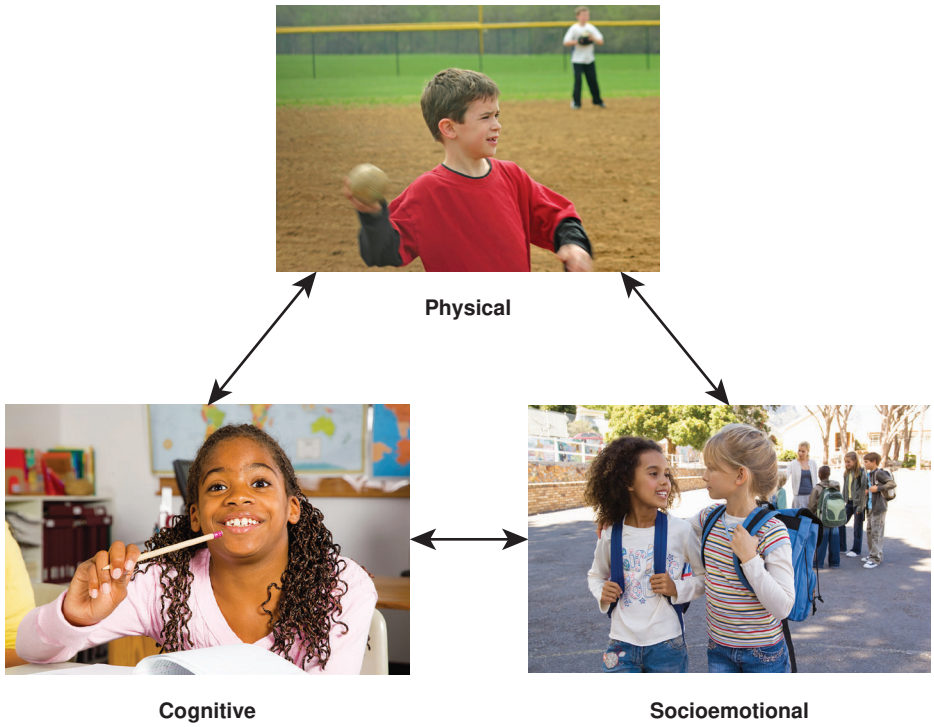
Consider the many changes that mark each period of development and it is apparent that development is multidimensional. That is, development includes changes in multiple domains of development. Perhaps the most obvious set of changes includes **physical development**, body maturation, and growth, such as body size, proportion, appearance, health, and perceptual abilities. **Cognitive development** refers to the maturation of thought processes and the tools that we use to obtain knowledge, become aware of the world around us, and solve problems. **Socioemotional development** includes changes in emotions, social abilities, self-understanding, and interpersonal relationships with family and friends. These domains of development overlap and interact. For example, the onset of walking precedes advances in language development in infants in the United States and China (He, Walle, & Campos, 2015; Walle & Campos, 2013). Babies who walk tend to spend more time interacting with caregivers; they can initiate interactions with caregivers, such as by bringing objects to them (Clearfield, 2011). They also evoke more verbal responses and warnings from caregivers as they interact with items and explore their environment. Therefore, walking (motor development) is associated with language and social development. Figure 1.1 illustrates how the three domains of development interact, a central principle of development.

Contexts of Development

Where did you grow up? Describe your childhood neighborhood. Did you play in a park or on a playground? Did you ride your bike outside? What was your elementary school like? Did you have

FIGURE 1.1

Domains of Development



Advances in physical, cognitive, and socioemotional development interact, permitting children to play sports, learn more efficiently, and develop close friendships.

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access to technology such as tablets and computers? Did you learn to type in school? How large is your family? What were some of your family traditions? What holidays did you celebrate? Did you share family meals often? Your responses to these questions reveal aspects of your context.

Context refers to where and when a person develops. Context encompasses many aspects of the physical and social environment, such as family, neighborhood, country, and historical time period. It includes intangible factors, characteristics that are not visible to the naked eye, such as values, customs, ideals, and culture. In order to understand a given individual's development, we must look to his or her context, including the subtle, less easily viewed, factors. For example, were you encouraged to be assertive and actively question the adults around you, or were you expected to be quiet and avoid confrontation? How large a part was spirituality or religion in your family's life? How did religious values shape your parent's childrearing practices and your own values? How did your family's economic status affect your development? These questions examine a critical context for our development, home and family. However, we are embedded in many more contexts that influence us, and that we influence, such as our peer group, school, neighborhood or community, and culture (see the Lives in Context feature). Our development plays out within the contexts in which we live, a theme that we will return to throughout this book.

THINKING IN CONTEXT 1.1

1. Consider the multidimensional nature of your development. Provide personal examples of physical, cognitive, and socioemotional development. What changes have you experienced in each of these areas over your childhood? How have these abilities influenced one another?
2. Describe the multiple contexts in which you were raised. How might these have influenced your physical, cognitive, and socioemotional development? Provide examples.
3. In what ways might your physical, cognitive, or socioemotional development have influenced aspects of your context?

LIVES IN CONTEXT: CULTURAL CONTEXT

Defining Culture

Cultural influences on development include the many ethnic communities that comprise most U.S. cities, and the unique foods, customs, and values that accompany each community.
Reuters/Lucy Nicholson

One broad aspect of context is **culture**. Culture refers to a set of customs, knowledge, attitudes, and values that are shared by members of a group and are learned early in life through interactions with group members (Markus & Kitayama, 1991). Early studies of culture and human development took the form of *cross-cultural research*, comparing individuals and groups from different cultures to examine how these universal processes worked in different contexts (Mistry & Dutta, 2015).

Most classic theories and research on human development are based on Western samples, and developmental researchers once believed that the processes of human development were universal. More recent observations suggest that development varies dramatically with context (Keller, 2017). For example, consider milestones, such as the average age that infants begin to walk. In Uganda, infants begin to walk at about 10 months of age, in France at about 15 months, and in the United States at about 12 months. These differences are influenced by parenting practices that vary by culture. African parents tend to handle infants in ways that stimulate walking, by playing games that allow infants to practice jumping and walking skills (Hopkins & Westra, 1989; Super, 1981). The cultural context in which individuals live influences the timing and expression of many aspects of development, even physical developments long thought to be influenced only by biological maturation (Mistry, 2013). Some scientists argue that applying principles of development derived from Western samples to children of other cultures is unscientific and even unethical because it may yield misleading conclusions about children's capacities (Keller, 2017).

There is a growing trend favoring *cultural research*, which examines how culture itself influences development, over cross-cultural research, which simply examines differences across cultures (Cole & Packer, 2015). Cultural research examines development and culture as fused entities that mutually interact, with culture inherent in all domains of development and a contributor to the context in which we are embedded, transmitting values, attitudes, and beliefs that shape our thoughts, beliefs, and behaviors (Mistry & Dutta, 2015). The shift toward cultural research permits the examination of the multiple subcultures that exist within a society (Oyserman, 2016, 2017). For example, North American culture is not homogeneous; many subcultures exist, defined by factors such as ethnicity (e.g., African American, Asian American), religion (e.g., Christian, Muslim), geography (e.g., southern, midwestern), and others, as well as combinations of these factors. Current trends in cultural research document diversity and emphasize understanding how the historical, cultural, and subcultural contexts in which we live influence development throughout our lives.

What Do You Think?

1. What subcultures can you identify in your own neighborhood, state, or region of the country? What characterizes each of these subcultures?
2. Consider your own experience. With which culture or subculture do you identify?
3. How much of a role do you think your cultural membership has had in your own development?

BASIC ISSUES IN DEVELOPMENTAL SCIENCE

Developmental scientists agree that the biological, cognitive, and socioemotional changes that occur from infancy through adolescence are indisputable. Yet they sometimes disagree on several fundamental questions about how development proceeds and its influences. Developmental scientists' explanations of how infants, children, and adolescents grow and change are influenced by their perspectives on several basic issues, or fundamental questions, about human development:

1. To what extent is development influenced by inborn genetic characteristics, and to what extent is it affected by the environment in which children live?
2. What role do children play in their own development—how much are they influenced by their surroundings, and how much do they influence their surroundings?
3. In what ways do children change gradually, often imperceptibly, over time, and to what extent is developmental change sudden and dramatic?

The following sections examine each of these questions.

Nature and Nurture: How Do Nature and Nurture Influence Development?

Perhaps the oldest question about development concerns its origin. Referred to as the **nature–nurture debate**, researchers once asked whether development is caused by nature (genetics) or nurture (environment). Explanations that rely on nature point to inborn genetic traits and maturational processes as causes of developmental change. For example, most infants take their first steps at roughly the same age, suggesting a maturational trend that supports the role of nature in development (Payne & Isaacs, 2016). An alternative explanation for developmental change emphasizes nurture, the environment. From this perspective, children are molded by the physical and social environment in which they are raised. Therefore, children tend to walk at about the same time because they experience similar environmental circumstances and parenting practices.

Today, developmental scientists generally agree that the nature–nurture debate is, in fact, not a debate. Instead, most now agree that *both* nature and nurture are important contributors to development, and the question has changed to "How do genetics and environment work together to influence child development?" (Rutter, 2014; Sasaki & Kim, 2017). For example, walking is heavily influenced by maturation (nature), but experiences and environmental conditions can speed up or slow down the process (nurture). Although most infants begin to walk at about the same time, infants who experience malnutrition may walk later than well-nourished infants, and those who are given practice making stepping or jumping movements may walk earlier (Siekerman et al., 2015; Worobey, 2014). Developmental scientists attempt to determine *how* nature and nurture interact and work together to influence children's development (Bjorklund, 2018b; Lickliter & Witherington, 2017). Developmental scientists' research on the dynamic interaction of nature and nurture has important applied implications, as discussed in the Applying Developmental Science feature.

APPLYING DEVELOPMENTAL SCIENCE

The Real-World Significance of Developmental Research

In its early years, the study of child development was based on laboratory research devoted to uncovering universal aspects of development by stripping away contextual influences. This basic research was designed to examine how development unfolds, with the assumption that development is a universal process with all children changing in similar ways and in similar time frames. In the early 1980s, influenced by contextual theories (such as Bronfenbrenner's bioecological approach, discussed later in this chapter) and the growing assumption that children are active in their development, scientists began to examine developmental processes outside of the laboratory (Lerner, Johnson, & Buckingham, 2015b). It quickly became apparent that there are a great many individual differences in development that vary with a myriad of contextual influences. The field of **applied developmental science** emerged, studying individuals within the contexts in which they live and applying research findings to improve people's lives.

Applied developmental science is a multidisciplinary field that unites scientists from around the world to examine and contribute to policies on issues that affect children, adolescents, adults, and their families, such as health and health care delivery, violence, and school failure. For example, some study contextual influences on development, such as the impact of environmental contaminants or poor

(*Continued*)

(Continued)

access to clean water or the ways in which poverty influences children's development and economic status later in life (Aizer, 2017; Gauvain, 2018; Golinkoff, Hirsh-Pasek, Grob, & Schlesinger, 2017; Huston, 2018). Developmental science research can help address global problems. For example, in September 2016, the United Nations defined and adopted the Sustainable Development Goals, a global consensus on 17 goals for supporting individuals and ensuring equity and health in all countries (United Nations General Assembly, 2015). Sample goals include ending poverty in all its forms everywhere; improving nutrition, health, and well-being for all people; promoting education and lifelong learning opportunities; and achieving gender equality and empowering all women and girls. The goals are broad in scope, and reaching them will require the knowledge and skills of applied developmental scientist researchers and practitioners from many disciplines working in interdisciplinary teams (Gauvain, 2018).

What Do You Think?

What are some of the practical challenges a researcher might face in studying applied problems, such as risks to children's health, how to advance education in underserved communities, or how to promote health and well-being in children of developing nations? ●

The Active Child: How Do Children Influence Their Own Development?

Children's development is influenced by their genes and environment, but children also play an active role in guiding their own development. For example, Baby Joey smiles at each adult he passes by as his mother pushes his stroller in the park. Adults often respond with smiles, use "baby talk," and make faces. Baby Joey's actions, even simple smiles, influence adults, bringing them into close contact, making one-on-one interactions, and creating opportunities for learning. By engaging the world around them, thinking, being curious, and interacting with people and objects, infants and children are "manufacturers of their own development" (Flavell, 1992, p. 998).

The prevailing view among developmental scientists is that individuals are active contributors to their own development (Lerner, Agans, DeSouza, & Hershberg, 2014). Children are influenced by the physical and social contexts in which they live, but they also play a role in influencing their development by interacting with and changing those contexts (Elder, Shanahan, & Jennings, 2016). Children interact with and influence the people and things around them, creating experiences that influence their physical, cognitive, and emotional development. That is, they play an active role in influencing their own development.

Infants influence their own development by smiling at adults, making adults more likely to smile, use "baby talk," and play with them in response.
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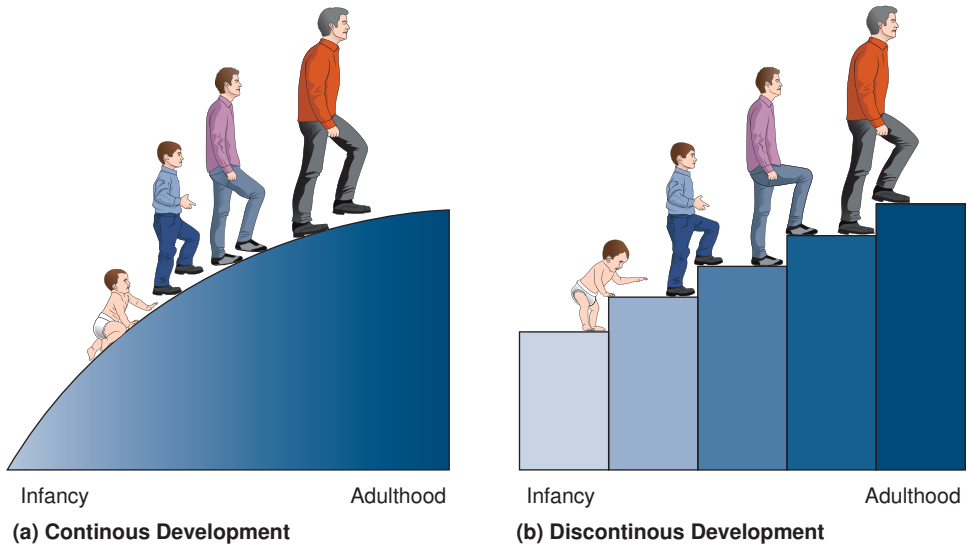
Continuities and Discontinuities: In What Ways Is Development Continuous and Discontinuous?

Some aspects of development unfold slowly and gradually over time, demonstrating **continuous change**. For example, children slowly gain experience and learn strategies to become quicker at problem solving (Siegler, 2016). Others are best described as **discontinuous change**, characterized by abrupt change. For example, puberty transforms children's bodies into more adult-like adolescent bodies (Wolf & Long, 2016), infants' understanding and capacity for language is qualitatively different from that of school-aged children (Hoff, 2015), and children make leaps in their reasoning abilities over the course of childhood, such as from believing that robotic dogs and other inanimate objects are alive to understanding that life is a biological process (Beran, Ramirez-Serrano, Kuzyk, Fior, & Nugent, 2011; Zaitchik, Iqbal, & Carey, 2014). As shown in Figure 1.2, a discontinuous view of development emphasizes sudden transformation, whereas a continuous view emphasizes gradual and steady changes.

It was once believed that development was either continuous or discontinuous—but not both. Today, developmental scientists agree that development includes both continuity and discontinuity (Lerner et al., 2014). Whether a particular developmental change appears continuous or discontinuous depends in part on our point of view. For example, consider physical growth. We often think of increases in height as involving a slow and steady process; each month, an infant is taller than the prior month, illustrating continuous change. However, as shown in Figure 1.3, when researchers measured infants' height every day, they discovered that infants have growth days and nongrowth days,

FIGURE 1.2

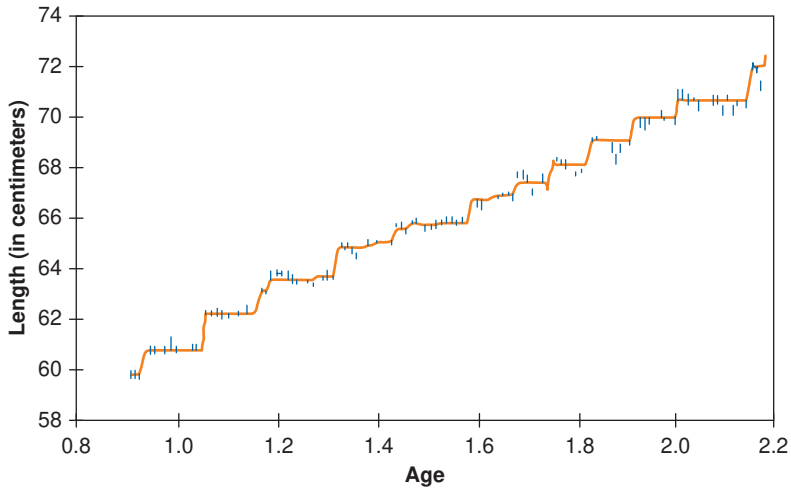
Continuous and Discontinuous Development



Source: Adapted from End of the Game (2014) Child Development 101, History and Theory, https://endofthegame.net/2014/04/15/child-development-101-history-and-theory/3/

FIGURE 1.3

Infant Growth: A Continuous or Discontinuous Process?



Infants' growth occurs in a random series of roughly 1-centimeter spurts in height that occur over 24 hours or less. The overall pattern of growth entails increases in height, but whether the growth appears to be continuous or discontinuous depends on our point of view.

Source: Figure 1 from Lampl, M., Veldhuis, J. D., & Johnson, M. L. (1992). Saltation and stasis: A model of human growth. *Science, 258*, 801–803. With permission from AAAS.

days in which they show rapid change in height interspersed with days in which there is no change in height, illustrating discontinuous change (Lampl, Johnson, & Frongillo, 2001). In this example, monthly measurements of infant height suggest gradual increases, but daily measurements show spurts of growth, each lasting 24 hours or less. Thus, whether a given phenomenon, such as height, is described as continuous or discontinuous can vary depending on perspective. Most developmental scientists agree that some aspects of development are best described as continuous and others as discontinuous (Miller, 2016).

THINKING IN CONTEXT 1.2

1. In what ways are your traits and abilities influenced by nature? How has nurture contributed to your development?
2. Can you identify ways in which you have changed very gradually over the years? Were there other times in which you showed abrupt change, such as physical growth, strength and coordination, thinking abilities, or social skills? In other words, in what ways is your development characterized by continuity? Discontinuity?
3. Identify examples of how a child might play an active role in his or her development. How do children influence the world around them?

THEORIES OF CHILD DEVELOPMENT

Over the past century, developmental scientists have learned much about how children progress from infancy through adolescence and into adulthood. Developmental scientists organize their observations to construct theories that explain how development unfolds. A **theory** is a way of organizing a set of observations or facts into a comprehensive explanation of how something works. Theories are important tools for compiling and interpreting the growing body of research in child development as well as determining gaps in our knowledge and making predictions about what is not yet known.

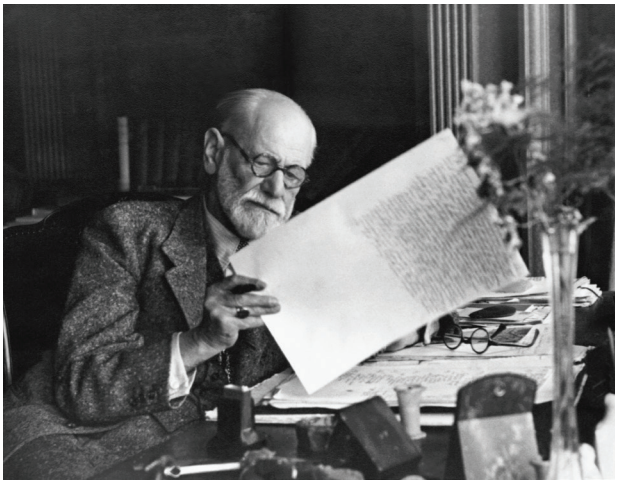
Effective theories pose specific explanations, or **hypotheses**, for a given phenomenon that can be tested by research. Scientists conduct research to find flaws in the hypothesis—not to "prove" that it is "correct." A good theory is one that is *falsifiable*, or capable of generating hypotheses that can be tested and, potentially, refuted. As scientists conduct research and learn more about a topic, they modify their theories. Updated theories often give rise to new questions and new research studies, whose findings may further modify theories. The great body of research findings about child development has been organized into several theories to account for the developmental changes that occur in infancy, childhood, and adolescence.

Psychoanalytic Theories

Is children's development guided or pushed by powerful inner forces that they cannot control? **Psychoanalytic theories** describe development and behavior as a result of the interplay of inner drives, memories, and conflicts we are unaware of and cannot control. These inner forces influence our behavior throughout our lives. Freud and Erikson are two key psychoanalytic theorists whose theories remain influential today.

Freud's Psychosexual Theory

Sigmund Freud (1856–1939), a Viennese physician, is credited as the father of the psychoanalytic perspective. Freud believed that much of our behavior is driven by unconscious impulses that are outside of our awareness. He described development as the progression through a series of *psychosexual stages*, periods in which unconscious drives are focused on different parts of the body, making stimulation to those parts a source of pleasure. Freud explained that the task for parents is to strike a balance between overgratifying and undergratifying a child's desires at each stage to



Sigmund Freud (1856–1939), the father of the psychoanalytic perspective, believed that much of our behavior is driven by impulses that we are unaware of and cannot control.
Bettmann/Getty Images

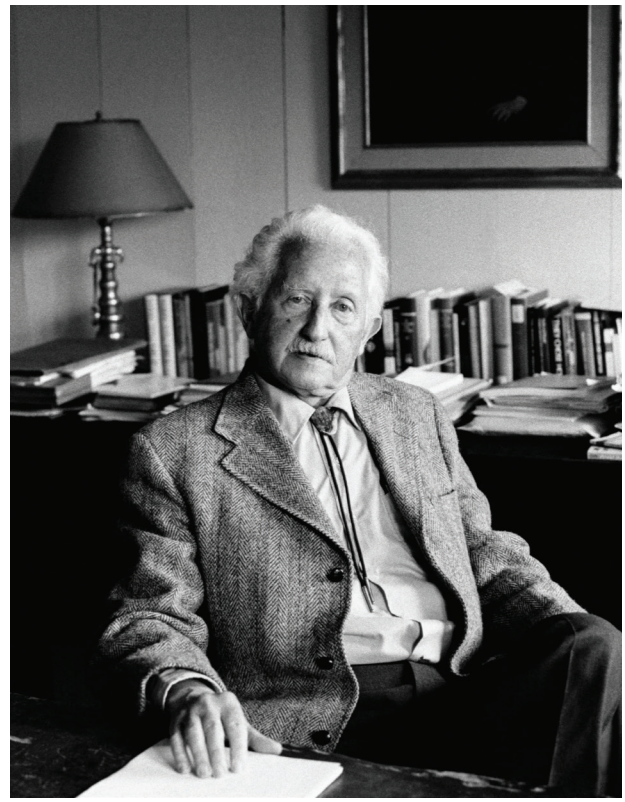
help the child develop a healthy personality with the capacity for mature relationships throughout life. Notably, Freud did not study children; his theory grew from his work with female psychotherapy patients (Crain, 2016).

Many of Freud's ideas, such as the notion of unconscious processes of which we are unaware, have stood up well to the test of time and have permeated popular culture. Notably, Freud's theory was the first to emphasize the importance of early family experience and especially the parent–child relationship for development (Bargh, 2013). However, the psychosexual stage framework's emphasis on childhood sexuality, especially the phallic stage, is unpopular and not widely accepted (Westen, 1998). In addition, unconscious drives and other psychosexual constructs are not falsifiable. They are not supported by research because they cannot be directly observed and tested (Miller, 2016).

Erikson's Psychosocial Theory

Erik Erikson (1902–1994) was influenced by Freud, but he placed less emphasis on unconscious motivators of development and instead focused on the role of the social world, society, and culture. According to Erikson, throughout their lives, individuals progress through eight *psychosocial stages* that include changes in how they understand and interact with others, as well as changes in how they understand themselves and their roles as members of society (Erikson, 1950) (see Table 1.1 for a comparison of Freud's and Erikson's theories). Each stage presents a unique developmental task, which Erikson referred to as a crisis or conflict that must be resolved. How well individuals address the crisis determines their ability to deal with the demands made by the next stage of development. For example, children's success in achieving a sense of trust in others influences their progress in developing a sense of autonomy, the ability to be independent and guide their own behavior. Regardless of their success in resolving a crisis of a given stage, individuals are driven by biological maturation and social expectations to the next psychosocial stage. No crisis is ever fully resolved, and unresolved crises are revisited throughout life.

As one of the first lifespan views of development, Erikson's psychosocial theory views development as spanning well beyond childhood. Erikson's theory offers a positive view of development and includes the role of society and culture, largely ignored by Freud. In addition, Erikson based his theory on a broad range of cases, including larger and more diverse samples of people than did Freud. Largely viewed as unfalsifiable, Erikson's theory is criticized as difficult to test. Yet it has nonetheless sparked research on specific stages, most notably on the development of identity during adolescence and the drive to guide youth and contribute to the next generation during middle adulthood (Crain, 2016). Erikson's ideas can help us understand children's socioemotional development. We will revisit his theory throughout this book.



Erik Erikson (1902–1994) posited that throughout their lifetime, people progress through eight stages of psychosocial development.
Ted Streshinsky Photographic Archive/Corbis Historical/Getty Images

Behaviorist and Social Learning Theories

In response to psychoanalytic theorists' emphasis on the unconscious as an invisible influence on development and behavior, some scientists pointed to the importance of studying observable behavior rather than thoughts and emotion, which cannot be seen or objectively verified. Theorists who study **behaviorism** examine only behavior that can be observed and believe that all behavior is influenced by the physical and social environment. For example, consider this famous quote from John Watson (1925), a founder of behaviorism:

TABLE 1.1

Psychodynamic Theories of Development

APPROXIMATE AGE	FREUD'S PSYCHOSEXUAL THEORY		ERIKSON'S PSYCHOSOCIAL THEORY	
0 to 18 months	Oral	Basic drives focus on the mouth, tongue, and gums. Feeding and weaning influence personality development. Freud believed that failure to meet oral needs influences adult habits centering on the mouth, such as fingernail biting, overeating, smoking, or excessive drinking.	Trust vs. Mistrust	Infants learn to trust that others will fulfill their basic needs (nourishment, warmth, comfort) or to lack confidence that their needs will be met.
18 months to 3 years	Anal	Basic drives are oriented toward the anus, and toilet training is an important influence on personality development. If caregivers are too demanding, pushing the child before he or she is ready, or if caregivers are too lax, individuals may develop issues of control such as a need to impose extreme order and cleanliness on their environment or extreme messiness and disorder.	Autonomy vs. Shame and Doubt	Toddlers learn to be self-sufficient and independent through toilet training, feeding, walking, talking, and exploring or to lack confidence in their own abilities and doubt themselves.
3 to 6 years	Phallic	In Freud's most controversial stage, basic drives shift to the genitals. The child develops a romantic desire for the opposite-sex parent and a sense of hostility and/or fear of the same-sex parent. The conflict between the child's desires and fears arouses anxiety and discomfort. It is resolved by pushing the desires into the unconscious and spending time with the same-sex parent and adopting his or her behaviors and roles, adopting societal expectations and values. Failure to resolve this conflict may result in guilt and a lack of conscience.	Initiative vs. Guilt	Young children become inquisitive, ambitious, and eager for responsibility or experience overwhelming guilt for their curiosity and overstepping boundaries.
6 years to puberty	Latency	This is not a stage but a time of calm between stages when the child develops talents and skills and focuses on school, sports, and friendships.	Industry vs. Inferiority	Children learn to be hard-working, competent, and productive by mastering new skills in school, friendships, and home life or experience difficulty, leading to feelings of inadequacy and incompetence.
Adolescence	Genital	With the physical changes of early adolescence, the basic drives again become oriented toward the genitals. The person becomes concerned with developing mature adult sexual interests and sexual satisfaction in adult relationships throughout life.	Identity vs. Role Confusion	Adolescents search for a sense of self by experimenting with roles. They also look for answers to the question, "Who am I?" in terms of career, sexual, and political roles or remain confused about who they are and their place in the world.

APPROXIMATE AGE	FREUD'S PSYCHOSEXUAL THEORY		ERIKSON'S PSYCHOSOCIAL THEORY	
Early adulthood			Intimacy vs. Isolation	Young adults seek companionship and a close relationship with another person or experience isolation and self-absorption through difficulty developing intimate relationships and sharing with others.
Middle adulthood			Generativity vs. Stagnation	Adults contribute to, establish, and guide the next generation through work, creative activities, and parenting or stagnate, remaining emotionally impoverished and concerned about themselves.
Late adulthood			Integrity vs. Despair	Older adults look back at life to make sense of it, accept mistakes, and view life as meaningful and productive or feel despair over goals never reached and fear of death.

> Give me a dozen healthy infants, well formed, and my own specified world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist I might select—doctor, lawyer, artist, merchant, chief, and yes, even beggar-man and thief, regardless of his talents, penchants, tendencies, abilities, vocations, and race of his ancestors. (p. 82)

By controlling an infant's physical and social environment, Watson believed he could control the child's destiny. Behaviorist theory is also known as *learning theory* because it emphasizes how people and animals learn new behaviors as a function of their environment. As discussed in the following sections, classical and operant conditioning are two forms of behaviorist learning; social learning integrates elements of behaviorist theory and information processing theories.

Classical Conditioning

Classical conditioning is a form of learning in which a person or animal comes to associate environmental stimuli with physiological responses. Ivan Pavlov (1849–1936), a Russian physiologist, discovered the principles of classical conditioning when he noticed that dogs naturally salivate when they taste food, but they also salivate in response to various sights and sounds that occur before they taste food, such as their bowl clattering or their owner opening the food cupboard. Pavlov tested his observation by pairing the sound of a tone with the dogs' food; the dogs heard the tone, then received their food. Soon the tone itself began to elicit the dogs' salivation. Through classical conditioning, a neutral stimulus (in this example,

Ivan Pavlov (1849–1936) discovered classical conditioning when he noticed that dogs naturally salivate when they taste food, but they also salivate in response to various sights and sounds that they associate with food.
Sovfoto/Universal Images Group/Getty Images

the sound of the tone) comes to elicit a response originally produced by another stimulus (food). Many fears, as well as other emotional associations, are the result of classical conditioning. For example, some children may fear a trip to the doctor's office because they associate the doctor's office with the discomfort they felt upon receiving a vaccination shot. Classical conditioning applies to physiological and emotional responses only, yet it is a cornerstone of psychological theory. A second behaviorist theory accounts for voluntary, nonphysiological responses, as described in the following section.

Operant Conditioning

Perhaps it is human nature to notice that the consequences of our behavior influence our future behavior. A teenager who arrives home after curfew and is greeted with a severe scolding may be less likely to return home late in the future. A child who is praised for setting the dinner table may be more likely to spontaneously set the table in the future. These two examples illustrate the basic tenet of B. F. Skinner's (1904–1990) theory of **operant conditioning**, which holds that behavior becomes more or less probable depending on its consequences. According to Skinner, a behavior followed by a rewarding or pleasant outcome, called **reinforcement**, will be more likely to recur, but one followed by an aversive or unpleasant outcome, called **punishment**, will be less likely to recur.

Operant conditioning explains much about human behavior, including how we learn skills and habits. Behaviorist ideas about operant conditioning are woven into the fabric of North American culture and are often applied to understand parenting and parent–child interactions (Troutman, 2015). Developmental scientists, however, tend to disagree with operant conditioning's emphasis on external events (reinforcing and punishing consequences) over internal events (thoughts and emotions) as influences on behavior (Crain, 2016). That is, controlling a child's environment can influence his or her development, but recall that children are active in their own development. Change can occur through a child's own thoughts and actions. A child can devise new ideas and learn independently, without experiencing reinforcement or punishment.

Social Learning Theory

Like behaviorists, Albert Bandura (1925–) believed that the physical and social environments are important, but he also advocated for the role of thought and emotion as contributors to development. According to Bandura's **social learning theory**, children actively process information—they think and they feel emotion—and their thoughts and feelings influence their behavior. The physical and social environment influences children's behavior through their effect on their thoughts and emotions. For example, the teenager who breaks his curfew and is met by upset parents may experience remorse, which may then make him less likely to come home late in the future. In this example, the social environment (a discussion with upset parents) influenced the teen's thoughts and emotions (feeling bad for upsetting his parents), which then influenced the teen's behavior (not breaking curfew in the future). In other words, our thoughts and emotions about the consequences of our behavior influence our future behavior. We do not need to experience punishment or reinforcement to change our behavior (Bandura, 2012). We can learn by thinking about the potential consequences of our actions.

One of Bandura's most enduring ideas about development is that people learn through observing and imitating others, which he referred to as **observational learning** (Bandura, 2010). This finding suggests that children who observe violence rewarded, such as a child grabbing (and successfully obtaining) another child's toy, may imitate what they see and use aggressive means to take other children's toys. People also learn by observing the consequences of others' actions. A child observer might be less likely to imitate a child who takes another child's toy if the aggressor is scolded by a teacher and placed in timeout. Observational learning is one of the most powerful ways in which we learn.

Bandura believed that children are active contributors to their development as described by his concept of **reciprocal determinism**, according to which individuals' personal characteristics, behaviors, and environments interact and influence each other (Bandura, 2011). Children's characteristics determine their behavior and the environments they seek. Children who are athletically inclined (personal characteristic) tend to engage in sports activities (behavior) and seek out environments that support their athletic interests, such as groups of children who play sports, like softball or dodgeball. Environments (children's softball team), in turn, influence children's personal characteristics (interest in athletic ability) and behaviors (playing softball). This is an example of the complex interplay among person, behavior, and physical and social environment that underlies much of what we will discuss throughout this book.

Behaviorist theories have made important contributions to understanding child development.

TABLE 1.2

Piaget's Stages of Cognitive Development

STAGE	APPROXIMATE AGE	DESCRIPTION
Sensorimotor	Birth to 2 years	Infants understand the world and think using only their senses and motor skills, by watching, listening, touching, and tasting.
Preoperations	2 to 7 years	Preschoolers explore the world using their own thoughts as guides and develop the language skills to communicate their thoughts to others. Despite these advances, their thinking is characterized by several errors in logic.
Concrete Operations	7 to 11 years	School-aged children become able to solve everyday logical problems. Their thinking is not yet fully mature because they are able to apply their thinking only to problems that are tangible and tied to specific substances.
Formal Operations	12 years to adulthood	Adolescents and adults can reason logically and abstractly about possibilities, imagined instances and events, and hypothetical concepts.

Concepts such as observational learning, reinforcement, and punishment hold implications for parents, teachers, and anyone who works with children. Social learning theory and reciprocal determinism offer a more complex explanation for development and behavior than do behaviorist theories. We will revisit these concepts in later chapters.

Cognitive Theories

Cognitive theorists view cognition—thought—as essential to understanding children's functioning. In this section, we look at some of the ideas offered by cognitive-developmental theory and information processing theory.

Piaget's Cognitive-Developmental Theory

Swiss scholar Jean Piaget (1896–1980) was the first scientist to systematically examine infants' and children's thinking and reasoning. Piaget believed that to understand children, we must understand how they think, because thinking influences all behavior. Piaget's **cognitive-developmental theory** views children and adults as active explorers of their world, driven to learn by interacting with the world around them and organizing what they learn into **cognitive schemas**, or concepts, ideas, and ways of interacting with the world. Through these interactions, they construct and refine their own cognitive schemas, thereby contributing to their own cognitive development.

Piaget proposed that children's drive to explore and understand the world—to construct more sophisticated cognitive schemas—propels them through four stages of cognitive development, as shown in Table 1.2.

Piaget's cognitive-developmental theory transformed the field of developmental psychology and remains one of the most widely cited developmental theories. It was the first to consider *how* infants and children think and to view people as active contributors to their development. In addition, Piaget's concept of cognitive stages and the suggestion that children's reasoning is limited by their stage has implications for education—specifically, the idea that effective instruction must match the child's developmental level.

Some critics of cognitive-developmental theory argue that Piaget focused too heavily on cognition and ignored emotional and social factors in development (Crain, 2016). Others believe that Piaget neglected the influence of contextual factors by assuming that cognitive-developmental stages are universal—that all individuals everywhere progress through the stages in a sequence that does not vary. Some cognitive theorists argue that cognitive development is not a discontinuous, stage-like process but instead is a continuous process (Birney & Sternberg, 2011), as described in the following section.

Information Processing Theory

A developmental scientist presents a 5-year-old child with a puzzle in which a dog, cat, and mouse must find their way to a bone, piece of fish, and hunk of cheese. To solve the puzzle, the child must move all three animals to the appropriate locations. How will the child approach this task? Which item will she move first? What steps will she take? What factors influence whether and how quickly a child completes this task? Finally, how does the 5-year-old child's process and performance differ from that of children older and younger than her?

The problem described above illustrates the questions studied by developmental scientists who favor **information processing theory**, which posits that the mind works in ways similar to a computer in that information enters and then is manipulated, stored, recalled, and used to solve problems (Halford & Andrews, 2011). Unlike the theories we have discussed thus far, information processing theory is not one theory that is attributed to an individual theorist. Instead, there are many information processing theories, and each emphasizes a different aspect of thinking (Callaghan & Corbit, 2015; Müller & Kerns, 2015; Ristic & Enns, 2015). Some theories focus on how children perceive, focus on, and take in information. Others examine how people store information, create memories, and remember information. Still others examine problem solving—how children approach and solve problems at home, at school, and in the peer group.

According to information processing theorists, children are born with the ability to think, or process information. Mental processes, such as noticing, taking in, manipulating, storing, and retrieving information, do not show the radical changes associated with stage theories. Instead, development is continuous and entails changes in the efficiency and speed of thought. Maturation of the brain and nervous system contributes to changes in information processing abilities. Children become more efficient at attending to, storing, and processing information (Luna, Marek, Larsen, Tervo-Clemmens, & Chahal, 2015). Experience and interaction with others also contribute by helping children learn new ways of managing and manipulating information.

Information processing theory offers a complex and detailed view of how children think, which permits scientists to make specific predictions about behavior and performance that can be tested in research studies. Indeed, information processing theory has generated a great many research studies and has garnered much empirical support (Halford & Andrews, 2011). Critics of the information processing perspective argue that a computer model cannot capture the complexity of the human mind and children's unique cognitive abilities. In addition, findings from laboratory research may not extend to everyday contexts in which children must adapt to changing circumstances and challenges to attention (Miller, 2016).

Contextual Theories

Contextual theories emphasize the role of the sociocultural context in development. Children are immersed in their social contexts; they are inseparable from the cultural beliefs and societal, neighborhood, and familial contexts in which they live. The origins of sociocultural systems theory lie with two theorists, Lev Vygotsky and Urie Bronfenbrenner.

Vygotsky's Sociocultural Theory

Writing at the same time as Piaget, Russian scholar Lev Vygotsky (1896–1934) offered a different perspective on development, especially cognitive development, that emphasized the importance of culture. Recall that culture refers to the beliefs, values, customs, and skills of a group; it is a product of people's interactions in everyday settings (Markus & Kitayama, 2010). Vygotsky's (1978) **sociocultural theory** examines how cultural tools, such as language and patterns of thought and behavior, are transmitted from one generation to the next through social interaction. Children interact with adults and more experienced peers as they talk, play, and work alongside them. It is through these formal and informal social contacts that children learn about their culture and adopt the ways of thinking and behaving that characterize their culture. By participating in cooperative dialogues and receiving guidance from adults and more expert peers, children adopt their culture's perspectives and practices, learning to think and behave as members of their society (Rogoff, 2016). Over time, they become able to apply these ways of thinking to guide their own

Lev Vygotsky's (1896–1934) sociocultural theory examines how cultural tools, such as language, are transmitted from one generation to the next through social interaction.
Heritage Images/Hulton Archive/Getty Images

actions, thus requiring less assistance from adults and peers (Rogoff, Moore, Correa-Chavez, & Dexter, 2014).

Vygotsky's sociocultural theory holds important implications for understanding cognitive development. Like Piaget, Vygotsky emphasized that children actively participate in their development by engaging with the world around them. However, Vygotsky also viewed cognitive development as a social process that relies on interactions with adults, more mature peers, and other members of their culture. Vygotsky also argued that acquiring language is a particularly important milestone for children because it enables them to think in new ways and have more sophisticated dialogues with others, advancing their learning about culturally valued perspectives and activities. We will revisit Vygotsky's ideas about the roles of culture, language, and thought in Chapter 8.

Vygotsky's sociocultural theory is an important addition to the field of human development because it is the first theory to emphasize the role of the cultural context in influencing children's development. Critics argue that sociocultural theory overemphasizes the role of context, minimizes the role of children in their own development, and neglects the influence of genetic and biological factors (Crain, 2016).

Bronfenbrenner's Bioecological Systems Theory

Similar to other developmental theorists, Urie Bronfenbrenner (1917–2005) believed that children are active in their own development. Specifically, Bronfenbrenner's **bioecological systems theory** poses that development is a result of the ongoing interactions among biological, cognitive, and psychological changes within the person and his or her changing context (Bronfenbrenner & Morris, 2006). Bronfenbrenner proposed that all individuals are embedded in, or surrounded by, a series of contexts: home, school, neighborhood, culture, and society, as shown in Figure 1.4. The bioecological systems theory thus offers a comprehensive perspective on the role of context as an influence on development. As shown in Figure 1.4, contexts are organized into a series of systems in which individuals are embedded and that interact with one another and the person to influence development.

At the center of the bioecological model is the individual. The developing person's genetic, psychological, socioemotional, and personality traits interact, influencing each other. For example, physical development, such as brain maturation, may influence cognitive development, which in turn may influence social development, such as a child's understanding of friendship. Social development then may influence cognitive development, as children may learn activities or ideas from each other. In this way, the various forms of development interact. The individual interacts with the contexts in which he or she is embedded, influencing and being influenced by them (Bronfenbrenner & Morris, 2006).

The individual is embedded in the innermost level of context, the *microsystem*, which includes interactions with the immediate physical and social environment surrounding the person, such as family, peers, and school. Because the microsystem contains the developing person, it has an immediate and direct influence on his or her development. For example, peer relationships can influence a person's sense of self-esteem, social skills, and emotional development.

The next level, the *mesosystem*, refers to the relations and interactions among microsystems, or connections among contexts. For example, experiences in the home (one microsystem) influence those at school (another microsystem); therefore, parents who encourage and provide support for reading will influence the child's experiences in the classroom. Like the microsystem, the mesosystem has a direct influence on the individual because he or she is a participant in it.

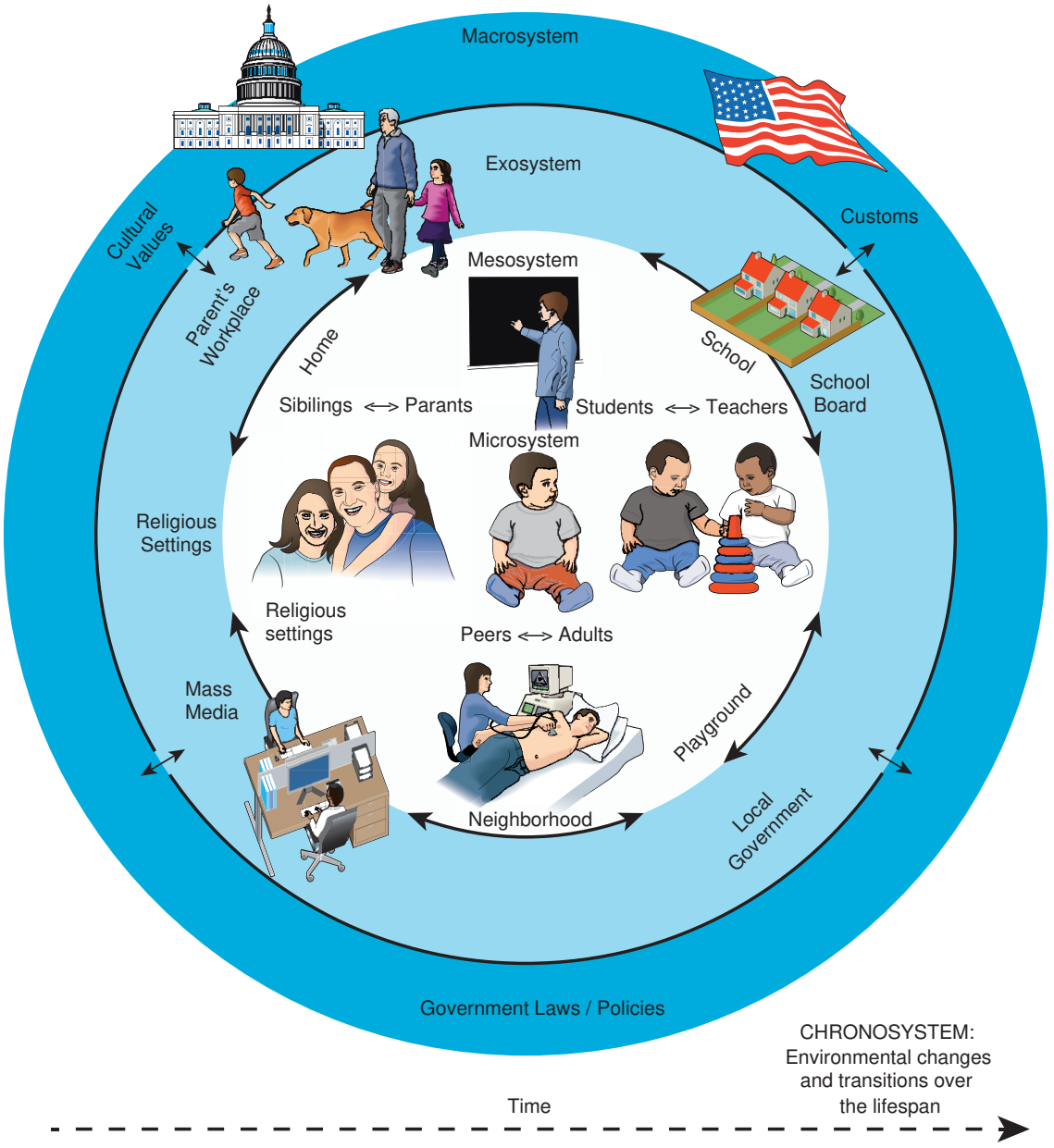
The *exosystem* consists of settings in which the individual is not a participant but that nevertheless influence him or her. For example, a child typically does not participate in a parent's work setting, yet the work setting has an indirect influence on the child because it affects the parent's mood. The availability of funding for schools, another exosystem factor, indirectly affects children by influencing the availability of classroom resources. The exosystem is an important contribution to our understanding of development because it shows us how the effects of outside factors trickle down and indirectly affect children and adults.

The *macrosystem* is the greater sociocultural context in which the microsystem, mesosystem, and exosystem are embedded. It includes cultural values, legal and political practices, and other elements of the society at large. The macrosystem indirectly influences the child because it affects each of the other contextual levels. For example, cultural beliefs about the value of education (macrosystem) influence funding decisions made at national and local levels (exosystem), as well as what happens in the classroom and in the home (mesosystem and microsystem).

A final element of the bioecological system is the *chronosystem*, which refers to how the bioecological system changes over time. As people grow and

FIGURE 1.4

Bronfenbrenner's Bioecological Systems Theory



Source: Adapted from Bronfenbrenner and Morris (2006).

change, they take on and let go of various roles. For example, graduating from college, getting married, and becoming a parent involve changes in roles and shifts in microsystems. These shifts in contexts, called *ecological transitions*, occur throughout life.

The bioecological model was criticized recently for its vague explanation of development, especially the role of culture (Vélez-Agosto, Soto-Crespo, Vizcarrondo-Oppenheimer, Vega-Molina, & García Coll, 2017). Situated in the macrosystem, culture is said to influence development through the interdependence of the systems. Yet current conceptualizations of culture describe it as all the processes used by people as they make meaning or think through interactions with group members (Mistry et al., 2016; Yoshikawa, Mistry, & Wang, 2016). Critics therefore argue that since culture is manifested in our daily activities, it is inherent in each bioecological level (Vélez-Agosto et al., 2017). Moreover, cultural changes derive from interactions and pressures at each ecological level, not simply

LIVES IN CONTEXT: CULTURAL CONTEXT

Effects of Exposure to Community Violence

The neighborhoods and communities where children reside are important contextual factors that influence their development. It is estimated that over one-third of all children and adolescents witness violence within their communities (Kennedy & Ceballo, 2014), and the number is much higher in some inner-city neighborhoods. Community violence is particularly damaging to development because it is experienced across multiple contexts—school, playground, and home. The chronic and random nature of community violence presents a constant threat to children and parents' sense of safety. In such environments, children learn that the world is a dangerous and unpredictable place and that parents are unable to offer protection.

Children exposed to chronic community violence display anxiety and symptoms of post-traumatic stress disorder, commonly seen in individuals exposed to the extreme trauma of war and natural disasters, including exaggerated startle responses, difficulty eating and sleeping, and academic and cognitive problems (Fowler, Tompsett, Braciszewski, Jacques-Tiura, & Baltes, 2009; Kennedy & Ceballo, 2014). The periodic and unpredictable experience of intense emotions may interfere with children's ability to identify and regulate their emotions and can disrupt the development of empathy and prosocial responses. Children who are exposed to community violence tend to be less socially aware, to be less skilled, and to display more aggressive and disruptive behavior than other children (McMahon et al., 2013).

Community violence also affects parents. Parents who are exposed to community violence may feel alienated from the community and unsafe (Guo, O'Connor Duffany, Shebl, Santilli, & Keene, 2018). The parental distress, frustration, and sense of helplessness that accompany community violence can compromise parenting (Vincent, 2009). When dealing with their own grief, fear, and anxiety, parents may be less available for physical and emotional caregiving, which in turn predicts poor child adjustment (Farver, Xu, Eppe, Fernandez, & Schwartz, 2005). They also experience a heightened risk for depression (Jacoby, Tach, Guerra, Wiebe, & Richmond, 2017), posing risks to parenting (Dempsey, McQuillin, Butler, & Axelrad, 2016).

Community violence is unquestionably detrimental to developmental outcomes. However, some children display more resilience to its negative effects than others. Three factors appear to protect children from the most negative effects of exposure to community violence: (1) having a supportive person in the environment; (2) having a protected place in the neighborhood that provides a safe haven from violence exposure; and (3) having personal resources such as adaptable temperament, intelligence, or coping capacities (Jain & Cohen, 2013). Unfortunately, the fear that accompanies community violence influences all members of the community, reducing supports and safe havens. Effective interventions to combat the effects of community violence include after-school community centers that allow children to interact with each other and caring adults in a safe context that permits them to develop skills in coping, conflict resolution, and emotional regulation.

What Do You Think?

Consider the problem of community violence from a bioecological perspective.

1. How might community violence influence individuals through the mesosystem and microsystem?
2. Identify exosystem and macrosystem factors that might influence the prevalence of community violence.
3. How can we help children and families? Identify microsystem, mesosystem, and exosystem factors that might help children and families cope with community violence. ●

the macrosystem as Bronfenbrenner believed (Varnum & Grossmann, 2017).

A second criticism arises from the sheer complexity of the bioecological model and its attention to patterns and dynamic interactions. We can never measure and account for all of the potential individual and contextual influences on development at once, making it difficult to devise research studies to test the validity of the model. Proponents, however, argue that it is not necessary to test all of the model's components at once. Instead, smaller studies can examine each component over time (Jaeger, 2016; Tudge et al., 2016). In any case, bioecological systems theory remains an important contribution toward explaining children's development and is a theory that we will consider throughout this book. The Lives in Context feature further examines the effects of contextual factors on development.

Ethology and Evolutionary Developmental Theory

What motivates parents of most species to care for their young? Some researchers argue that caregiving behaviors have an evolutionary basis. **Ethology**

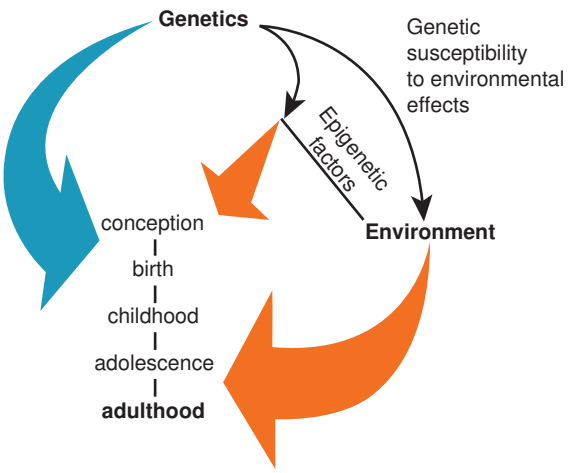
is the scientific study of the evolutionary basis of behavior (Bateson, 2015). In 1859, Charles Darwin proposed his theory of evolution, explaining that all species adapt and evolve over time. Specifically, traits that enable a species to adapt, thrive, and mate tend to be passed to succeeding generations because they improve the likelihood of the individual and species' survival. Several early theorists applied the concepts of evolution to behavior. Konrad Lorenz and Niko Tinbergen, two European zoologists, observed animal species in their natural environments and noticed patterns of behavior that appeared to be inborn, emerged early in life, and ensured the animals' survival. For example, shortly after birth, goslings imprint to their mother, meaning that they bond to her and follow her. Imprinting aids the goslings' survival because it ensures that they stay close to their mother, get fed, and remain protected. In order for imprinting to occur, the mother goose must be present immediately after the goslings hatch; mothers instinctively stay close to the nest so that their young can imprint (Lorenz, 1952).

According to John Bowlby (1969), humans also display biologically preprogrammed behaviors that have survival value and promote development. For example, caregivers naturally respond to infants' cues. Crying, smiling, and grasping are inborn ways that infants get attention from caregivers, bring caregivers into physical contact, and ensure that they will be safe and cared for. Such behaviors have adaptive significance because they meet infants' needs and promote the formation of bonds with caregivers, ensuring that the caregivers will feel a strong desire and obligation to care for them (Bowlby, 1973). In this way, innate biological drives and behaviors work together with experience to influence adaptation and ultimately an individual's survival.

Another theory, **evolutionary developmental theory**, applies principles of evolution and scientific knowledge about the interactive influence of genetic and environmental mechanisms to understand the changes people undergo throughout their lives (Bjorklund, 2018a; Witherington & Lickliter, 2016). You may have wondered, for example, whether you—your abilities, personality, and competencies—result from your genes or from the physical and social environment in which you were raised. Evolutionary developmental scientists explain that this is the wrong question to ask. From an evolutionary development perspective, genes and context interact in an ever-changing way such that it is impossible to isolate the contributions of each to development (Witherington & Lickliter, 2016). While all of our traits and characteristics are influenced by genes, contextual factors influence the expression of genetic instructions. This process is known as **epigenetics** (Moore, 2017). The term *epigenetics* literally means "above the gene." Individuals are influenced by both genetic and contextual factors; however, as shown in Figure 1.5, some contextual factors can determine whether and how genetic capacities are expressed or shown.

FIGURE 1.5

Interaction of Genetic and Environmental Factors



Development is influenced by the dynamic interplay of genetic and environmental factors. Genetic predispositions may influence how we experience environmental factors, and environmental factors may influence how genes are expressed.

Source: Picker (2005).

As an example, contextual factors such as gravity, light, temperature, and moisture influence how genes are expressed and therefore how individuals develop (Meaney, 2017). For instance, in some reptiles such as crocodiles, sex is determined by the temperature in which the organism develops. Eggs incubated at one range of temperatures produce male crocodiles and at another temperature produce female crocodiles (Pezaro, Doody, & Thompson, 2017).

According to evolutionary developmental theory, genetic factors and biological predispositions interact with the physical and social environment to influence development, and Darwinian natural selection determines what genes and traits are passed on to the next generation (Bjorklund, 2018a; Witherington & Lickliter, 2016). Children are viewed as active in their development, influencing their contexts, responding to the demands for adaptation posed by their contexts, and constantly interacting with and adapting to the world around them. The relevance of both biological and contextual

factors to human development is indisputable, and most developmental scientists appreciate the contributions of evolutionary developmental theory (DelGiudice, 2018; Frankenhuis & Tiokhin, 2018; Legare, Clegg, & Wen, 2018). The ways in which biology and context interact and their influence on development change over the course of the lifetime, as we will discuss throughout this book.

Dynamic Systems Theory

Some of the major concepts that we have discussed throughout this chapter include the interaction of genetics and environment and the active role of children in their own development. Children are motivated to understand their experience and control their environment. Each child's characteristics and environmental circumstances and interactions are unique and influence how the child approaches developmental tasks and problems, resulting in unique patterns of functioning. Esther Thelen's **dynamic systems theory** posits that children's developmental domains, maturation, and environment form an integrated system that is constantly changing, resulting in developmental change and the emergence of new abilities (Thelen, 1995, 2000).

Many childhood milestones, such as an infant's first steps or first word, might look like isolated achievements, but they actually develop systematically and are the result of skill-building, with each new skill (such as pulling up to stand or babbling sounds) preparing an infant to tackle the next (Thelen, 1995, 2000). Simple actions and abilities are combined to provide more complex and effective ways for babies to explore and engage the world. An infant might combine the distinct abilities to sit upright, hold the head upright, match motor movements to vision, reach out an arm, and grasp to coordinate reaching movements to obtain a desired object (Corbetta & Snapp-Childs, 2009; Spencer, Vereijken, Diedrich, & Thelen, 2000). Development reflects goal-oriented behavior because it is initiated by the infant or child's desire to accomplish something, such as picking up a toy or expressing him- or herself. Infants' abilities and their immediate environments, including environmental supports and constraints, determine whether and how the goal can be achieved (Spencer et al., 2000). Although Esther Thelen described developmental systems theory with motor development in mind, theorists are applying it to understand children's cognitive and emotional development as well as mental health (Guo, Garfin, Ly, & Goldberg, 2017; Mascolo, van Geert, Steenbeek, & Fischer, 2016).

The many theories of human development offer complementary and contrasting views of how we change throughout our lifetimes. Table 1.3 provides a comparison of theories of human development.

TABLE 1.3

Comparing Theories of Human Development

	HOW DO NATURE AND NURTURE INFLUENCE DEVELOPMENT?	HOW DO CHILDREN INFLUENCE THEIR DEVELOPMENT?	IS DEVELOPMENT CONTINUOUS OR DISCONTINUOUS?
Freud's psychosexual theory	Greater emphasis on nature: Children are driven by inborn drives, but the extent to which the drives are satisfied influences developmental outcomes.	Children are driven by inborn instincts and are not active participants in their development.	Discontinuous stages
Erikson's psychosocial theory	Both nature and nurture: Biological and social forces propel people through the stages, and social and psychosocial influences determine the outcome of each stage.	Children are active in their development because they interact with their social world to resolve psychosocial tasks.	Discontinuous stages
Behaviorist theory	Nurture: Environmental influences shape behavior.	Individuals are shaped and molded by their environment.	Continuous process of learning new behaviors
Bandura's social learning theory	Both nature and nurture: Inborn characteristics and the physical and social environment influence behavior.	Individuals play an active role in their development; their characteristics and behavior interact with the environment.	Continuous process of learning new behaviors

(*Continued*)

TABLE 1.3 (Continued)

	HOW DO NATURE AND NURTURE INFLUENCE DEVELOPMENT?	HOW DO CHILDREN INFLUENCE THEIR DEVELOPMENT?	IS DEVELOPMENT CONTINUOUS OR DISCONTINUOUS?
Piaget's cognitive-developmental theory	Both nature and nurture: An innate drive to learn, coupled with brain development, leads people to interact with the world. Opportunities provided by the physical and social environment influence development.	Children actively interact with the world to create their own schemas.	Discontinuous stages
Information processing theory	Both nature and nurture: People are born with processing capacities that develop through maturation and environmental influences.	Children attend to, process, and store information.	Continuous increase of skills and capacities
Vygotsky's sociocultural theory	Both nature and nurture: People learn through interactions with more skilled members of their culture; however, capacities are influenced by genes, brain development, and maturation.	Children actively interact with members of their culture.	Continuous interactions with others lead to developing new reasoning capacities and skills.
Bronfenbrenner's bioecological systems theory	Both nature and nurture: People's inborn and biological characteristics interact with an ever-changing context to influence behavior.	Children interact with their contexts, being influenced by their contexts but also determining what kinds of physical and social environments are created and how they change.	Continuous: People constantly change through their interactions with the contexts in which they are embedded.
Ethology and evolutionary developmental theory	Both nature and nurture: Genetic programs and biological predispositions interact with the physical and social environment to influence development, and Darwinian natural selection determines what genes and traits are passed on to the next generation.	Active individuals interact with their physical and social environment.	Both continuous and discontinuous: People gradually grow and change throughout life, but there are sensitive periods in which specific experiences and developments must occur.
Dynamic systems theory	Both nature and nurture: Biological factors, maturation, and the environment form an integrated system, resulting in developmental change.	Children are active in their development because they are motivated to achieve goals and master skills.	Both: Continuous process of systemic change. Behaviors may show stage-like transformations.

THINKING IN CONTEXT 1.3

Just after their healthy baby girl is born, Latisha and Devonne are overwhelmed by the intense love they feel for her. Like most new parents, they also worry about their new responsibility. They hope that their baby will develop a strong, secure, and close bond to them. They want their baby to feel loved and to love them.

1. What advice would a psychoanalytic theorist give Latisha and Devonne? Contrast psychoanalytic with behaviorist or social learning perspectives. How might a behaviorist theorist approach this question?
2. How might an evolutionary developmental theorist explain bonding between parents and infants? What advice might an evolutionary developmental theorist give to Latisha and Devonne?
3. Considering bioecological systems theory, what microsystem and mesosystem factors influence the parent–child bond? What role might exosystem and macrosystem factors take?

RESEARCH IN HUMAN DEVELOPMENT

Developmental scientists conduct research to gather information and answer questions about how children grow and change. They devise theories to organize what they learn from research and to suggest new hypotheses to test in research studies. In turn, research findings are used to modify theories. By conducting multiple studies over time, developmental scientists refine their theories about child development and determine new questions to ask.

The Scientific Method

Researchers employ the **scientific method**, a process of posing and answering questions by making careful and systematic observations and gathering information. The scientific method provides an organized way of formulating questions, gathering and evaluating information, and determining and communicating answers. Its basic steps are as follows:

1. Identify the research question or problem to be studied and formulate the hypothesis, or proposed explanation, to be tested.
2. Gather information to address the research question.
3. Summarize the information gathered and determine whether the hypothesis is refuted, or shown to be false.
4. Interpret the summarized information, consider the findings in light of prior research studies, and share them with the scientific community and world at large.

In practice, the scientific method usually does not proceed in such a straightforward, linear fashion. Frequently, research studies raise as many questions as they answer—and sometimes more. Unexpected findings can prompt new studies. For example, researchers may repeat an experiment (called a *replication*) to see whether the results are the same as previous ones. Sometimes analyses reveal flaws in data collection methods or research design, prompting a revised study. Experts may also disagree on the interpretation of a study. Researchers may then conduct new studies to test new hypotheses and shed more light on a given topic. For all of these reasons, scientists often say the scientific method is "messy."

Methods of Data Collection

The basic challenge that developmental scientists face in conducting research is determining how to measure their topic of interest. Scientists use the term *data* to refer to the information they collect. How can we gather data about children? Should we simply talk with them? Watch them as they play? Hook them up to machines that measure physiological activity such as heart rate or brain waves? Developmental scientists use a variety of different methods to collect information.

Observational Measures

Some developmental scientists collect data by watching and recording children's behavior. Developmental scientists employ two types of observational measures: naturalistic observation and structured observation.

This researcher is using a video camera to observe and record the facial expressions a newborn baby makes while it sleeps.
Thierry Berrod, Mona Lisa Production/Science Source

Scientists who use **naturalistic observation** observe and record behavior in natural, real-world settings. For example, Salo, Rowe, and Reeb-Sutherland (2018) observed 12-month-old infants playing with their parents. They recorded infants' gestures and how often they participated with parents in paying attention to or interacting with an object (such as a toy). One year later, infants who used more gestures and engaged in more joint attention, especially responses to parents' efforts to direct their attention, showed more advanced language development; they understood and produced more words.

Sometimes the presence of an observer causes those being observed to behave in unnatural ways or ways that are not typical for them. This is known as *participant reactivity*, and it poses a challenge to gathering data by naturalistic observation. One way of reducing the effect of observation is to conduct multiple observations so that the children get used to the observer and return to their normal behavior. Another promising method of minimizing participant reactivity is to use an electronically activated voice recorder (EAR) (Mehl, 2017). Participants carry the EAR as they go about their daily lives. The EAR captures segments of information over time: hours, days, or even weeks. It yields a log of people's activities as they naturally unfold. The EAR minimizes participant reactivity because the participant is unaware of exactly when the EAR is recording. For example, researchers who study child trauma use the EAR to sample conversations between parents and children to understand how parent–child interactions influence children's adjustment and how the family environment can aid children's recovery from trauma (Alisic, Krishna, Robbins, & Mehl, 2016).

Naturalistic observation permits researchers to observe patterns of behavior in everyday settings, such as whether an event or behavior typically precedes another. Such observations can help researchers determine which behaviors are important to study in the first place. For example, a scientist

who studies bullying by observing children's play may notice that some victims act aggressively *before* a bullying encounter (Kamper-DeMarco & Ostrov, 2017). The scientist may then decide to examine aggression in victims not only after a bullying incident but also beforehand. Naturalistic observation is a useful way of studying events and behaviors that are common. However, some behaviors and events occur infrequently, requiring a researcher to observe for very long periods of time to obtain data on the behavior of interest. For this reason, many researchers make structured observations.

Structured observation entails observing and recording behaviors displayed in a controlled environment, a situation constructed by the experimenter. For example, children might be observed in a laboratory setting as they play with another child or complete a puzzle-solving task. The challenges of identifying and categorizing which behaviors to record are similar to those involved in naturalistic observation. However, the laboratory environment permits researchers to exert more control over the situation than is possible in natural settings. In addition to cataloging observable behaviors, some researchers use technology to measure biological functions such as heart rate, brain waves, and blood pressure. One challenge to conducting structured observations is that children do not always behave in laboratory settings as they do in real life.

Self-Report Measures

Interviews and questionnaires are known as self-report measures because the child under study answers questions about his or her experiences, attitudes, opinions, beliefs, and behavior. Interviews can take place in person, over the phone, or over the Internet.

One type of interview is the **open-ended interview**, in which a trained interviewer uses a conversational style that encourages the child under study to expand his or her responses. Interviewers may vary the order of questions, probe, and ask additional questions based on responses. The scientist begins with a question and then follows up with prompts to obtain a better view of the person's reasoning (Ginsburg, 1997). An example of this is the Piagetian Clinical Interview, which requires specialized training to administer. Consider this dialogue between Piaget and a 6-year-old child:

> You know what a dream is?
>
> *When you are asleep and you see something.*
>
> Where does it come from?
>
> *The sky.*
>
> Can you see it?
>
> *No! Yes, when you're asleep.*
>
> Could I see it if I was there?
>
> *No.*
>
> Why not?
>
> *Because it is in front of us. . . . When you are asleep you dream and you see them, but when you aren't asleep you don't see them.*
>
> (Piaget, 1929, p. 93)

Open-ended interviews allow children to explain their thoughts thoroughly and in their own words. They also enable scientists to gather a large amount of information quickly. Open-ended interviews are very flexible as well. However, their flexibility poses a challenge: When questions are phrased differently for each child, responses may not capture real differences in how children think about a given topic and instead may reflect differences in how the questions were posed and followed up by the interviewer.

A **structured interview** poses the same set of questions to each child in the same way. On one hand, structured interviews are less flexible than open-ended interviews. On the other hand, because all children receive the same set of questions, differences in responses are more likely to reflect true differences among children and not merely differences in the manner of interviewing. For example, Evans, Milanak, Medeiros, and Ross (2002) used a structured interview to examine American children's beliefs about magic. Children between the ages of 3 and 8 were asked the following set of questions:

> What is magic? Who can do magic?
>
> Is it possible to have special powers? Who has special powers?
>
> Does someone have to learn to do magic? Where have you seen magic? (p. 49)

After compiling and analyzing the children's responses as well as administering several cognitive tasks, the researchers concluded that even older children, who have the ability to think logically and perform concrete operations, may display magical beliefs.

To collect data from large samples of people, scientists may compile and use **questionnaires**, also called surveys, made up of sets of questions, typically multiple choice. Questionnaires can be administered in person, online, or by telephone, email, or postal mail. Questionnaires are popular data collection methods with adolescents because they are easy to use and enable scientists to collect information from many people quickly and inexpensively. Scientists who conduct research on sensitive topics, such as sexual interest and experience, often use questionnaires because they can easily be administered anonymously, protecting participants' privacy. For example, the

Monitoring the Future Study is an annual survey of 50,000 eighth-, tenth-, and twelfth-grade students that collects information about their behaviors, attitudes, and values concerning drug and alcohol use (Miech et al., 2017). The survey permits scientists to gather an enormous amount of data, yet its anonymity protects the adolescents from the consequences of sharing personal information that they might not otherwise reveal. Questionnaires, however, rely on a child's ability to read and understand questions and provide responses. It is not until late childhood and, more often, adolescence that questionnaires become feasible sources of data.

Despite their ease of use, self-report measures are not without challenges. Sometimes children give socially desirable answers: They respond in ways they would like themselves to be perceived or believe researchers desire. A fifth-grade student completing a survey about cheating, for example, might sometimes peek at other students' tests, but she might choose survey answers that do not reflect this behavior. Her answers might instead match the person she aspires to be or the behavior she believes her teacher expects—that is, someone who does not cheat on exams. Self-report data, then, may not always reflect children's understanding, attitudes, or behavior.

Physiological Measures

Physiological measures are increasingly used in developmental research because cognition, emotion, and behavior have physiological indicators. For example, when you are speaking in public, such as when you give a class presentation, do you feel your heart beat more rapidly or your palms grow sweaty? Increases in heart rate and perspiration are physiological measures of anxiety that might be measured by researchers. Other researchers might measure cortisol, a hormone triggered by the experience of stress (Simons, Cillessen, & de Weerth, 2017).

Some researchers measure eye movements or pupil dilation as indicators of attention and interest. For example, researchers in one study examined infants' pupil dilation to determine whether they detect and attend to an unusual sound (Wetzel, Buttelmann, Schieler, & Widmann, 2016). Another study examined older children's eye movements to determine their attention to healthy and unhealthy foods depicted in a cartoon (Spielvogel, Matthes, Naderer, & Karsay, 2018). The children paid more attention to unhealthy foods than healthy foods, especially when the characters were shown interacting with and eating the unhealthy food.

In recent decades, researchers have increasingly used physiological measures of brain activity to study human behavior. There are many ways of measuring brain activity, and each measure provides a different perspective, as noted in the Lives in Context feature. An advantage of physiological measures is that they do not rely on verbal reports and generally cannot be faked. A challenge to physiological measures is that, although physiological responses can be recorded, they may be difficult to interpret. For example, excitement and anger may both cause an increase in heart rate. Data collection methods are summarized in Table 1.4.

TABLE 1.4

Data Collection Methods

MEASURE	ADVANTAGE	DISADVANTAGE
OBSERVATIONAL MEASURES		
Naturalistic observation	Gathers data on everyday behavior in a natural environment as behaviors occur.	The observer's presence may influence the children's behavior. No control over the observational environment.
Structured observation	Observation in a controlled setting.	May not reflect real-life reactions and behavior.
SELF-REPORT MEASURES		
Open-ended or clinical interview	Gather a large amount of information quickly and inexpensively.	Nonstandardized questions. Characteristics of the interviewer may influence children's responses.
Structured interview	Permits gathering a large amount of information quickly and inexpensively.	Characteristics of the interviewer may influence children's responses.
Questionnaire	Permits collecting data from a large sample more quickly and inexpensively than by interview methods.	Some participants may respond in socially desirable or inaccurate ways. Children may be too young to understand and participate.
Physiological measures	Assesses biological indicators and does not rely on participant report.	May be difficult to interpret.

LIVES IN CONTEXT: CULTURAL CONTEXT

Methods of Studying the Brain

What parts of the brain are active when children solve problems or feel emotions? How does the brain change with development? Until recently, the brain was a mystery. Over the past hundred years, researchers have devised several ways of studying brain activity that have increased our understanding of how the brain functions and how it develops.

The earliest instrument created to measure brain activity was the electroencephalogram, first used with humans in the 1920s (Collura, 1993). Electroencephalography (EEG) measures electrical activity patterns produced by the brain via electrodes placed on the scalp. Researchers study fluctuations in activity that occur when participants are presented with stimuli or when they sleep. EEG recordings measure electrical activity in the brain, but they do not provide information about the location of activity.

Not until the invention of positron emission tomography (PET) in the early 1950s did researchers obtain the first glimpse of the inner workings of the brain (Portnow, Vaillancourt, & Okun, 2013). Researchers inject a small dose of radioactive material into the participant's bloodstream and the PET scan measures its flow throughout the brain. The resulting images can illustrate what parts of the brain are active as participants view stimuli and solve problems. Developed in 1971, computerized tomography, known as the CT scan, produces X-ray images of brain structures that are combined to make a three-dimensional picture of the person's brain, providing images of bone, brain vasculature, and tissue (Cierniak, 2011). Because both PET and CT scans rely on the use of radioactive material, these methods are generally only used for diagnosis rather than research.

Commonly used for research, functional magnetic resonance imaging (fMRI) measures brain activity by monitoring changes in blood flow in the brain (Bandettini, 2012). Developed in the 1990s, MRI machines house a powerful magnet that uses radio waves to measure the blood oxygen level. Active areas of the brain require more oxygen-rich blood. Like PET scans, fMRI enables researchers to determine what parts of the brain are active as individuals complete cognitive tasks.

Near-infrared spectroscopy (NIRS) involves directing infrared light into brain tissue and detecting its differential absorption in response to neural activity. Unlike fMRI, NIRS does not require the child to remain motionless (Yücel, Selb, Huppert, Franceschini, & Boas, 2017). The infant wears a cap with sensors and can move and interact with others during testing (McDonald & Perdue, 2018). NIRS, however, measures activity only on the outer part of the brain, the cortex, limiting its use somewhat.

What Do You Think?

1. If you were going to study the brain, which measure would you choose and why?
2. Would you use the same measure for an infant and older child? Why or why not?
3. Identify a research question that your measure might help you answer. What type of information would you obtain from your chosen measure? ●

Research Designs

Conducting research entails determining a question, deciding what information to collect, and choosing a research design—a technique for conducting the research study. Developmental scientists employ several types of designs.

Case Study

A **case study** is an in-depth examination of a single individual (or small group of individuals). It is conducted by gathering information from many sources, such as through observations, interviews, and conversations with family, friends, and others who know the individual. A case study may include samples or interpretations of a person's writing, such as poetry or journal entries, artwork, and other creations. A case study provides a rich description of a person's life and influences on his or her development. It is often employed to study individuals who have unique and unusual experiences, abilities, or disorders. Conclusions drawn from a case study may shed light on an individual's development but may not be generalized or applied to others. Case studies can be a source of hypotheses to examine in large-scale research.

Correlational Research

Are children with high self-esteem more likely to excel at school? Are toddlers with working parents

more aggressive? Do children who participate in athletic activities have a positive body image? All of these questions can be studied with **correlational research**, which permits researchers to examine relations among measured characteristics, behaviors, and events. For example, in one study, scientists examined the relationship between physical fitness and academic performance in middle school students and found that children with higher aerobic capacity scored higher on achievement tests than did children with poorer aerobic capacity (Bass, Brown, Laurson, & Coleman, 2013). Note that this correlation does not tell us *why* aerobic capacity was associated with academic achievement. Correlational research cannot answer this question because it simply describes relationships that exist among variables; it does not enable us to reach conclusions about the causes of those relationships. It is likely that other variables influence both a child's aerobic ability and achievement (e.g., health), but correlation does not enable us to determine the causes for behavior—for that we need an experiment.

Experimental Research

Developmental scientists who seek to test hypotheses about *causal* relationships, such as whether media exposure influences behavior or whether hearing particular types of music influences mood, employ **experimental research**. An experiment is a procedure that uses control to determine causal relationships among variables. Specifically, one or more variables thought to influence a behavior of interest are changed, or manipulated, while other variables are held constant. Researchers can then examine how the changing variable influences the behavior under study. If the behavior changes as the variable changes, this suggests that the variable caused the change in the behavior.

For example, Gentile, Bender, and Anderson (2017) examined the effect of playing violent video games on children's physiological stress and aggressive thoughts. Children were randomly assigned to play a violent video game (*Superman*) or a nonviolent video game (*Finding Nemo*) for 25 minutes in the researchers' lab. The researchers measured physiological stress as indicated by heart rate and cortisol levels before and after the children played the video game. Children also completed a word completion task that the researchers used to measure the frequency of aggressive thoughts. Gentile et al. (2017) found that children who played violent video games showed higher levels of physiological stress and aggressive thoughts than did the children who played nonviolent video games. The researchers concluded that the type of video game changed children's stress reactions and aggressive thoughts.

Let's take a closer look at the components of an experiment. Conducting an experiment requires choosing at least one **dependent variable**, the behavior under study (e.g., physiological stress—heart rate and cortisol—and aggressive thoughts), and one **independent variable**, the factor proposed to change the behavior under study (e.g., type of video game). The independent variable is manipulated or varied systematically by the researcher during the experiment (e.g., a child plays with a violent or a nonviolent video game). The dependent variable is expected to change as a result of varying the independent variable, and how it changes is thought to depend on how the independent variable is manipulated (e.g., physiological stress and aggressive thoughts vary in response to the type of video game).

In an experiment, the independent variable is administered to one or more *experimental groups*, or test groups. The *control group* is treated just like the experimental group except that it is not exposed to the independent variable. For example, in an experiment investigating whether particular types of music influence mood, the experimental group would experience a change in music (e.g., from "easy listening" to rock), whereas the control group would hear only one type of music (e.g., "easy listening"). **Random assignment**, whereby each participant has an equal chance of being assigned to the experimental or control group, is essential for ensuring that the groups are as equal as possible in all preexisting characteristics (e.g., age, ethnicity, and biological sex). Random assignment makes it less likely that any observed differences in the outcomes of the experimental and control groups are due to preexisting differences between the groups. After the independent variable is manipulated, if the experimental and control groups differ on the dependent variable, it is concluded that the independent variable *caused* the change in the dependent variable. That is, a cause-and-effect relationship has been demonstrated.

As another example, consider a study designed to examine whether massage therapy improves outcomes in preterm infants (infants who were born well before their due date) (Abdallah, Badr, & Hawwari, 2013). Infants housed in a neonatal unit were assigned to a massage group (independent variable), who were touched and their arms and legs moved for 10-minute periods once each day,

By experimentally manipulating which infants receive massage therapy, researchers determined that massage can help preterm infants gain weight.
AP Photo / AL GOLDIS

or to a control group, which received no massage. Other than the massage/no-massage periods, the two groups of infants were cared for in the same way. Infants who were massaged scored lower on the measure of infant pain and discomfort (including indicators such as heart rate, oxygen saturation, and facial responses) at discharge (dependent variable). The researchers concluded that massage therapy reduces pain responses in preterm infants.

Developmental scientists conduct studies that use both correlational and experimental research. Studying development, however, requires that scientists pay close attention to age and how people change over time, which requires the use of specialized research designs, as described in the following sections.

Developmental Research Designs

Do children outgrow shyness? Are infants' bonds with their parents associated with their peer relationships in adolescence? These challenging questions require that developmental scientists examine relationships among variables over time. There are several approaches to examining developmental change.

Cross-Sectional Research Design

A **cross-sectional research study** compares groups of children of different ages at a single point in time. For example, to examine how vocabulary improves in elementary school, a researcher might measure the vocabulary size of children in first, third, fifth, and seventh grades. The resulting comparison describes how the vocabulary of first-grade children differs from older children in Grades 3, 5, and 7. However, the results do not tell us whether the observed age differences in vocabulary reflect age-related or developmental change. In other words, we don't know whether the first graders will show the same pattern of vocabulary ability and use as the seventh graders, 6 years from now, when they are in seventh grade.

Cross-sectional research permits age comparisons, but participants differ not only in age but also in cohort, limiting the conclusions researchers can draw about development. A cohort is a group of people of the same age who are exposed to similar historical events and cultural and societal influences. Although the first-grade and seventh-grade children may attend the same school, they are different ages and different cohorts and thus may have different experiences. For example, suppose the elementary school changed the language curriculum, leading the first-grade children to be taught a new, improved curriculum, whereas the seventh graders received the old curriculum. The first graders and seventh graders therefore have different experiences because they were taught different curricula. Any differences in vocabulary may be due to age but also to different experiences. Therefore, cross-sectional research is an important source of information about age differences (how the first graders differ from seventh graders), but it cannot provide information about age change (whether the first graders will show similar development as the seventh graders).

Longitudinal Research Design

A **longitudinal research study** follows the same group of participants over many points in time. Returning to the previous example, to examine how vocabulary changes between Grades 1 and 7, a developmental scientist using longitudinal research would measure children's vocabulary size in first grade, then follow up 2 years later in third grade, then 2 years later in fifth grade, and finally 2 years later in seventh grade. This longitudinal study would take 6 years to complete.

Longitudinal research provides information about age change because it follows people over time, enabling scientists to describe how the first graders' vocabulary progressed through childhood. However, longitudinal research studies only one cohort or age-group over time. Are the findings due to developmental change or are they specific to the children studied? Is the pattern of change experienced by these children over a 6-year span similar to other cohorts or groups of children?