Invitation to the Life Span

third edition

Kathleen Stassen Berger

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Kathleen Stassen Berger

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About the Author

Kathleen Stassen Berger received her undergraduate education at Stanford University and Radcliffe College, and then she earned an MAT from Harvard University and an MS and PhD from Yeshiva University. Her broad experience as an educator includes directing a preschool, serving as chair of philosophy at the United Nations International School, and teaching child and adolescent development to graduate students at Fordham University in New York and undergraduates at Montclair State University in New Jersey and Quinnipiac University in Connecticut. She also taught social psychology to inmates at Sing Sing Prison who were earning their paralegal degrees.

Currently, Berger is a professor at Bronx Community College of the City University of New York, as she has been for most of her professional career. She began there as an adjunct in English and for the past decades has been a full professor in the Social Sciences Department, which includes sociology, economics, anthropology, political science, human services, and psychology. She has taught introduction to psychology, child and adolescent development, adulthood and aging, social psychology, abnormal psychology, and human motivation. Her students—who come from many ethnic, economic, and educational backgrounds and who have a wide range of ages and interests—consistently honor her with the highest teaching evaluations.

Berger is also the author of *The Developing Person Through the Life Span* and *The Developing Person Through Childhood and Adolescence*. Her developmental texts are currently being used at more than 700 colleges and universities worldwide and are available in Spanish, French, Italian, and Portuguese, as well as English. Her research interests include adolescent identity, immigration, bullying, and grandparents, and she has published articles on developmental topics in the *Wiley Encyclopedia of Psychology* and in publications of the American Association for Higher Education and the National Education Association for Higher Education. She continues teaching and learning from her students as well as from her four daughters and three grandsons.

Brief Contents

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Detailed Contents

Part Three: Early Childhood 161

CLAUDIA DEWALD/GETTY IMAGES

Part Four: Middle Childhood 237


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Preface

My grandson, Asa, is in early childhood. He sees the world in opposites: male/female, child/grown-up, good guys/bad guys. He considers himself one of the good guys, destroying the bad guys in his active imagination with karate kicks in the air.

Oscar, his father, knows better. He asked me whether Asa really believes there are good guys and bad guys, or is that just an expression. I said that most young children think in simple opposites.

Undeterred, Oscar told Asa that he knows some adults who were once bad guys but became good guys.

"No," Asa insisted. "That never happens."

Asa is mistaken. As he matures, his body will grow taller and become better able to sit with feet on the floor, not kicking. His thoughts will include the idea that people change as they grow older, a theme throughout this book. What Asa says "never happens" occurs every day—not that any of us is always a bad guy or a good guy, but that all of us keep developing, ideally for the better.

Pondering My grandson, Asa, looks thoughtfully at his father, Oscar.

Oscar is not alone in his awareness. Many folk sayings affirm development: People "turn over a new leaf," are "born again"; parents are granted a "do-over" when they become grandparents; today is "the first day of the rest of your life." We recognize that the past never disappears and that parents always influence children, as in the saying "The apple does not fall far from the tree." But we also recognize many other genetic, biological, and social influences on each person, as detailed in the best-selling book *Far from the Tree* (Solomon, 2012).

Complexity, twists and turns, dynamic unfolding, and endless variety of the human experience throughout life is fascinating to me, which is why I continue to study development and revise this textbook. The study itself is dynamic: New insights, new phrases, and new topics appear in every edition, and old topics require revision.

We all have echoes of Asa in us: We want life to be simple. Some aspects of development do not change—birth, death, families, attachment—and some old theories and perspectives are still insightful. They are detailed in this text. But life is not simple or stagnant. Learning about human development helps everyone respond to life's variations and influences, not with imaginary kicks but with wisdom.

Education occurs in many ways. This textbook is only one of them, an aid to understanding the complexity of your life, my life, and the lives of all the estimated 20 billion humans who are either alive now or once lived. Nonetheless, although life experiences and thousands of other books add to our education, writing this text is my contribution and studying it is one of yours: Together we might learn how to limit the bad and increase the good in each of us as time goes on.

New Material

Every year, scientists discover and explain more concepts and research. The best of these are integrated into the text, with hundreds of new references on many topics, including epigenetics at conception, prenatal protections, infant nutrition,

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Healthy? Children have high energy but small stomachs, so they enjoy frequent snacks more than big meals. Yet snacks are typically poor sources of nutrition.

autism spectrum disorder, attachment over the life span, high-stakes testing, drug use and drug addiction, sex education, and diversity of all kinds—ethnic, economic, and cultural. Cognizant of the interdisciplinary nature of human development, I include recent research in biology, sociology, education, anthropology, political science, and more—as well as my home discipline, psychology.

Genetics and social contexts are noted throughout. The interaction of nature and nurture are discussed in many chapters, as neuroscience relates to research on family life. Among the many topics described with new research are the variations, benefits, and hazards of breast-feeding, infant day care, preschool education, single parenthood, exercise, vaccination, same-sex marriage—always noting differences, deficits, and resilience.

Renewed Emphasis on Critical Thinking in the Pedagogical Program

We all need to be critical thinkers. Virtually every page of this book presents not only facts but also questions. A new marginal feature, *Think Critically,* encourages student reflection and analysis. There are no pat answers to these questions: They could be used to start a class discussion or begin a long essay.

Every chapter begins with a few *What Will You Know?* questions, one for every major heading. Of course, much of what readers will learn will be reflected in new attitudes and perspectives—hard to quantify. But these *What Will You Know?* questions are intended to be provocative and to pose issues that the students will remember for decades.

In addition, after every major section, *What Have You Learned?* questions appear. They are designed to help students review what they have just read, a pedagogical technique proven to help retention. Ideally, students will answer the learning objective questions in sentences, with specifics that demonstrate knowledge.

Some items on the new lists are straightforward, requiring only close attention to the chapter content. Others require comparisons, implications, or evaluations. Key terms are indicated with bold print and are defined in the margins as well as the glossary, because expanded vocabulary aids expanded understanding. To help students become better observers, occasional "observation quizzes" accompany a photo or figure. The hope is that students will learn to look closely at life around them.

As a professor myself, I continue to seek ways to deepen knowledge. Cognitive psychology and research on pedagogy finds that vocabulary, specific knowledge, attention to experience, and critical thinking are all part of learning. This book and these features are designed to foster all four.

Updated Features: *Opposing Perspectives,* *A View from Science,* and *A Case to Study*

Special topics and new research abound in life-span development. This edition of *Invitation to the Life Span* includes three boxed features in every chapter. *Opposing Perspectives* focuses on controversial topics—from prenatal sex selection to e-cigarettes. Information and opinions on both sides of each issue are presented, so students can weigh evidence, assess arguments, and reach their own conclusions while appreciating that an opposite conclusion also has merit. *A View from Science*

explains recent scientific research in more detail, illustrating the benefits of the scientific method for a specific issue. *A Case to Study* focuses on particular individuals, helping students to identify the personal implications of what they learn.

Visualizing Development

Information is sometimes better understood visually and graphically. Carefully chosen, updated photos and figures appear on almost every page to accomplish this, with, as always, captions that explain and increase knowledge. In addition, every chapter of this new edition includes a full-page illustration of a topic in development.

These infographics explain key concepts, from brain development to marriage rates, often with data that encourage students to think of other nations, other cultures, other times. My three awesome editors and I have worked closely with noted designer Charles Yuen to create these infographics, hoping they reinforce key ideas.

OKSANA KUZMINA/SHUTTERSTOCK

Open Wide Synchrony is evident worldwide. It is not easy for parents—notice this father's neck muscles—but it is a joy for both partners.

New Online Data Connections Activities

Understanding how scientists use data helps students realize that the study of human development is not just a matter of personal experience and common sense, but goes far beyond that—sometimes contradicting old myths and pat conclusions. This edition includes interactive activities to allow students to interpret data on topics ranging from breast-feeding to risk taking.

For example, students discover how rates of smoking differ by gender or age during adolescence, which probably is not what they think. These interactive activities will make students more engaged and active learners, while deepening their understanding of the importance of quantitative data. Instructors can assign these activities in the online LaunchPad that accompanies this book.

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New Integration with LaunchPad

Throughout the book, the margins include LaunchPad call-outs to online videos about either people in a particular context or key scientists who might become role models. For example, Susan Beal, the Australian scientist who revolutionized our understanding of SIDS (sudden infant death syndrome) and infant sleep position, saving millions of babies, is shown to be a person with whom many students can identify.

Child Development and Nursing Career Correlation Guides

Many students taking this course hope to become nurses or early-childhood educators. This book and accompanying testing material are fully correlated to the NAEYC (National Association for the Education of Young Children) career preparation goals and the NCLEX (nursing) licensure exam. These two supplements are available in this book's accompanying online LaunchPad.

New Research Throughout

Life-span development, like all sciences, builds on past learning. Many facts and concepts are scaffolds that continue to foster learning: stages and ages, norms and variations, dangers and diversities, classic theories and fascinating applications. However, discoveries and experiences, current crises, and new research continue to change how developmentalists describe development. No paragraph in this edition is exactly what it was in the first or second edition.

Especially to help professors who taught with the earlier texts, or students who have friends who took the course a few years ago, highlights of updates in the text appear below.

Chapter 1

- New *A View from Science: Are Children Too Overweight?*
- In the section *The Historical Context,* a new discussion of how public perception of marijuana use illustrates the impact of cohort on attitudes and behavior. A new figure shows how support for marijuana legislation has changed over the years.
- New U.S. poverty data in the section *The Socioeconomic Context.*
- New figure on the Gini index, which measures income equality.
- Discussion of gender differences and neurosexism added to illustrate the difference-equals-deficit error.
- New *Visualizing Development: Diverse Complexities,* which shows regional and age differences in ethnicity in the United States.
- New figure depicting neurogenesis added to *Development Is Plastic.*
- The story of David, the author's nephew, is now the subject of *A Case to Study*.
- New two-page infographic: *Highlights of the Science of Human Development*.
- New discussion of how evolutionary theory offers explanations for many human phenomena, such as morning sickness, toddlers' attachment to parents, and adolescent rebellion.
- New example illustrating the experiment: Do summer jobs prevent juvenile delinquency?
- Discussion of e-cigarette use to show how longitudinal research is needed to determine whether certain substances are harmful. Hydrofracking and e-waste are mentioned as well.
- New examples of cross-sequential research: self-esteem in late adulthood and substance use disorder.
- New example of correlation: U.S. counties with more dentists have fewer obese residents.
- The recent Ebola epidemic used to illustrate ethical dilemmas researchers must navigate.

Chapter 2

- New chapter-opening narrative about my daughter giving birth to her second child.
- Ebola as it relates to genetic diversity.
- Additional discussion of how similar the human genetic code is to that of other animals.
- Discussion of HapMap research omitted and replaced with specific examples of how subtle differences in alleles can have both minor and major effects (e.g., apoE2 versus apoE4 and BRAC1 versus BRAC2).
- In the section *Twins,* new mention of older mothers and vanishing twins.
- New discussion of epigenetics, including type 2 diabetes, drug use, and loneliness.
- New mention of IVF and stem cells analyzed for disease.
- Additional discussion of ethical ramifications of resuscitating a non-breathing, extremely preterm infant.
- New photo of fetus at 27 weeks post-conception.
- New discussion of World Health Organization recommendations and statistics regarding c-sections, as well as an updated figure.
- Huntington's disease discussed more thoroughly in *Gene Disorders*.
- Table describing the effects and prevention of teratogens has been omitted and now comprises an interactive Data Connections activity, available in the online LaunchPad.
- The figure *Critical Periods in Human Development* has been heavily revised with more realistic anatomical art.
- New discussion of the importance of careful consultation with doctors about herbal medicine, over-the-counter medications, and psychoactive drug use.

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Mutual Joy Ignore this dad's tattoo and earring, and the newborn's head wet with amniotic fluid. Instead recognize that, for thousands of years, hormones and instincts propel fathers and babies to reach out to each other, developing lifelong connections.

- New discussion of how some states are enacting laws that incarcerate pregnant women for using alcohol and drugs while pregnant.
- New *A View from Science: Conflicting Advice.*
- New section *Prenatal Testing* discusses false positives and how early pregnancy testing can cause undue anxiety.
- New *A Case to Study: False Positives and False Negatives.*

Chapter 3

- Failure to thrive discussed as part of explanation of percentile rankings.
- Updated discussion of sleep moved ahead of brain development.
- In the section on the senses, new 3D image of parts of brain where hearing occurs.
- New discussion of infant reflexes.
- New discussion on cross-modal perception and synesthesia in infants.
- New *A Case to Study: Scientist at Work,* on Susan Beal's research on SIDS.
- New *A View from Science: From Breast to Formula and Back* explores historical and cultural trends in breast- and formula-feeding.
- A-not-B error, as well as research of Renee Baillargeon, added to my explanation of Piaget's object permanence experiment.
- fNIRS (functional near infrared spectroscopy) added to the list (and illustration) of techniques used by neuroscientists to understand brain function.
- Revised and expanded discussion of information-processing theory.
- New discussion of mean length of utterance (MLU) as a measure of a child's language progress.
- New research on cultural differences in what sounds infants prefer.
- New coverage of bilingualism in babies.

Chapter 4

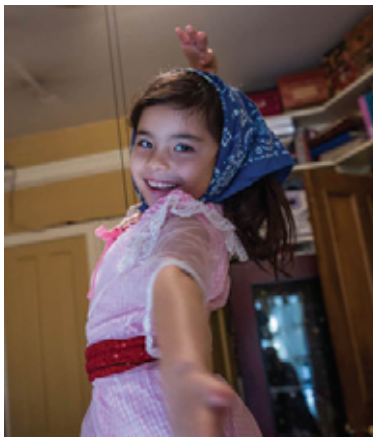
- New chapter-opening narrative illustrating caregiver–infant interaction with an exchange between two of my daughters and my newest grandson.
- Expanded discussion of infants' experience of fear.
- Section on brain growth significantly revised; now includes discussion of cultural differences encoded in the brain, developing social awareness, and early caregiving and cortisol.
- New *Opposing Perspectives: Mothers or Genes?,* which explores whether temperament can change.
- Heavily revised *Visualizing Development: Developing Attachment.*
- Discussion of allocare moved to discussion of fathers' role in child-rearing.
- New *A Case to Study: Can We Bear This Commitment?* recounts the dramatic experience of my friend, illustrating attachment between parents and their children.
- New example of how parents can help their young children express emotions in positive ways.
- New sections on humanism and evolutionary theories and infant psychosocial development.
- Section on infant day care now focuses on North America, Norway, and Australia; includes new *A View from Science: The Mixed Realities of Center Day Care.*

Chapter 5

- New chapter-opening narrative, my memory of trying to fly at age 4.
- New research on nutrition, including long-term effects of childhood obesity.
- Condensed section on food allergies; the just-right phenomenon omitted.
- Sections on environmental hazards, injury, and prevention moved to Chapter 6.
- New brain scan image showing myelination.
- New *A Case to Study: Stones in the Belly* illustrates preoperational cognition.
- Expanded discussion of overimitation.
- New *A View from Science: Witness to a Crime,* regarding children's eyewitness testimony.
- Recent research on the naming explosion and fast-mapping.
- New *Opposing Perspectives: Culture, Child-Centered Versus Teacher-Directed,* comparing child-centered and teacher-directed approaches to early-childhood education.
- New *Visualizing Development: Early-Childhood Schooling.*
- New figure of longitudinal data on the Abecedarian Project.

Chapter 6

- New mention of effortful control.
- Addition of the marshmallow test to illustrate self-control and emotional regulation.
- New discussion on how and when to praise children.
- Elaborated debate about whether play is essential for healthy development.
- New discussion of pretend play versus social play.



Joy Supreme Pretend play in early childhood is thrilling and powerful. For this 7-year-old from Park Slope, Brooklyn, pretend play overwhelms mundane realities, such as an odd scarf or awkward arm.

- New *Visualizing Development: Less Play, Less Safe?*
- New discussion of screen time and a figure showing daily screen time for U.S. children.
- New *A View from Science: Culture and Parenting Style,* using Mexican American mothers to show that parenting style is more fluid than previously thought.
- Behaviorism, cognitive theory, humanism, and evolutionary theories of gender development now separated into discrete sections.
- Prosocial and antisocial behavior condensed; aggression expanded.
- New discussion of cultural, regional, socioeconomic, and gender differences in spanking among U.S. parents, as well as longitudinal research on children who are physically punished.
- Sections on environmental hazards, injury, and prevention moved from Chapter 5.
- Updated coverage on how maltreatment is noticed and defined.
- New research on long-term impact of child maltreatment on development of social skills.

Chapter 7

- New chapter-opening narrative about my friend's son, illustrating the interaction of genes and environment, asking how much parents are to blame for their children's problems.
- New statistics on illness and death rates in middle childhood, as well as on oral health.
- New research on recess and active play, including a comparison of Texas and Japan.
- New research on childhood obesity, including an updated *Visualizing Development: Childhood Obesity Around the Globe.*
- New research on the reduction of asthma in children of Latino parents and caregivers.
- Significantly reorganized section on cognition.
- New example of hierarchical classification.
- Expanded coverage of connections between lobes and regions in children's brains.
- Expanded discussion of international contexts for social interaction and instruction.
- New research regarding estimating math proficiency and knowledge of fractions.
- Discussion of executive processes within section on control processes.
- New *The Maturing Brain* section discusses reaction time and automatization.
- New research on metaphorical understanding and bilingual children.
- Section on bilingual education expanded and brought forward.
- Recent research about arts education.
- Section on international testing revised and expanded.
- New *A Case to Study: Encouraging Child Learning.*
- New comparison of the United States and Finland in discussion of why U.S. students perform poorly on international tests.
- Added section on the ethnic and economic gap in academic performance in the United States.
- New research on attitudes toward the Common Core.
- New figure showing percent of U.S. students in public, private or parochial, and home schools.
- Second-language learning as an example of how policy affects education.
- New section on ethnic diversity in U.S. schools.
- IQ and intelligence testing now opens the *Developmental Psychopathology* section.
- New *Opposing Perspectives: True Grit.*
- Updated coverage of ADHD, psychopathology, intellectual disability, and special education, including new figure on percentage of U.S. children who are or have been medicated for emotional or behavioral difficulties. (All terminology use updated to DSM-5 classifications.)

Chapter 8

- New chapter-opening narrative illustrating social development in middle childhood.
- Reorganized *The Nature of the Child* section.
- Revised section *Self-Concept* includes focus on the importance of social comparison.
- New *Opposing Perspectives: Protect or Puncture Self-Esteem?*
- New examples in *Cumulative Stress* section—child soldiers in Sierra Leone, U.S. children temporarily living

KIDSTOCK/BLEND IMAGES/GETTY IMAGES

Stay Home, Dad The rate of battle deaths for U.S. soldiers is lower for those deployed in Iraq and Afghanistan than for any previous conflict, thanks to modern medicine and armor. However psychological harm from repeated returns and absences is increasing, especially for children.

in homeless shelters, and children exposed to a wildfire in Australia.

- Expanded discussion of parentification, including children who survived Hurricane Katrina.
- New *A View from Science: "I Always Dressed One in Blue Stuff . . .",* which illustrates how siblings raised in the same households do not necessarily share the same environment.
- Revised section on family structure and divorce.
- New *A Case to Study: How Hard Is It to Be a Kid?*
- Updated *Visualizing Development: A Wedding, or Not? Family Structures Around the World.*
- New research on long-term implications for children who have been bullied.
- Reorganized coverage of moral development.

Chapter 9

- New chapter-opening narrative about one of my former students.
- New research on hormones affecting psychopathology in adolescent girls and boys.
- New *Opposing Perspectives: Algebra at 7 A.M.? Get Real!*
- In discussion of secular trends, new example of the heights of various U.S. presidents.
- New discussion of precocious puberty, including possible environmental causes.
- Updated research about stress and puberty.
- Mention of importance of family dinners to adolescent nutrition.
- New data on nutritional deficiencies.
- Discussion of obesity and rates among teenagers in various U.S. states, which introduces section on eating disorders.
- Addition of binge eating disorder, newly recognized in DSM-5.
- Expanded discussion of how immaturity of the prefrontal cortex leads to risk taking, including new research on texting while driving.
- New *A View from Science: The Pleasures of the Adolescent Brain.*
- Addition of three short problems for students to test themselves on intuitive and analytical reasoning.
- Revised *Visualizing Development: Thinking in Adolescence.*
- New *A Case to Study: "What Were You Thinking?"*
- Major section on technology and cognition reorganized and substantially revised under the heading *Digital Natives.*
- New section on sexting.
- New research on declines in school engagement and performance.
- Updated statistics on enrollment in AP classes and college.
- New figure on U.S. high school dropout rates.

Chapter 10

- New chapter-opening narrative about my parenting during adolescence.
- Updated research on political party identification among U.S. adults and their adolescent children.
- New, separate section on ethnic identity featuring anecdote about racial awareness from a U.S. high school senior.
- Enhanced and revised discussion of gender identity, including an explanation of why the DSM-5 describes gender dysphoria, not gender identity disorder.
- New coverage of parent–child conflict, including updated research on parental monitoring.
- New *A Case to Study: An Ignorant Parent—Me!*
- Updated coverage of peer pressure and influence on adolescent decision making.
- New section on social networking among adolescents.
- Section on sexual interactions now comprises *Human Relationships* section.
- New research on sexual activity among adolescents and the impact of parental involvement.
- Revised section on same-sex relationships.

- New coverage of sex education and teenage pregnancy internationally.
- New *A View from Science: Sex Education in School.*
- New coverage of depression in adolescence, including expanded DSM-5 diagnoses.
- Updated research on suicide, suicidal ideation, and parasuicide.
- Updated research on adolescent crime and incarceration rates.
- Updated coverage of teenage drug use. including e-cigarettes and marijuana.
- New *Opposing Perspectives: E-Cigarettes: Path to Addiction or Healthy Choice?*

Chapter 11

- New chapter-opening narrative about my youngest daughter as an emerging adult.
- New *Opposing Perspectives: A Welcome Stage, or Just WEIRD?*
- Section on body development substantially revised; now includes discussion of organ reserve, homeostasis, and allostasis formerly in Chapter 12.
- New discussion of premarital sex and contraception, and fewer single-sex colleges.
- New *A Case to Study: An Adrenaline Junkie.*
- Expanded coverage of alcohol abuse in emerging adulthood.
- New longitudinal data and research on graduation rates, college debt, and salary differences between college grads and non-grads.
- Revised and expanded section on college contexts, including MOOCs and flipped classes.
- Added discussion and research on college and critical thinking.
- New figures comparing problem-solving abilities in many nations.
- Revised section *Identity Achievement,* including new research and examples of changing identity status, employment patterns, and personality development.
- Extensively updated material on dating, cohabitation, and romance in emerging adults; material on friendships and relationships with parents and peers moved forward.

Chapter 12

- Significantly reorganized chapter: Exercise, drug use (including new material on prescription and over-the-counter drug use), and diet begin the chapter. A new section, *Losses and Gains,* now houses the subsections on appearance, disease in adulthood (new), and sex and fertility (including the material on hormone decline).
- New figures showing U.S. rates of cigarette smoking and lung cancer.
- New discussion and research on cancer, including new 3D image of cancer cell.
- New data on adult obesity around the world and new material on reducing obesity.
- New research on in vitro fertilization.
- Revised section *The Aging Brain* now includes material on adult intelligence.
- New *A View from Science: Adult IQ.*
- New research showing how education helps people prepare for and survive disasters.
- Section on stress moved to new section *Selecting and Protecting;* includes new material on posttraumatic growth and weathering.
- Updated coverage of the development of expertise in a new, technologically connected era.
- New *A Case to Study: Jenny, Again.*

© PETER BECK/CORBIS

Smart Farmer; Smart Teacher This school field trip is not to a museum or a fire station but to a wheat field, where children study grains that will become bread. Like this creative teacher, modern farmers use every kind of intelligence. To succeed, they need to analyze soil, fertilizer, and pests (analytic intelligence); to anticipate market prices and food fads (creative intelligence); and to know what crops and seed varieties grow in each acre of their land as they manage their workers (practical intelligence).

Chapter 13

- New updates about marital satisfaction, including cross-cultural data and research.
- New material on same-sex marriages around the globe.
- Updated coverage of parenting joys and challenges—including for foster, step, and adoptive parents.
- New section on culture and caregiving, focusing on elder care internationally, including Japan.

- New *Visualizing Development: Caregiving in Adulthood.*
- Discussion of meta-analysis of job loss and adult happiness.
- New material on the challenges of balancing work and family, particularly for families with "nonstandard" work schedules.
- New *A Case to Study: Having It All.*

Chapter 14

- New chapter-opening narrative about a dinner I attended that challenged my assumptions.
- Updated coverage of stereotype threat and ageism.
- New *A View from Science: I'm Not Like Those Other Old People.*
- New figure on rates of exercise among older adults.
- New *Opposing Perspectives: Stop the Clock?*
- Revised section on demographic shift, including new figures depicting demographic pyramids in India and Japan and percentage of population over age 65 in various countries.
- New example of how statistics about Alzheimer's disease are more frightening than reality.
- Reorganized *Theories of Aging* section.
- New *A Case to Study: Should Older Couples Have More Sex?*
- New subsection within *Selective Optimization with Compensation* called *Medical Compensation: Survival,* which includes discussions of primary and secondary aging, compression of morbidity, and heart disease.
- New research on brain aging comparing humans and other primates.
- New discussion on brain plasticity and neurogenesis in adulthood.

Touch Your Toes? This woman can even put both feet behind her neck. Although everyone loses some flexibility with age, daily practice is crucial. Tao Porchon-Lynch has taught yoga for half a century. At age 92, shown here, she can balance on one leg in tree pose, stretch her hamstrings in downward dog, and then relieve any remaining stress in cobra pose.

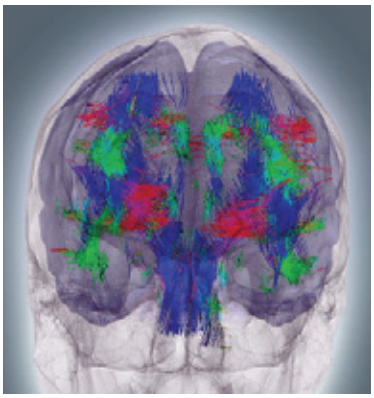
- New coverage of "mind wandering" in later life.
- New section on brain diseases, with new research, statistics, and DSM-5 diagnostic criteria.

Chapter 15

- New discussion of experiment showing how elders tend to follow their emotions, not logic.
- Expanded discussion of why compulsive hoarding was not considered a psychological disorder until DSM-5.
- New figure showing life expectancy in various countries.
- New paragraph on how past employment sometimes resulted in poverty for women and ethnic minorities.
- Subsection on age stratification moved to end of *Stratification Theories* section; new subsection critiquing stratification theories.
- New figures showing percentage of elders who are employed and percentage of U.S. labor force over age 65.
- New research and discussion of bridge jobs in subsection on retirement.
- New research findings on how retirees stay active, aging in place.
- Updated material on religious involvement and political activism.
- More discussion of challenges of skipped-generation families.
- Updated material on caregiving for fragile elders.
- New *A View from Science: Leave the Bedroom.*
- New *A Case to Study: Family Encouraging Confusion.*

Epilogue

- New chapter-opening vignette illustrating how people deal with grief differently.
- New example of how the Hmong attitudes about autopsies conflict with Minnesota law.
- New research on how adolescents and emerging adults think about death.
- Added mention of legacy work.
- Updated research on hospice and palliative care.
- Updated data on Death with Dignity.
- New coverage of the DSM-5's treatment of the "bereavement exclusion" for grief-related depression.
- Addition of study on Swedish children that illustrates how bereavement can affect mental health.
- New example of Bali terrorist attack to illustrate cultural differences in mourning practices.
- New example of mass shooting in Charleston, South Carolina, to demonstrate how people find meaning in death.



ZEPHYR/SCIENCE SOURCE

Mental Coordination? This brain scan of a 38-year-old depicts areas of myelination (the various colors) within the brain. As you see, the two hemispheres are quite similar, but not identical. For most important skills and concepts, both halves of the brain are activated.

Ongoing Features

Many characteristics of this book have been acclaimed since the first edition and have been retained in this revision.

Writing That Communicates the Excitement and Challenge of the Field

Writing about the science of human development should be lively, just as real people are. Each sentence conveys attitude as well as content. Chapter-opening vignettes describe real-life situations. Examples and clear explanations abound, helping students connect theory, research, and experiences.

Coverage of Brain Research

Inclusion of neuroscience is a familiar feature of this book. Virtually every chapter includes a section on the brain, often enhanced with charts and photos to help students understand the brain's inner workings. The following list highlights some of this material.

Epigenetics and brain function in depressed individuals, p. 7; illustrated (PET scans of brains of a depressed and a nondepressed person), p. 7

Neurological plasticity, pp. 21–22; illustrated, p. 21

Prenatal growth of the brain, pp. 60–61; illustrated, p. 61

Teratogenic effects on brain development, pp. 72–75; illustrated, p. 73

Impact of anoxia on the brain, pp. 75–76

A View from Science: the effects of pesticides and other chemicals on fetal brain development, p. 76

Consequences of low birthweight on brain development, p. 79

Brain development in the first two years, pp. 93–97; illustrated, pp. 94–95

Experience-expectant and experience-dependent brain development, p. 96

Dangers of shaken baby syndrome, p. 97

Parts of the brain in which hearing and language comprehension occur, p. 97

Brain abnormalities as possible cause of SIDS, p. 106

Consequences of stunting for brain growth, p. 111

Limitations of Piaget's theory as revealed by brain scans, p. 117

Brain developments that support social emotions, pp. 132–133

The effect of the stress hormone cortisol on the developing brain, p. 134

Opposing Perspectives: Genetic influences on temperament, especially the combination of DRD4 VNTR and 5-HTTLPR genes, pp. 135–136

Brain maturation and synchrony, pp. 137–138

Brain development in early childhood (prefrontal cortex, myelination, lateralization, the limbic system), pp. 166–173; illustrated, p. 167

Abnormal growth of the corpus callosum and ADHD, p. 171

Maturation of the brain and theory of mind, p. 180

The impact of toxic stress on the developing brain, p. 181

Neuroscience research on bilingualism, as well as its benefits, pp. 185–186

The influence of myelination of the limbic system and growth of the prefrontal cortex in development of emotional regulation, pp. 203–204

Development of the prefrontal cortex and rough-and-tumble play, p. 208

Brain development and the development of empathy and antipathy, p. 219

Decreases in instrumental and reactive aggression as prefrontal cortex matures, p. 220

The effect of lead exposure on brain development, pp. 227–228

The effects of physical exercise on the brain, p. 240

Formation of brain connections during middle childhood, p. 248

Neurological advances and selective attention, p. 249

Neuroscience confirming usefulness of information-processing approach, p. 250

Development of control processes in middle childhood, p. 252

Brain development in middle childhood, pp. 253–254

Research on how the brain works like a muscle, p. 268
Plasticity and specific learning disorders, p. 272
The effects of cumulative stress on brain function, p. 286
Brain abnormality as a possible factor in bullying, p. 303
The role of the pituitary gland in hormone production, pp. 316–317
The role of the brain in regulating circadian rhythms, pp. 317–320
Adolescent brain development; heightened arousal of reward areas of the brain, pp. 326–329
Proportion of gray matter from childhood through adolescence, illustrated, p. 327
Benefits of adolescent brain development, p. 329
Dual processing as a result of brain maturation, pp. 333–336; illustrated, p. 334
Role of 5-HTTLPR in depression, p. 370
Drug use and potential harm to the brain, pp. 379–381
The impact of alcohol on the adolescent brain, p. 380
Physiological responses affecting neurological patterns, p. 392
Brain development and postformal thought, pp. 399–400; illustrated, p. 400
Link between exercise and mental health, p. 429
Harmful effects of alcohol on the brain, p. 432
The aging brain and intelligence in adulthood, pp. 444–452; illustrated, p. 446
The impact of stress on cognitive function, p. 447
Brain plasticity in adulthood, p. 461
Brain activity in musicians and non-musicians to illustrate automatic skills, p. 459
Cognitive reserve, p. 459
Expertise and the brain, p. 461
Personality and the brain, p. 469
Link between friendship and mental health, p. 477
Reactive attachment disorder among adopted children, p. 483
Psychological implications of unemployment and income disparity, p. 491
Genes, genetic clock, and life expectancy, pp. 512–513
Cellular aging and telomeres, p. 513
Aging and the brain, pp. 520–525
Information processing in late adulthood, pp. 522–525
Brain diseases in late adulthood, pp. 525–533
Benefits of brain plasticity and exercise in late adulthood, pp. 530–531
Depression and other reversible conditions confused for neurocognitive disorders, pp. 532–533
Intellectual abilities of older adults, pp. 534–536
Religious involvement and depression in later life, p. 554
Mental capacity in late adulthood, p. 564
Major neurocognitive disorder and elder abuse, p. 567
Limbic system and prefrontal cortex affecting how children understand and cope with death, p. 576
Effects of drugs in palliative care, p. 584
End-of-life brain functioning, p. 585

Coverage of Diversity

Cross-cultural, international, multiethnic, sexual orientation, poverty, age, gender—all these words and ideas are vital to appreciating how people develop. Research uncovers surprising similarities and notable differences: We have much in common, yet each human is unique. From the discussion of social contexts in Chapter 1 to the coverage of cultural differences in death and dying in the Epilogue, each chapter highlights possibilities and variations.

New research on family structures, immigrants, bilingualism, and ethnic differences in health are among the many topics that illustrate human diversity. Listed here is a smattering of the discussions of culture and diversity in this new edition. Respect for human differences is evident throughout. You will note that examples and research findings from many parts of the world are included, not as add-on highlights but as integral parts of the description of each age.

KIDSTOCK/GETTY IMAGES

Not Victims An outsider might worry that these two boys would be bullied, one because he is African American and the other because he appears to have a physical disability. But both are well liked for the characteristics shown here: friendship and willingness to help and be helped.

Inclusion of all kinds of people in the study of development, p. 4
Second-language learning to illustrate sensitive periods, p. 10
Multi-contextual considerations in development (SES, cohort, family configuration, etc.), pp. 11–15
Culture defined; the need to include people of many cultures in developmental study, pp. 15–16

Social constructions and cultural differences, p. 16

Concept of neurosexism as an example of difference-equals-deficit error, p. 17

Learning within a culture/cultural transmission (Vygotsky), pp. 17–18

Race and *ethnic group* defined and discussed (includes *Opposing Perspectives*), pp. 18–19

Age and regional differences in ethnicity across the United States (*Visualizing Development*), p. 20

Cultural and contextual influences on David's life (*A Case to Study*), p. 22

Age diversity in cross-sectional research and cohort diversity in cross-sequential research, pp. 38–41

Ethical dilemmas in the treatment of Ebola in West Africa, pp. 42–43

Genetic variations among people: alleles, p. 48

Male and female sex chromosomes, pp. 51–52

Opposing Perspectives: international differences in sex selection, pp. 52–53

Prevalence of twins in certain cultures, p. 55

Birthing practices in various cultures, pp. 62–63

Rates of cesarean births in selected countries, pp. 64–65

Cultural differences in home births versus hospital births, pp. 66–67

Incarceration of pregnant women who use alcohol and other psychoactive drugs, p. 75

Low birthweight and the immigrant paradox, p. 78

Rates of low birthweight in various countries, pp. 78–80, illustrated, p. 80

Cultural differences in alcohol use and abuse, pp. 81–82

Prevalence of nearsightedness in the United States and various Asian countries, pp. 82–83

Opposing Perspectives: cultural differences in co-sleeping, pp. 92–93; rates in various countries, p. 92

Infant mortality rates in various countries, p. 104

Susan Beal and her research on SIDS, pp. 105–106

Successes of immunization in various countries, p. 107

Breast-feeding and HIV-positive women in Africa, p. 108

A View from Science: changing trends in breast- and formula-feeding over the years, pp. 109–110

International rates of stunting, p. 111

Malnutrition: wasting in developing nations, pp. 111–112

Cultural and family differences in infants' exposure to language and language use, pp. 120–122

Sociocultural explanation for language, p. 123

Cultural differences in emotions encouraged in toddlers, p. 131

The infant brain as a "cultural sponge," pp. 132–133

Genetic and gender differences in infant/toddler temperament, p. 136

Ugandan mothers' contact-maintaining behaviors, p. 140

Influence of SES on attachment type, p. 142

Outcomes for Romanian orphans adopted by North American, European, and Australian families, pp. 143–145

Gender differences in parent–infant relationships, p. 147

Gender differences in child care, pp. 148–150

Toddlers' learning of gender roles according to social learning theory, p. 152

International comparisons of infant caregiving differences, pp. 154–157

Parental leave policies in selected countries, p. 155

Changes in obesity rates in Brazil versus the United States, p. 165

Handedness and the difference-equals-deficit error, pp. 168–169

Culture as a determinant of how one thinks and acts (social learning, Vygotsky), pp. 176–178

Study of overimitation in South Africa, Botswana, and Australia, p. 178

Bilingualism in various nations; ethnicity and bilingualism in the United States; English proficiency among U.S. children whose home language is not English, pp. 185–187

Cultural differences in parental preference for various preschool programs, pp. 192–194

Effects of intervention programs on low-SES children, pp. 194–197

Ethnic and SES differences in children's activities, illustrated, p. 206

Cultural differences in young children's play, pp. 208–209

A View from Science: cultural differences in caregiving styles, p. 213

Sex and gender differences, pp. 213–218

Cultural differences in child discipline, pp. 221–222

Opposing Perspectives: cultural attitudes toward spanking, pp. 222–223

Correlation between lead and crime in various countries, p. 228

Regional and ethnic differences in child maltreatment, p. 230

Cultural differences in recess time, p. 242

A View from Science: childhood obesity in the United States, by ethnicity; genetic propensity toward obesity and diabetes, pp. 242–243; illustrated, p. 245

Childhood asthma and ethnicity in the United States, pp. 244–246

Stress and disasters around the world, pp. 453–454
Gender differences in coping styles, p. 455
Concept of weathering in African American community, pp. 455–456
Expertise and age, p. 461
Well-being and self-esteem in various nations, p. 468
International and gender differences in marriage rates, pp. 470–471; illustrated, p. 471
International, cultural, and SES differences in marital happiness and divorce rates, pp. 471–472
Gay and lesbian partners, pp. 474–475
Gender differences in consequences of divorce, pp. 475–476
Danish research on impact of family bonds, p. 478
Cultural differences in sibling relationships, p. 479
Gender differences in parental roles, pp. 481–482
Nonbiological parents, pp. 482–485
Cultural differences in caregiving, pp. 488–489
Stress of unemployment in various nations, p. 491
Diversity in the workplace, pp. 492–493
Immigrants in the workforce, p. 494
Impact of nonstandard work schedules on women of varying SES, p. 495
Finding the balance between work and life, pp. 496–498
A Case to Study: explores whether women can have a family and a career, pp. 496–497
Ageism and attitudes about aging, pp. 503–507
Bicycle riding among elderly in several nations, p. 508
Demographic shift in the United States and other nations, pp. 508–510
Results of severe calorie reduction in several countries, p. 512
Ethnic differences in genetic predisposition for type 2 diabetes, p. 513
Ethnic differences in telomere length, p. 513
Ethnic, SES, and religious differences in life expectancy, p. 514
Sexual activity in late adulthood, pp. 515–516
Accommodations that could enable older adults to continue driving, p. 518
Gender and ethnic differences in rates of heart disease, p. 519
Prevalence of major NCD (dementia) around the world, p. 515; pp. 526–527
Gender, ethnic, income, and age stratification, pp. 544–548
Trends in volunteering around the world, p. 551
Aging in place, p. 552
Filial responsibility around the world, pp. 557–559
Cultural differences in caring for the frail elderly, p. 562; pp. 565–566
Religious and cultural differences in understanding and rituals relating to death, pp. 575–577
Age differences in how people react to death, pp. 576–579
International and cultural differences in rates of people receiving hospice and palliative care, pp. 582–585
Cultural differences in acceptance of euthanasia, pp. 586–587
Cultural and international differences regarding grief and mourning, pp. 592–597

JUSTIN SULLIVAN/GETTY IMAGES

In Every Nation Everywhere, older adolescents are most likely to protest against government authority. Younger adolescents in Alabama celebrate the 50-year anniversary of the historic Selma-to-Montgomery march across the Pettus Bridge. In that historic movement, most of those beaten and killed were under age 25.

Up-to-Date Coverage

My mentors welcomed curiosity, creativity, and skepticism; as a result, I am eager to read and analyze thousands of articles and books on everything from the genes that predispose children to autism spectrum disorder to the complications of zygosity. The recent explosion of research in neuroscience and genetics has challenged me, once again, first to understand and then to explain many complex findings and

speculative leaps. My students continue to ask questions and share their experiences, always providing new perspectives and concerns.

Topical Organization Within a Chronological Framework

The book's basic organization remains unchanged. Two chapters begin the book with coverage of definitions, theories, genetics, and prenatal development. These chapters function not only as a developmental foundation but also as the structure for explaining the life-span perspective, plasticity, nature and nurture, multi-cultural awareness, risk analysis, gains and losses, family bonding, and many other concepts that yield insights for all of human development.

The other six parts correspond to the major periods of development. With the exception of a lone chapter on prenatal development and birth, and another lone chapter on emerging adulthood, each age is discussed in two chapters, one for the biological and cognitive, and one for the social world. The topical organization within a chronological framework is a useful scaffold for students' understanding of the interplay between age and domain.

Photographs, Tables, and Graphs That Are Integral to the Text

Students learn a great deal from this book's illustrations because Worth Publishers encourages authors to choose the photographs, tables, and graphs and to write captions that extend the content. *Observation Quizzes* that accompany many of them inspire readers to look more closely at certain photographs, tables, and figures. The online *Data Connections* further this process by presenting numerous charts and tables that contain detailed data for further study.

MIRANDA PEDERSON/DAILY NEWS/ASSOCIATED PRESS

Girls Can't Do It As Vygotsky recognized, children learn whatever their culture teaches. Fifty years ago, girls were in cooking and sewing classes. No longer. This 2012 photo shows 10-year-olds Kamrin and Caitlin in a Kentucky school, preparing for a future quite different from that of their grandmothers.

Supplements

After teaching every semester for many years, I know well that supplements can make or break a class. Students are now media savvy and instructors use tools that did not exist when they themselves were in college. Many supplements are available for both students and professors. I encourage adopters of my textbook to ask their publisher's representative for guidance as to how these might be used. As an instructor who has used books from many publishers, I think you will find that Worth representatives are a cut above the rest, and you will be happy you asked for help.

LaunchPad

A comprehensive Web resource for teaching and learning, Worth Publishers' online course space offers:

- Prebuilt units for each chapter, curated by experienced educators, with relevant media organized and ready to be assigned or customized to suit your course.
- One location for all online resources, including an interactive e-Book, LearningCurve's adaptive quizzing (see p. xxviii), videos, activities, and more.
- Intuitive and useful analytics, with a gradebook that lets you track how students in the class are performing individually and as a whole.
- A streamlined and intuitive interface that lets you build an entire course in minutes.

The LaunchPad can be previewed at www.macmillanhighered.com/launchpad/bergerinvitels3e.

LearningCurve

The **LearningCurve** quizzing system was designed based on the latest findings from learning and memory research. LearningCurve's adaptive and formative quizzing provides an effective way to get students involved in the coursework. It combines:

- A unique learning path for each student, with quizzes shaped by each individual's correct and incorrect answers.
- A personalized study plan to guide students' preparation for class and for exams.
- Feedback for each question with live links to relevant e-Book pages, guiding students to the resources they need to improve their areas of weakness.

It combines adaptive question selection, immediate feedback, and an interactive interface to engage students in a learning experience that is unique to them. Each LearningCurve quiz is fully integrated with other resources in LaunchPad, so students will be able to review with Worth's extensive library of videos and activities. And state-of-the-art question-analysis reports allow instructors to track the progress of individual students as well as their class as a whole. A team of dedicated instructors—including Diana Riser (Columbus State University), Chrysalis Wright (University of Central Florida), Matthew Isaak (University of Louisiana at Lafayette), and Jason Spiegelman (The Community College of Baltimore County)—has worked closely to develop more than 5,000 quizzing questions specifically for this book.

You will find the following in our LaunchPad:

Human Development Videos

In collaboration with dozens of instructors and researchers, Worth has developed an extensive archive of video clips. This collection covers the full range of the course, from classic experiments (like the Strange Situation and Piaget's conservation tasks) to investigations of children's play to adolescent risk taking. Instructors can assign these videos to students through LaunchPad or choose 1 of 50 popular video activities that combine videos with short-answer and multiple-choice questions. For presentation purposes, our videos are available in a variety of formats to suit your needs.

Instructor's Resources

Now fully integrated with LaunchPad, this collection of resources written by Richard O. Straub (University of Michigan, Dearborn) has been hailed as the richest collection of instructor's resources in developmental psychology. The resources include learning objectives, springboard topics for discussion and debate, handouts for student projects, course-planning suggestions, ideas for term projects, and a guide to audiovisual and online materials.

Interactive Presentation Slides

A new, extraordinary series of "next-generation" interactive presentations gives instructors a dynamic yet easy-to-use way to engage students during lectures on core developmental psychology topics. Each presentation enables lively classroom discussion and interaction with an unprecedented number of embedded video clips and animations from Worth Publishers' library of videos. In addition to these animated presentations, Worth Publishers also offers two other sets of prebuilt slides: one comprised of chapter art and illustrations, and another consisting of comprehensive, book-specific lectures created by Pauline Davey Zeece, PhD. These slides can be used as is, or they can be customized to fit individual needs.

Test Bank and Computerized Test Bank

The test bank, prepared by Diana Riser (Columbus State University), includes at least 100 multiple-choice and 70 fill-in-the-blank, true-false, and essay questions for each chapter. Good test questions are critical to every course, and we have gone through each and every one of these test questions with care. We have added more challenging questions, and questions are keyed to the textbook by topic, page number, and level of difficulty. Questions are also organized by NCLEX, NAEYC, and APA goals and Bloom's taxonomy. We have also written rubrics for grading all of the short-answer and essay questions in the test bank.

The Diploma computerized test bank guides instructors step by step through the process of creating a test. It also allows them to quickly add an unlimited number of questions; edit, scramble, or re-sequence items; format a test; and include pictures, equations, and media links. The accompanying gradebook enables instructors to record students' grades throughout the course and includes the capacity to sort student records, view detailed analyses of test items, curve tests, generate reports, and add weights to grades.

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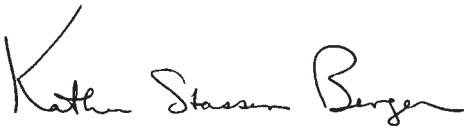
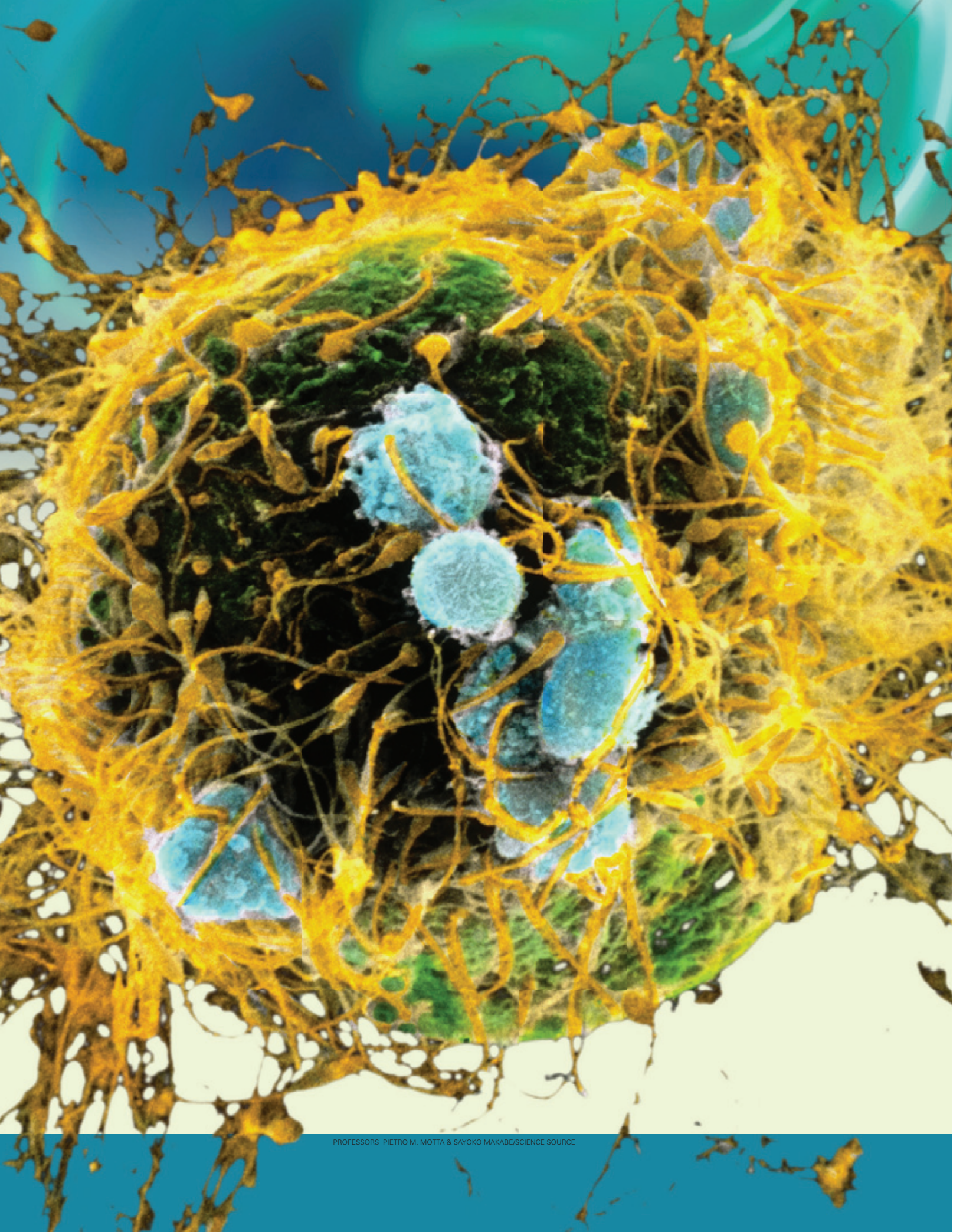


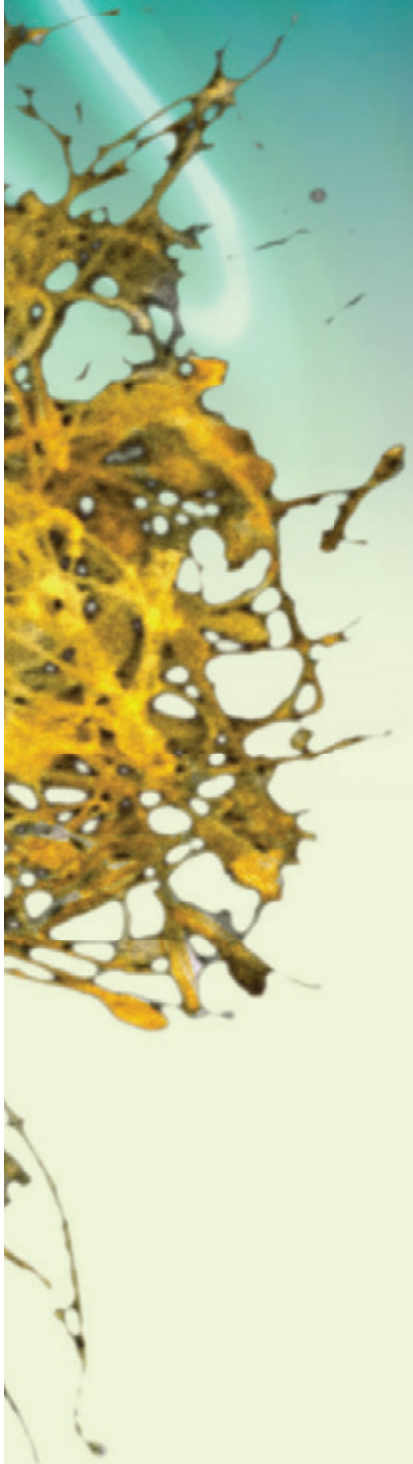
Kathleen Stassen Berger
New York, September 2015



PROFESSORS PIETRO M. MOTTA & SAYOKO MAKABE/SCIENCE SOURCE

PART ONE

- CHAPTER 1
- CHAPTER 2



The Beginning

The science of human development has many beginnings. Chapter 1 introduces the science, explaining some theories, strategies, and methods used to understand how people grow and change. Chapter 2 traces early development, from the genetic interactions that produce all inherited characteristics to the newborn's first movements, sounds, and reactions.

Throughout these chapters, the interplay of nature (heredity) and nurture (the environment) is illustrated. For instance, whether or not a person will develop type 2 diabetes at age 60 depends on both nature (genetic vulnerability) and nurture (the mother's diet during pregnancy and the adult's exercise and eating habits). Understanding the interplay of biology and culture is the foundation that allows us to reach ***the goal of our study: a happy and meaningful life for all 7 billion people on Earth, of all ages, cultures, and aspirations***.

CHAPTER OUTLINE

CHAPTER 1

THE BEGINNING

The Science of Human Development

WHAT WILL YOU KNOW?

- How can the study of people be considered a science?
- Are people the same, always and everywhere, or is each person unique, changing from day to day?
- Do all the major theories of human development agree with each other?
- What cautions do developmental scientists need to remember?[1]

I am holding my daughter's bent right leg in place with all my strength. A nurse holds her left leg while Bethany pulls on a sheet tied to a metal structure over her bed. The midwife commands, "Push . . . push . . . push." Finally, a head is visible, small and wet, but perfect. In a moment, body and limbs emerge, all 4,139 grams of Caleb, perfect as well. Apgar is 9, and every number on the monitor is good. Bethany, smiling, begins to nurse.

Decades of learning, studying, teaching, praying, and mothering have led me to this miracle at 6:11 A.M., my first-born with her first-born. Celestial music rings in my ears. The ringing grows louder. Suddenly, I am on the floor, looking up at six medical professionals: I have fainted.

"I am fine," I insist, getting back on the couch where I spent the night. They stare at me.

"You need to go to triage."

"No, I am fine. Sorry I fainted."

"Hospital policy."

"No. I belong here."

"We must send you to triage, in a wheelchair."

What should I say to make them ignore me and focus on Caleb?

Another nurse wisely adds, "You can refuse treatment."

Of course. I remember; the law now requires patient consent.

So I am wheeled down the hall, wait for the elevator, go to Admitting, explain that I was with my laboring daughter all night with neither food nor sleep. I fainted, but I am fine. I refuse treatment.

The admitting nurse takes my blood pressure—normal—and checks with her supervisor.

[1]"What Will You Know?" questions, one for each major heading, are a preview before each chapter. They are big ideas that you will still know a decade from now, unlike the "What Have You Learned" questions after each major heading, which are more specific.

COURTESY KATHLEEN BERGER

Born Blissful One of us rests after an arduous journey, and the other rejoices after crying and fainting.

"I refuse treatment," I repeat.

I am approved to leave, so I stand up to walk back.

"Sit down. Someone must wheel you back. Hospital policy."

I am puzzled. Bethany chose me for her birth partner because of my knowledge, experience, and steadiness. I can interpret numbers, jargon, monitors, body language, medical competence, hospital cleanliness, hall noises, and more. I do not panic; I know that Bethany is strong, healthy, and conscientious. I appreciate all the advances of modern medicine, sadly not part of every birth but available to my well-insured, well-educated daughter.

Consequently, I was grateful but not surprised that Caleb was perfect. I told the triage nurse that I had not slept or eaten all night—true, but I had gone without sleep and food before, never fainting. She accepted my explanation, but I do not. What happened this time?

This incident introduces Chapter 1, which begins to explain what we know, what we don't know, and how we learn about human development. Emotions mix with intellect, family bonds with professional competence, contexts with cultures, personal experiences with academic knowledge. Much is known and yet new questions arise, surprises occur. I learned more about physiology, relationships, and cognition because I fainted. I also thought more about family and aging as well as about genetics and prenatal care. This chapter, and those that follow, will help you learn as well. ■

Understanding How and Why

science of human development
The science that seeks to understand how and why people of all ages and circumstances change or remain the same over time.

The **science of human development** *seeks to understand how and why people—all kinds of people, everywhere, of every age—change over time.*

Development over the life span is *multi-directional, multi-contextual, multi-cultural,* and *plastic*—four terms that will be explained soon. First we must emphasize that developmental study is a *science.* It depends on theories, data, analysis, critical thinking, and sound methodology, like every other science. Scientists ask questions and seek answers to ascertain "how and why."

THINK CRITICALLY: What are the limitations of a scientific approach to human development?[2]

Science is especially necessary when the topic is human development. People disagree about what pregnant women should eat; where babies should sleep; when children should be punished; whether adults should go to college, marry, divorce, and have children; how people in late adulthood should approach aging, caregiving, and dying.

Some parents beat their children; other people put such parents in prison. Some people quit working as soon as they can; other people never retire. Everyone's choices affect everyone else. Scientists seek to progress from personal opinions to proven facts, from wishes to evidence that might affect us all.

The Scientific Method

scientific method
A way to answer questions using empirical research and data-based conclusions.

hypothesis
A specific prediction that can be tested.

empirical evidence
Evidence that is based on observation, experience, or data; not theoretical.

As you surely realize, facts may be twisted, and applications sometimes spring from false assumptions. To rein in personal biases and avoid misinterpretations, researchers follow the **scientific method** (see Figure 1.1):

1. *Begin with curiosity.* Pose a question, guided by theory, research, or observation.
2. *Develop a hypothesis.* Shape the question into a **hypothesis,** a testable prediction.
3. *Test the hypothesis.* Conduct research to gather **empirical evidence** (data).

[2]*Think Critically* questions occur several times in each chapter. They are intended to provoke thought, not simple responses, and hence have no obvious answers.


GREGORY COSTANZO/ PHOTODISC/GETTY IMAGES

1. Curiosity


GEOSTOCK/STOCKBYTE/ PHOTODISC

2. Hypothesis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3. Test


MOODBOARD/MOODBOARD/ SUPERSTOCK

4. Analyze data and draw conclusions


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5. Report the results

FIGURE 1.1 Process, Not Proof Built into the scientific method—in questions, hypotheses, tests, and replication—is a passion for possibilities, especially unexpected ones.

4. *Draw conclusions.* Use the evidence to support or refute the hypothesis.
5. *Report the results.* Share data, conclusions, limitations, and alternative explanations.

As you see, developmental scientists begin with curiosity and then seek facts, drawing conclusions after careful research.

Replication—repeating the procedures and methods of a study with different participants—is often a sixth and crucial step (Jasny et al., 2011). Scientists study the reports of other scientists and build on what has gone before. Sometimes they try to duplicate a study exactly; often they follow up with related research (Stroebe & Strack, 2014). Conclusions are revised, refined, rejected, or confirmed after replication.

replication
Repeating a study, usually using different participants, perhaps of another age, location, socioeconomic status (SES), or culture.

This method is not foolproof. Scientists sometimes draw conclusions too hastily, misinterpret data, or ignore alternative perspectives.

Occasionally scientists discover, to their shock and horror, that another scientist has not followed the procedures outlined above. This is one reason that detailed procedures and replication are needed. Asking questions and testing hypotheses by gathering data are the foundation of science.

A VIEW FROM SCIENCE

Are Children Too Overweight?*

Obesity is a serious problem. In every age group, from childhood to age 60, rates of obesity increase. Rates begin to decrease at about age 60, perhaps because some of the heaviest people die of the consequences of a lifetime of overweight—heart disease, diabetes, and strokes.

The connection between overweight and disease was not always known. Since before written history, observers have noted that some children were heavier than others and that underweight children were more likely to die. That led to an assumption, still held by some adults: Heavy children are healthy (Laraway et al., 2010).

Sixty years ago another untested assumption was that heart attacks in older adults could not be prevented, or even predicted. Doctors were "baffled" and decided to study more than 5,000 adults in Framingham, Massachusetts, to see what they could learn (Levy & Brink, 2005).


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What Will Become of Her? This happy, beautiful girl in Sweden may become an obese woman . . . or she may not. Research finds that if she slims down by adulthood, she is likely to be healthier than the average woman who was never overweight.

*Every chapter of this text features *A View from Science*, which explains surprising insights from recent scientific research.

The Framingham Heart Study began in 1948, collecting data and drawing conclusions that, by 1990, revolutionized adult behavior—a historic example of the scientific method applied to human behavior. Because of that study, cigarette smoking is down, exercise is up, and doctors now routinely monitor blood pressure, weight, and cholesterol, advising and prescribing accordingly. Millions of premature deaths have been averted.

That research led to a new thought: Since obese adults are likely to die of heart attacks and strokes, childhood obesity might be a health risk, too. That thought (Step 1) led to the hypothesis (Step 2) that childhood overweight impairs adult health.

This hypothesis is now widely assumed to be true. For instance, a poll found that most Californians consider childhood obesity "very serious," with a third of them rating poor eating habits as a worse risk to child health than drug use or violence (Hennessy-Fiske, 2011).

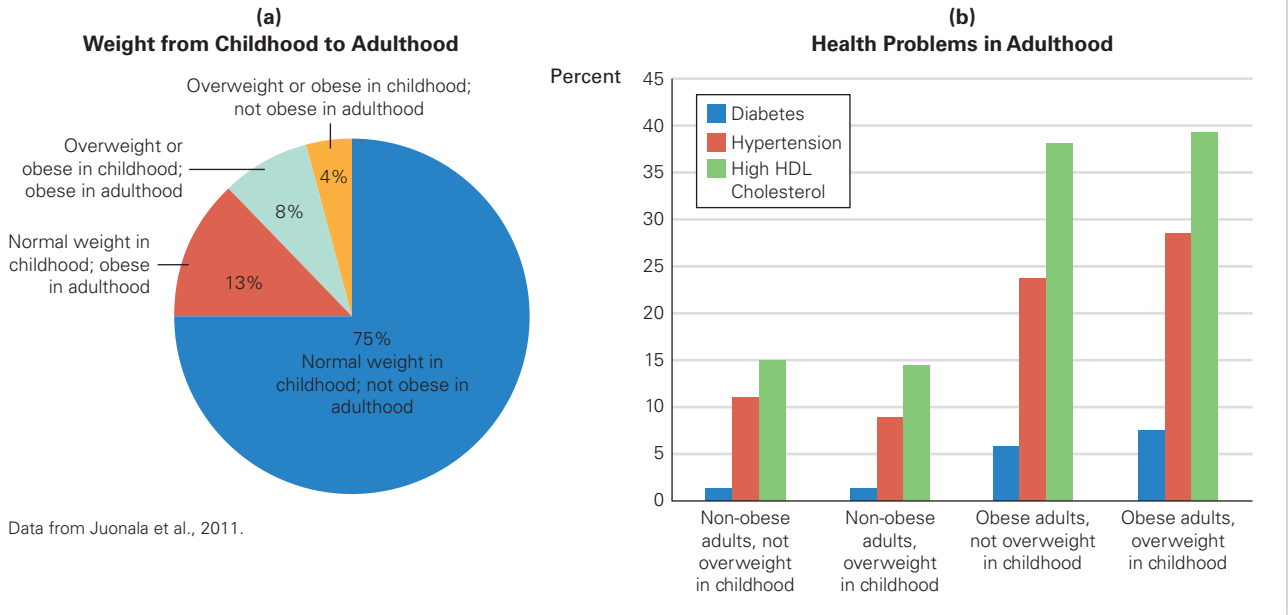
The best way to test that hypothesis (Step 3) is to examine adult health in people who had been weighed and measured in childhood. Several researchers did exactly that. Indeed, four studies measured and weighed children and then assessed the same people as adults. Most (83 percent) of the people in these studies maintained their relative weight (see Figure 1.2a).

From that research, a strong conclusion was reached (Step 4) and published (Step 5): Overweight and obese children are likely to become obese adults, who then are at high risk for cardiovascular disease, diabetes, and early death (Juonala et al., 2011). For instance, in those four studies, 29 percent of those who were overweight from childhood on had high blood pressure as adults, compared to 11 percent of those who were never overweight.

A new question arose (Step 1), building on the earlier findings. What about overweight children who become normal-weight adults? That led to a new hypothesis (Step 2): Childhood obesity predicts heart attacks, strokes, diabetes, and early death in adulthood, even if the person slims down. The research design was the same, measuring health in formerly overweight adults (Step 3). The data (Step 4) (see Figure 1.2b) found that the hypothesis was wrong: As normal-weight adults they were *not* at high risk of disease, a conclusion replicated by four studies with different participants (Juonala et al., 2011).

Many other issues, complications, and conclusions regarding obesity are discussed later in this book. For now, all you need to remember are the steps of the scientific method and that developmentalists are right: Significant "change over time" is possible.

FIGURE 1.2 Not Yet Obese You probably know that more than half of all adults in the United States are overweight, so this chart—with only 21 percent of adults obese—may seem wrong. However, three facts explain why the data are accurate: (1) "Obese" is much heavier than overweight; (2) the average adult in this study was 34 years old (middle-aged and older adults are more often obese); and (3) one of the studies that provided much of the longitudinal data was in Finland, where rates of obesity are lower than in the United States.



Data from Juonala et al., 2011.

The Nature–Nurture Controversy

An easy example of the need for science concerns a great issue in development, the *nature–nurture question*. **Nature** refers to the influence of the genes that people inherit. **Nurture** refers to environmental influences, beginning with the health and diet of the embryo's mother and continuing lifelong, including family, school, community, culture, and society.

The nature–nurture issue has many other names, among them *heredity vs. environment* and *maturation vs. learning.* Under whatever name, the basic question is: *How much of any characteristic, behavior, or emotion is the result of genes and how much is the result of experience?*

Some people believe that most traits are inborn, that children are innately good (an "innocent child") or bad ("beat the devil out of them"). Other people stress nurture, crediting or blaming parents, or neighborhoods, or society, or drugs.

Neither extreme is accurate. The question is "how much," not "which," because *both* genes and experience affect every characteristic: Nature always affects nurture, and then nurture affects nature.

Some scientists think that even "how much" is misleading: It implies that nature and nurture each contribute a fixed amount when actually their explosive interaction is crucial (Eagly & Wood, 2013; Lock, 2013).

nature
In development, nature refers to the traits, capacities, and limitations that each individual inherits genetically from his or her parents at the moment of conception.

nurture
In development, nurture includes all the environmental influences that affect the individual after conception. This includes everything from the mother's nutrition while pregnant to the cultural influences in the nation.

epigenetics
The study of how environmental factors affect genes and genetic expression—enhancing, halting, shaping, or altering the expression of genes.

differential susceptibility
The idea that people vary in how sensitive they are to particular experiences. Often such differences are genetic, which makes some people affected "for better or for worse" by life events. (Also called *differential sensitivity.*)

EPIGENETICS A new discipline related to genetics is called **epigenetics**—it explores the many ways environmental forces alter genetic expression. Neuroscientists have shown that loneliness, for example, can literally change structures in the brain (Cacioppo et al., 2014).

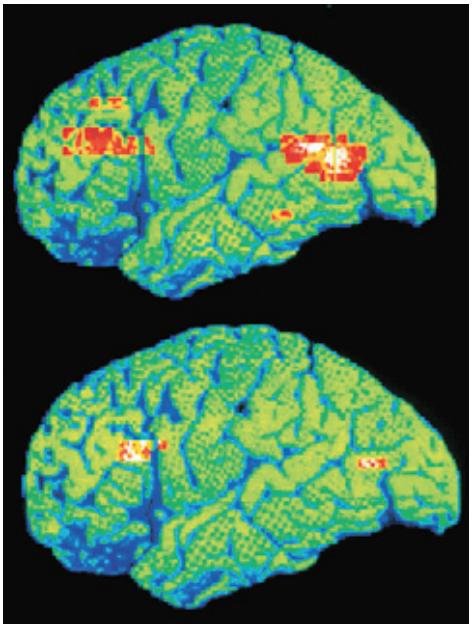
Sometimes protective factors, in either nature or nurture, outweigh liabilities. As one review explains, "there are, indeed, individuals whose genetics indicate exceptionally high risk of disease, yet they never show any signs of the disorder" (Friend & Schadt, 2014, p. 970). Why? Epigenetics.

DANDELIONS AND ORCHIDS There is increasing evidence of **differential susceptibility**—that is, how sensitivity to any particular environmental experience differs from one person to another because of the particular genes each person has inherited.

Some people are like *dandelions*—hardy, growing and thriving in good soil or bad, with or without ample sun and rain. Other people are like *orchids*—quite wonderful, but only when ideal growing conditions are met (Ellis & Boyce, 2008; Laurent, 2014).

For example, in one study, depression in pregnant women was assessed and then the emotional maturity of their children was measured. Those children who had a particular version of the serotonin transporter gene (5-HTTLPR) were likely to be emotionally immature if their mothers were depressed, but *more* mature than average if their mothers were not depressed (Babineau et al., 2015).

The interaction between nature and nurture is apparent for every topic in this book, as you will see, and in every moment of our lives, as I see in myself. In retrospect, I fainted at Caleb's birth because of the interaction of at least eight factors (low blood sugar, lack of sleep, physical exertion, gender, age, joy, memories, relief), all influenced by both nature and nurture, a combination that threw me to the floor.



WDCN/UNIV. COLLEGE LONDON/SCIENCE SOURCE

Red Means Stop At top, the red areas on this PET scan show abnormally low metabolic activity and blood flow in a depressed person's brain, in contrast to the normal brain at bottom. Neuroscience confirms that depression is biological, not just psychological.

The Three Domains

Obviously, it is impossible to examine nature and nurture in every aspect of human development at once, especially for any one individual. I do not

know how much of my fainting was affected by my genes, nor how much by my past experiences.

A century ago, nature (especially physical development such as tooth eruption or running speed) was the main focus of developmental research. Scientists now realize that social factors affect every aspect of development and that intellect and emotions, not just physical growth, develop throughout the entire life span. All three are always responsive to each other.

Consequently, the traditional emphasis on physical growth has been accompanied by recognition of cognition and social interactions. Development is often divided into three domains—*biological, cognitive,* and *psychosocial* (see Figure 1.3), or body, mind, and social world. As you see in this text, body and mind are separate halves of Chapters 3, 5, 7, 9, 12, and 14, and the other chapters includes the social world—except for Chapter 11, on emerging adulthood, which includes all three. Other books differ, but everyone distinguishes these three.

Each domain includes several academic disciplines: Biological includes physiology, neuroscience, and medicine; cognitive includes psychology, linguistics, and education; and psychosocial includes economics, sociology, and history.

Typically, each scientist pursues a particular thread within one discipline, using clues, research, and conclusions from scientists in other disciplines who have concentrated on that same thread. Yet always remember that the interaction between and among domains—an *interdisciplinary approach*—is essential to understanding the whole developing person.

Since every individual is a tapestry of many-colored threads, every aspect of growth touches on all three domains. For example, babies start speaking when the brain, mouth, and vocal cords mature (*biological*), which allows them to express connections between objects, events, and words (*cognitive*), which depends on people talking to them (*psychosocial*).

From the recognition of the interaction of domains comes a related concept in psychology called *embodied cognition,* the idea that people's thinking and social relationships are affected by their bodies. For instance, walking in a happy, open way makes a person feel happier, and standing arms akimbo makes a person feel confident and makes other people perceive that person as competent. More research is needed, as the evidence for embodied cognition is mixed, but no one doubts that all three domains interact (Marmolejo-Ramos & D'Angiulli, 2014; Shapiro, 2014).

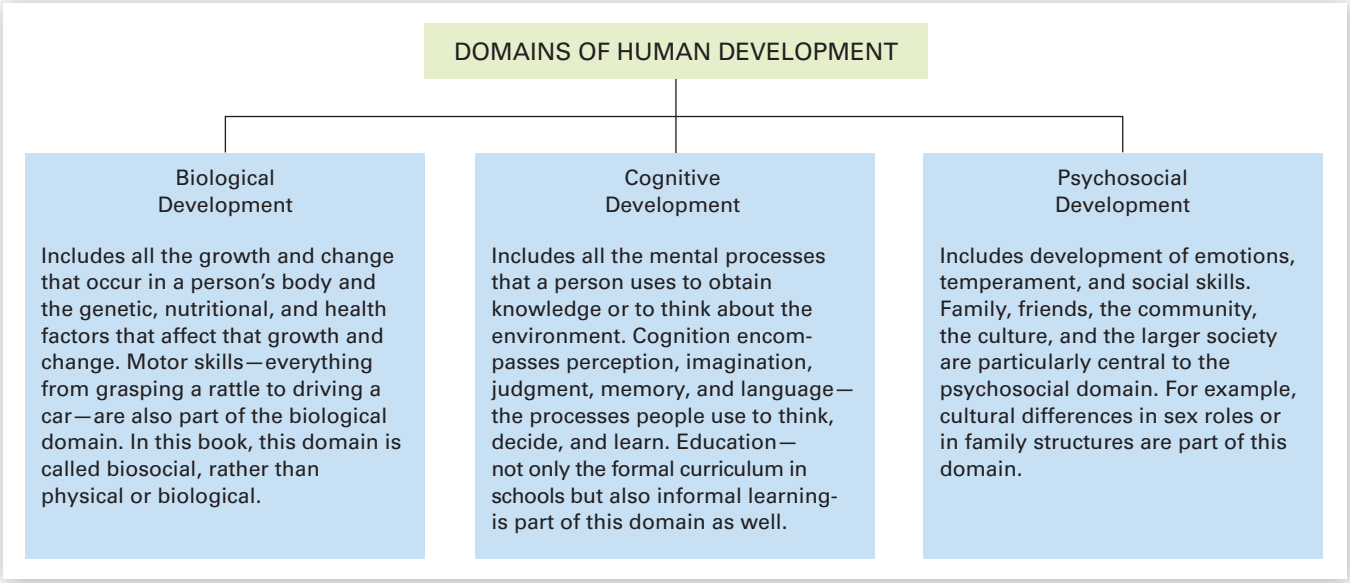


FIGURE 1.3 The Three Domains
The division of human development into three domains makes it easier to study, but remember that very few factors belong exclusively to one domain or another. Development is not piecemeal but holistic: Each aspect of development is related to all three domains.

WHAT HAVE YOU LEARNED?

1. What are the five steps of the scientific method?
2. Why is replication important?
3. What basic question is at the heart of the nature–nurture controversy?
4. What is the difference between "genetics" and "epigenetics"?
5. How might differential susceptibility apply to understanding students' varied responses to a low exam grade?
6. What are the three domains of development?
7. How does multidisciplinary research connect with the three domains?

The Life-Span Perspective

The **life-span perspective** (Baltes et al., 2006; Fingerman et al., 2011; Raz & Lindenberger, 2013) takes into account all phases of life, not just the first two decades (which were once the sole focus of developmental study). By including the entirety of life (see Table 1.1), this perspective has led to the realization that human development is multi-directional, multi-contextual, multicultural, and plastic. Now we examine each of these four.

TABLE 1.1 Age Ranges for Different Periods of Development

Infancy	0 to 2 years
Early childhood	2 to 6 years
Middle childhood	6 to 11 years
Adolescence	11 to 18 years
Emerging adulthood	18 to 25 years
Adulthood	25 to 65 years
Late adulthood	65 years and older

As you will learn, developmentalists are reluctant to specify chronological ages for any period of development, since time is only one of many variables that affect each person. However, age is a crucial variable, and development can be segmented into periods of study. Approximate ages for each period are given here.

Development Is Multi-Directional

Multiple changes, in every direction, characterize the life span: Development is *multi-directional*. If human traits were all charted over time from birth to death, some traits would appear, others disappear, with increases, decreases, and zigzags (see Figure 1.4). The traditional idea—that all development advances until about age 18, steadies, and then declines—has been refuted by life-span research.

The pace of change varies as well. Sometimes *discontinuity* is evident: Change can occur rapidly and dramatically, as when caterpillars become butterflies. Sometimes *continuity* is found: Growth can be gradual, as when redwoods grow taller over hundreds of years.

life-span perspective
An approach to the study of human development that takes into account all phases of life, not just childhood or adulthood.

Even stability is possible. Some characteristics seem not to change. For instance, chromosomal sex is lifelong: A zygote that is XY or XX (male or female) for life. Of course, the power and meaning of that biological fact change, but the chromosomes themselves stay the same.

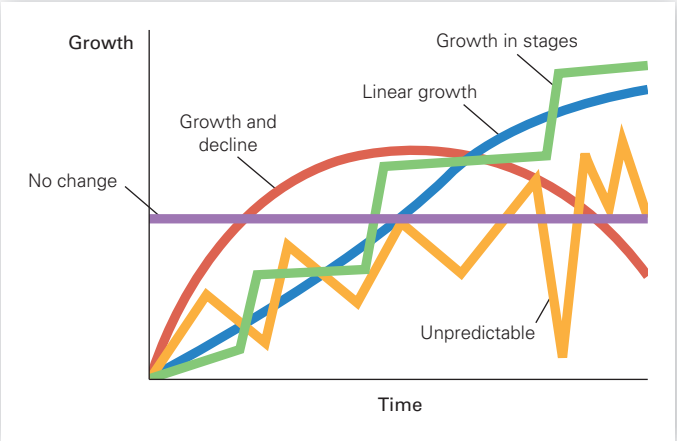


FIGURE 1.4 Patterns of Developmental Growth Many patterns of developmental growth have been discovered by careful research. Although linear (or nonlinear) progress seems most common, scientists now find that almost no aspect of human change follows the linear pattern exactly.