Introduction

Students may well yawn when the idea of critical thinking is pressed upon them. Many readers of this book have been asked to do "critical thinking" exercises as far back as elementary school, but on the whole their experiences have simply been of exercises that asked them to go beyond the information they already had, not necessarily in a logical or critical way. Unfortunately, when we look at common secondary school experiences of the last couple of decades, we see that some of these may diminish rather than foster critical thinking abilities.

Some years ago, the novelist Francine Prose (1999) examined efforts toward critical thinking used in high school English textbooks. In her article, aptly named "I Know Why the Caged Bird Cannot Read," she noted a failure to require close, line-by-line reading and a tendency to ask questions about social or moral implications rather than about the actual content of the novel. Prose referred to one teacher's manual that asked students reading *Huckleberry Finn* to count the ways in which Mark Twain negated the humanity of the slave character, Jim, rather than asking them to compare the number of such incidents with the number in which his humanity was witnessed. Prose also noted the frequency of assignments in which questions asked were only peripherally relevant to the information available to the student. For example, students might be asked questions whose answers they would be unlikely to know, such as a question about the mental health prognosis of the heroine of *The Bell Jar*. Assignments of these types discourage a focus on recognizing relevant, available information and encourage the view that all possible answers (if long enough) are acceptable. College students who have experienced high school assignments of the kind Prose described are likely to feel comfortable with irrelevancies, low levels of abstraction, and assignments that provide insufficient information, and even to believe that they are excellent critical thinkers because of their handling of such matters.

What Is Critical Thinking?

If the critical thinking assignments you did in high school, or even in some college courses, did not actually involve critical thinking, what in the world *is* the critical thinking that this book will ask you to do? One definition, offered by a group that exists to encourage critical thinking as part of education, is as follows: "Critical thinking is the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information. . . . It is based on universal intellectual values that transcend subject matter divisions:

clarity, accuracy, precision, consistency, relevance, sound evidence, good reasons, depth, breadth, and fairness" ("Defining Critical Thinking," 2013).

This sounds like a great deal to ask of any student, so let's look at some of the factors that may seem more doable. Critical thinking is *active*; it's not just a matter of absorbing and reflecting back pieces of information, so it can take time and energy. Critical thinking is *evaluative*; it involves assessing the evidence for claimed facts and the reasoning by which they are related to each other and to conclusions. Critical thinking examines the *relevance* of information to conclusions and rejects conclusions based on facts that may be correct but have nothing to do with the issue.

How Do You Think Critically?

Achievement of critical thinking skills is a lifetime's work. No one succeeds in applying good critical thinking skills to every problem, every day. But we can learn how to do this important job by dealing with two issues.

First, if we want to think critically, we need to recognize some common *fallacies*, or errors of reasoning. We need to be able to see when other people are reasoning fallaciously, but it's even more important to be able to check our own reasoning for fallacies. Many authors have created lists of fallacies to watch out for, and the study of fallacies has become a topic of its own. Fortunately, not all of these fallacies are common in the study of child development, so we can limit the useful fallacy list to a relatively small number.

Second, in order to do a good job of critical thinking, we have to be as sure as possible that we are thinking about valid information. Without trustworthy facts, our application of thinking skills is not worth much. This is why *evaluation* is an important part of critical thinking. Students of child development need to learn some specialized skills for assessment of information, and those skills will be discussed later in this Introduction.

Fallacies to Watch for When Studying Child Development

Analogies and Metaphors

Analogies and metaphors are useful thinking techniques that compare two different things by showing the ways in which they are similar. These techniques are helpful in teaching about development, as many developmental events are difficult to observe directly or occur over long periods of time. The problem with analogies and metaphors is that although they may be used to convey ideas, they cannot in themselves establish an argument or support an inference. One problem is that they fail to note how the two things are different. Analogies can be abused as well as used, and such abuse leads to fallacious conclusions.

Common analogies. Here are some common analogies and metaphors used in the study of development: (1) "stages" or "milestones" of development; (2) the term *attachment* or *bond* to describe an attitude toward another person; (3) brain/cortical/hand/gene "dominance" (use of this metaphor may be one reason why it is so difficult for students to define dominant and recessive genes); (4) "regression" (not the statistical kind); (5) the term "sexual" in the description of psychosexual stages of development. These comparisons may be extremely valuable for teaching purposes, but their downside is the fallacious assumption that phenomena with some things in common will have everything in common.

Easily abused analogies. In the study of development, one common instance of abuse of analogies involves fallacious reasoning from aspects of nonhuman development to aspects of human development. For example, John Bowlby's application of ethological concepts of imprinting in birds to human attachment abused an analogy, and fortunately it was rejected after some consideration by developmental scientists. But this type of critical thinking error is still with us, and not in textbooks alone. For example, an article in the APA *Monitor on Psychology* (Price, 2009) titled "Programmed for Life?" has a subhead stating that "your developmental environment can undercut your memory, give it a boost, or possibly even predict how you'll treat your children," but the reported study deals with factors influencing how much mice lick and groom their pups.

Affirming the Consequent and Other Forms of Transductive Reasoning

If you have not already read about Piaget's work on early cognitive development, you are bound to meet this topic as you study children and adolescents. Piaget's discussion of early childhood cognition included a description of *transductive* reasoning, a form of primitive logic in which a child assumes that when two events share some characteristics, they are likely to share others, including a cause-and-effect relationship that may work in either direction. Piaget's famous example of this was a situation in which his daughter, given a cup of orange-colored chamomile tea, insisted that a green orange she wanted must have become ripe and attained the color that meant she could eat it. Unfortunately, we adults are not entirely immune to transductive reasoning, and when we use it, our reasoning can also involve fallacies.

Affirming the consequent. This fallacy or error in critical thinking involves the practice of assuming that the converse, or reverse order, of a claimed condition is true. For example, let's take the following statement:

If a child has Reactive Attachment Disorder, she has lived in an orphanage or under similar conditions. [This is true, as the list of criteria for the Reactive Attachment Disorder diagnosis includes the experiences that seem to have caused the disorder.]

The converse of the statement is the following:

If a child has lived in an orphanage (or under similar conditions), she has Reactive Attachment Disorder. [This claim is made on a number of Internet sites.]

To assume that this converse statement is true—without requiring other evidence—is to *affirm the consequent.*

Denying the antecedent. This critical thinking error involves the assumption that if a positively stated claim is true, a negative statement (the obverse) can also be assumed to be true, without further evidence. For example, here is a common (although questionable) claim:

If a toddler carries a blanket around, it means he feels insecure without it.

Here is the obverse of the claim:

A toddler does not feel insecure [without a blanket] if he does not carry a blanket around (and therefore, taking the blanket away is a cure for insecurity).

Other Fallacies in Discussions of Child Development

Although fallacies that involve analogies are a real problem for critical thinking about child development, they are not the only fallacies students need to be able to identify. Here is a list of other problems you need to watch out for:

1. The fundamental attribution error: Although this mistake is not often listed as a fallacy, students of all aspects of psychology are warned against the error of assuming without good evidence that a person's behavior is caused entirely by his or her own individual characteristics, rather than being influenced by past or present situational factors that can range from number of brothers and sisters to being in a frightening physical environment. Of course, it is possible that some problems are entirely the result of personal characteristics, but it is a mistake to think this without good evidence. The fundamental attribution error can include the idea that behaviors occur because an individual wants their outcomes, at either a conscious or an unconscious level, even though he or she seems unhappy with the result.

2. The irrelevant conclusion: When the information used to draw a conclusion has nothing to do with the conclusion, fallacious thinking is at work. For example, it may be a mistake to assume that because parents of a delinquent adolescent claim membership in a strict religious organization, their parenting behavior is therefore not a factor in their child's situation.

3. *Post hoc, ergo propter hoc* fallacy: This common error is a matter of assuming that if Event B occurred after Event A, B must have been caused by A, rather than by one or all other earlier events. The post hoc fallacy is important to the study of child development because so many developmental issues involve questions about early causes and possible confusions between the effects of experiences and of biologically based maturational changes.

4. *Argumentum ad hominem*: In this fallacy, weaknesses of an individual or of his or her work are used to evaluate entire systems. For example, a discussion of economics on National Public Radio began with some of the less attractive personal characteristics of the economist John Maynard Keynes, and one discussant expressed surprise that the country was turning to such a person for solution of its economic difficulties. In psychology, Piaget's observations of his own children are sometimes presented as a reason to dismiss his entire theory of cognitive development; J. B. Watson's questionable treatment of "little Albert" and his ill-judged advice about parenting are seen as arguments against behaviorism; Lawrence Kohlberg's suicide is taken to mean that his work on moral development is worthless. In popular discussions, personal experiences may be taken to be supportive evidence for claims—for example, in Internet discussions of adoption, statements by nonadopted persons may be dismissed.

5. Overgeneralization: This fallacy involves assuming without evidence that experiences or characteristics of one group must be very similar to those of another group. For example, adults may think that because they would dislike the experience a baby has during birth, the baby must also dislike it. Or, they may assume that because a toddler cries and is frightened when separated from her mother, a newborn baby will have the same feelings.

6. Single factor theories: There are certainly aspects of development where one single factor determines the outcome—for example, that certain eye colors are produced by specific genes. However, it is likely that most claims that one single factor causes a developmental outcome will prove to be fallacious. Most outcomes of development result from a wide and changing range of causes, so the suggestion that some aspect of development (like mental illness) was caused by one and only one factor should be approached with caution.

This list of fallacies that interfere with critical thinking is an incomplete one, but it provides student readers with names for some basic problems that contribute to the misunderstandings of child development that are a focus of this book.

Claims About Child Development

Everyone has some knowledge about children because everyone has been a child. Most people have also observed other children and have heard adults talking about children. As a result, students arrive in a child development course with a lot of background knowledge, not as the "blank slates" they would be for a course in Russian, introductory physics, or the Victorian novel.

Students entering a child development or developmental psychology course bring more than observed facts with them. All of us have *theories* of child development based on our observations, the connections among these observations, and the ideas we have picked up in school or social settings. For example, almost every person has a way to explain juvenile delinquency— and chooses either genetics or family experiences as the cause. These explanations come from individuals' theories about child development. Very few people can state their theories in words, but the theories are there, and they exert a strong influence on expectations about development.

So far, this sounds like a good arrangement. Students come to study child development, not "from scratch" but with some knowledge and thoughts already in place. How can this not be good? The answer is this: Not all past observations are completely accurate, and not all theories are good descriptions of the rules of development. In other words, people can "know" a great deal that cannot be substantiated by systematic research. As is often the case, the problem is not what students don't know but what they know that isn't true. Most people who study developmental psychology find that they need to examine their own beliefs and assumptions, throw out some of what they've always thought, and make way for information supported by good evidence. If your old assumptions are in conflict with new information, you may not thoroughly understand or remember the new information.

Surprisingly, people who have their own children already do not necessarily have more accurate information than beginning students do. A survey of parents conducted by one of the premier associations for education about early development, Zero to Three, showed that parents performed especially poorly on understanding of social and emotional development (DYG, Inc., 2000). The power of old, inaccurate information is a real problem for everyone who needs to know about child development.

This book consists of a series of essays on common but inaccurate claims and beliefs about childhood growth and development. These essays serve to call students' attention to the assumptions they bring to a child development or developmental psychology course. Careful examination of your own assumptions—the "facts" that everybody knows but that may not be true—is an exercise that can help prepare you to understand some important issues in the study of development. You will find that the examination process is important because of the complexity of the modern view of developmental change. As is frequently noted among developmentalists, developmental psychology isn't rocket science; it's a lot more complicated than that. When

material is complicated, one has to be especially careful to resist falling back on "what everybody knows."

Types of Mistaken Claims

Naturally, not all incorrect claims about child development are of the same type. A range of inaccuracies exists, from completely invalid ideas to incorrect conclusions drawn from correct information.

Some beliefs about development are so far off base that one can call them *myths*—ideas that are so far from what research evidence shows that they are essentially superstitions. To use an example from another topic, most cultures have creation myths, which are old stories that explain the origin of the world. Although the stories are interesting and enjoyable to hear, they do not stand up well to close examination. One story tells of an anthropologist who questioned a person who believed the world rested on the back of a giant turtle. The anthropologist asked, "And what's under that?" The person replied, "Another turtle." The anthropologist repeated the question and received the same reply. After the anthropologist's repeated questioning, the exasperated informant declared, "It's turtles, turtles, turtles, all the way down!" Myths about child development do not stand up to examination any better than the "turtles, turtles, turtles" explanation, but nevertheless these myths are so deeply entrenched in U.S. culture that they are not easily dismissed. For example, the belief that children learn moral values by experiencing punishment for mistakes is generally accepted, but it is probably not correct, nor is the idea that learning right from wrong is a simple matter.

Some erroneous beliefs about child development are *mistakes*, which are based on errors in research design or conclusions, leading to much-publicized statements that are difficult to correct. For example, in the early days of crack cocaine use, statements about the terrible problems of "crack babies" were common, but later work showed that good environments and early intervention corrected many of the difficulties the babies might have had as a result of prenatal drug exposure.

Some erroneous claims are based on a *misunderstanding* of complex issues and are often related to mistakes in the definition of words. Ideas involving the use of the terms *bonding* and *attachment* are often good examples of such beliefs. As an essay in this book shows, people who make claims about bonding and attachment often assume meanings for these terms that are different from their technical use. These claimants also often believe measurement of these behaviors is easy and the discovery of all of the factors involved in emotional development is uncomplicated.

Some erroneous beliefs are related to *missing information*. Strange though it may seem, researchers are still very far from having all of the basic data that will show people how development proceeds. For example, it is common to hear explanations for child behavior couched in the term *brain development*, but in fact there is very little information about normal brain

development or how it relates to behavioral and cognitive change. At the time of this writing, research related to this concept of brain development is being conducted by studying developmental changes in 10,000 typically-developing children as they grow from age 9 or 10 into young adults (Wadman, 2018). Developmental scientists and others have for many years been cautioning that the neuroscience of development is not yet advanced enough to provide good guidelines for understanding or supporting children's maturation (The Santiago Declaration, 2007; Kagan, 2017; Schwartz, Lilienfeld, Meca, & Sauvigné, 2016).

There is also much missing information about genetic factors as they contribute to development. Though we may hear "it's genetic" or "it's in the DNA" as explanations for children's behavior and cognition, we need to remember that there are many questions to answer about the role of genetics in development. For example, a current approach focuses on the ways children both inherit their parents' genetic material but are also influenced by the parents' child-rearing methods that are partially determined by their genetic characteristics—an idea called "genetic nurture" (Koellinger & Harden, 2018).

"Seductive Ideas"

In the late 1990s, a leading developmental psychologist, Jerome Kagan (1998), published a book with the intriguing title *Three Seductive Ideas*. Although Kagan's book is not quite as juicy as its title suggests—these ideas would not be much help if you wanted to seduce someone—*Three Seductive Ideas* addresses some important issues for our consideration of child development claims. Seductive ideas, according to Kagan, are assumptions that are so attractive to people that they quickly give the ideas credence and fail to give them the examination they require. They are ideas that people respond to with an immediate "yes, of course" and can confuse an examination of claims about child development. Kagan referred to one of his seductive ideas as the love of abstraction. *Abstraction* is a necessary tool for forging an understandable conclusion out of many pieces of information, but it can prove dangerous when people abstract excessive simplicity out of complication and are thus unable to tell the difference between two events. Humans care for their offspring, and ducks care for their ducklings: People can abstract from these facts a simplified statement about maternal care. But how important are the details that were lost? Can people make conclusions about human caregiving by studying ducks with their ducklings? In examining claims about child development, people need to notice whether supportive material comes from studies of another species and decide whether a claim is acceptable. Our tendency to pursue abstraction can make this difficult to do.

A second seductive idea discussed by Kagan is one of enormous importance for the study of child development: *infant determinism*, which is the assumption that experiences in the first few years of life are of overwhelming

importance and cannot easily have their impact altered or corrected by later events. It is possible that this idea is true, but it is presently a seductive idea rather than a well-supported principle. Again, examination of claims about development should check for the presence of the assumption of infant determinism and consider that conclusions drawn directly from this assumption may not have a solid basis in fact.

Adults may also find their thinking "seduced" by the concept of *adultomorphism*, a made-up word based on *anthropomorphism* (the idea that animals think and feel just as humans do). *Adultomorphism* is the assumption that infants, children, and adolescents share the motives and abilities of adults. Adults holding this belief feel they are able to understand child development issues on the basis of their own experiences, without examining the facts of child development. At best, adultomorphism confuses students; at worst, of course, it can lead to child abuse by adults who assume that a child is able to obey any adult command and refuses to do so only out of malicious opposition. Professional research reports rarely involve adultomorphic thinking, but claims made by nonprofessional life coaches and parent educators may be based on adultomorphism.

Why Is It All So Complicated?

Intuitively, people expect young children's lives to be explained by simple factors and uncomplicated connections and expect only a bit more complexity for adolescents. (At the same time, adults think their own lives are so full of complications that no one can appreciate them.) This expectation is a mistake, of course. If anything, children's lives are governed by more complex rules than those of adults because the rapid physical and mental changes of childhood are factors in themselves, beyond the experiences and hereditary factors that are more obvious. In this section, we comment on some other issues that contribute to the complexity of child development and can slow students' understanding.

Understanding Basic Facts

As we pointed out earlier in this introduction, critical thinking skills are not much help unless they have valid information to work on. Before you can evaluate statements about child development, you must have some understanding of developmental facts. Those facts may be quite different about one aspect of development than they are about another; for example, development of speech will proceed along different lines from development of moral judgment. This means that we can't just "study development" but must study with care the aspects of development that are most related to the problem we are dealing with. This needs to be done systematically, with the attention to detail and line-by-line reading essential to critical thinking. One useful systematic approach, suggested years ago by Everett Waters

(Waters, Kondo-Ikemura, Posada, & Richters, 1991), but rarely mentioned in a teaching context, involves a set of five questions that can be applied to any developmental topic and that help to organize thinking and to stress "what's important." The helpful organizing questions are these:

1. *What develops?* That is, what aspect of the phenomenon under consideration actually changes with age, and in what way does it change?

2. *What are the rate and pattern of development?* How quickly or slowly does change occur? Is change gradual and continuous, or are there periods of rapid change and other periods with little or no change in this particular phenomenon?

3. *What are the mechanisms of development?* What actually causes these specific developmental changes to occur? Does it depend on genetic characteristics of the individual or species? Does the environment directly cause change? Or is there some interaction between the two, as when the environment guides the direction of developmental change that is caused genetically? Does the environment have an effect only at certain periods in development?

4. *Are there normal individual differences in this aspect of development?* Is it to be expected that there will be variation on this factor among a large group of healthy individuals, or does atypicality indicate that an individual is at risk for developmental problems?

5. *Are there predictable population differences in this aspect of development?* Are there differences between populations (e.g., boys and girls) in the amount of developmental change, its speed or pattern, its variability, or its causes?

If you can answer these questions accurately about some aspect of development—whether it's physical growth or gender identity—the chances are that you understand the facts well enough to go ahead and apply critical thinking methods to a related question.

Values and Political Goals

An important complicating problem in the understanding of child development is that some of our beliefs are guided by *values* and others by *political goals*. As is the case in many areas of life, our thoughts about child development are affected as much by how we want things to be as by what they actually are.

The values connected with child development issues are powerful. They include the status and obligations of men and women, the importance of obedience and independence, and the relative values of the immediate family and the community. The duties and entitlements of boys versus those of girls,

as well as the duties and entitlements assigned to minority versus majority populations, are part of our value system. With respect to infants and sick or injured older children, important values include the importance of quality of life versus life itself. Unfortunately, in the universal situation of limited resources, the needs of children are often compared to the needs of the elderly, and values help people determine which group is given more. Further, beliefs about how life should be—equity as a measure of fairness, for instance—may help to determine expectations about similarities or differences between groups of people (boys and girls, perhaps). An individual's commitment to any of these values helps to determine the questions he or she asks and the answers he or she accepts about aspects of development.

Although values play a strong role in guiding individual thoughts, it is important to remember that groups of people share values that help determine their political goals, which in turn help to determine the group's actions regarding children, such as a vote on school funding. Values also make it likely that the group will emphasize beliefs about children that are congruent with their goals. Political organizations may feel little need to present all relevant information when making a decision affecting children but instead may choose to work with myths, misunderstandings, or partial truths that predispose others to agree with them. The existence of political goals can influence discussion of research evidence, as was seen some years ago in the books *The Bell Curve* (Herrnstein & Murray, 1994) and *The Myth of the First Three Years* (Bruer, 2002). These popular books discussed the effects of genetics versus early childhood experience on children's school performance and contributed to arguments about the appropriateness of funding for early childhood and other school programs.

The study of child development has probably never been a "pure" science. For example, developmentalists may be interested in certain issues because the issues are related to programs to improve children's physical and mental health. In fact, value-based decisions are a major way of deciding what is an improvement and what is not. The book *Science in the Service of Children* (Smuts, 2006) describes how the developmental sciences came out of a combination of ideals, scientific and otherwise. Does this mean that the study of child development is vague and subjective in nature? Is it an immature science or one with inadequate methods (Cahan, 2007)? No, but the role played by values in the study of child development is so strong that one must be careful to evaluate what is really so and what is simply how people think things should be.

Variations on the Developmental Theme

Individual Differences

The complexity that must be faced before one understands child development is only partly a matter of values and politics. The facts about development are complicated. The common term *average child* is confusing

shorthand that means that any group of children will contain individuals who are quite different from each other. People can accurately say they know a child whose measurable characteristics are equivalent to the mathematical average of the measurements of all children in a group, but in fact we can average only numbers, not children. Paradoxically, a group may not include any child whose measured characteristics are exactly the same as the average child, that hypothetical person who has measurements equivalent to the average taken from every child's measurements.

In child development, perhaps even more than in adult life, individual differences are key, and understanding the extent of those differences is vital in understanding how development progresses. The term that describes the extent of individual differences is *variability*. (This word applies to other kinds of difference, too, but those are discussed later.) Without getting too deeply into statistics, there are quantitative measures of variability, such as standard deviation or variance. These statistics are ways of stating the amount of variability in a group, just as the average or mean is a way of stating the number that best describes the whole group.

Information about children often states the average measurement (e.g., IQ) in a group but less frequently gives a measurement of variability. However, knowledge of variability provides greater insight into the nature of a group and helps in making good decisions. Take, for example, a decision about giving resources to two groups of needy babies, if you can give money to one group only. The average weight of both groups is six pounds, which is within the normal range. But what if one group had very low variability in weight, with all of the babies weighing about the same? And what if the other group had very high variability, with half of the babies weighing only three pounds and the other half weighing about nine pounds? When you have this information about variability, it's easy to see that the group with the very small babies needs more help, even though both groups have the same average weight.

Individual differences may be brought about by different events in the environment, by hereditary factors, or by a combination of the two. In the highly variable group of babies described previously, the small babies may have had small parents, they may have been born prematurely, or a combination of factors, such as a small mother receiving poor nutrition during pregnancy, may have affected the birth weights. The description of individual differences identifies only the variation, not why it occurs, although the "why" is also an important issue.

The existence of a great deal of variability and individual differences in children's development is one of the reasons our casual observations cannot give us a very good idea of what children are all about. Especially in today's small families, people have limited opportunities to observe anyone's development except their own. As it happens, a small sample of people chosen out of a large population (all children in the world) may not resemble the large population at all closely. In fact, in choosing a small sample, we may

accidentally come up with a group of people who are dramatically different from others. Our own observations may be helpful in providing us with vivid stories and examples, but they will not necessarily help us avoid myths and other mistakes.

Population Differences and Diversity

The issue of diversity is another aspect of variability. The term *diversity* means variation, really, but today the term is used primarily to refer to the importance of considering ethnic differences. Discussion of diversity often focuses on the consideration of everyone's needs and tolerance and encouragement of ethnic differences, such as those of speech, dress, or religious practice. In terms of the study of child development, however, the concept of diversity should also mean that people base their understanding on information from many different types of human beings, rather than assuming that one group can represent the world's total population. Although it may seem to some students politically incorrect to suggest that developmental events can be different for different ethnic groups, this is the case, and to ignore the fact is to risk unfair and inappropriate treatment of some groups of children. Diversity and its implications involve a form of variability based on population (group) differences, not on individual differences. Such variability may be based on genetic differences between groups or on experiential factors, such as diet or health care, or, in some cases, on a combination of both. Once again, describing variations does not immediately explain them.

Developmental scientists are paying increasing attention to population differences. They point out that the vast majority of child development research has been done on the children of WEIRD groups—people who are characterized as Western, Educated, Industrialized, Rich, and Democratic (Henrich, Heine, & Norenzayan, 2010). It may not be appropriate to try to generalize from data about WEIRD children to conclusions about non-WEIRD children, and it may not be possible to come up with universal statements about development on the basis of WEIRD information alone; for example, new data about fetal growth shows real differences among growth rates in various countries even when pregnant women were living in excellent circumstances (de Vrieze, 2017). Getting information about development from many different groups can help us learn more about the basic nature of developmental change, as well as preventing us from assuming incorrectly that something is wrong with a child who is not following developmental paths typical of WEIRD groups (Lansford et al., 2016).

Age Differences

The concept of variability is a useful way to think about the most-studied aspect of childhood: developmental change. Whether considering physical growth, sexual maturation, cognitive advancement, or emotional change, when talking about development, people are talking about variation among

age groups. Older children as a group are taller than younger children, and younger children as a group are more emotional than older children. We designate a course as a child development, developmental psychology, or developmental science course because its basic focus is on variations that go along with age. Developmental change may be caused by genetic factors, by experience, or by a combination of the two, but it accompanies changes in chronological age. Note that this last sentence does not say development is *caused* by age; age cannot cause anything except perhaps permission to get a driver's license. Factors such as experience and maturation (the result of genetic commands) cause developmental change. Because these factors accompany age changes, it is easy to forget that they are separate from chronological age.

Examining the Evidence: Recognizing That a Belief May Be Mistaken

Most questions about child development involve one of the forms of variability just discussed and may include considerations about why variability occurs and the form it takes. These questions may be answered by references to myths, misunderstandings, or seductive ideas, or the answers may be derived from systematic research. The assumption of this book is that a better understanding of child development comes from systematic investigations of the facts rather than myths or unexamined ways of thinking. But how do we examine beliefs about child development? How can we decide whether a statement about development deserves our confidence or not? Myths and misunderstandings do not come neatly labeled and, where these beliefs are widespread, the situation may be very confusing.

Defining Terms

Of all of the steps necessary to examine a statement about child development, the first is probably the simple matter of defining terms. Many terms used in discussing development lead people to say "I can't define it, but I know it when I see it." Unfortunately, this is not good enough, because vague definitions or guesses make it impossible for people to use words to communicate information. In addition, many words used to describe children's characteristics, such as *aggression*, *autism*, or *independence*, carry their own value messages that may be interpreted differently by different listeners. The meaning assigned to some terms may be influenced by movies or other media presentations—an example is the movie *Rain Man*, which has a near monopoly on most people's definition of autism. Words with strong value and emotional implications, such as *bonding* and *attachment*, are not often used with their technical definitions in general conversation or in media presentations.

Care in using words about child development is essential to communication and has significance for practical decision making. A jury that makes a

decision about *attachment* should know what the word means or their deliberations may not be at all to the point. Children and families can be affected for good or ill by accurate or inaccurate use of words. As stated in one discussion of this issue, "If our careless, underspecified choice of words inadvertently does damage to future generations of children, we cannot turn with innocent outrage to the judge and say, 'But your honor, I didn't realize the word was loaded'" (Elman et al., 1998, p. 391).

One way to examine a statement about child development is to check the definitions of the words used. Do the stated or implied definitions match the way other sources define the terms? Do the authors at least discuss the issue, perhaps saying that they intend to use a term with a slightly different meaning than is common? If there is no discussion, and if the meanings do not seem to jibe with the technical definitions typically used in professional materials, it would be wise to question the reasoning involved. Particular caution should be used when a condition or characteristic is frequently referred to by an abbreviation, such as ADHD (attention deficit hyperactivity disorder) or RAD (reactive attachment disorder). Using these abbreviated forms saves time, but it can also lead both speaker and listener to assign to the condition some qualities that the condition is not usually considered to have. This *criterion creep*, or slow change in definitions, results in conclusions that are not necessarily justified by the evidence.

Developmentally Appropriate Practice

The term *developmentally appropriate practice* refers primarily to the use of procedures that are beneficial to a particular age group of children. For example, caregivers should frequently pick up and carry infants. A 6-year-old, on the other hand, does not need this type of care and would probably be very annoyed if subjected to it. For our purposes in this book, the concept of *developmentally appropriate practice* is a reminder that information collected from one age group may or may not explain anything about the characteristics of other age groups. A belief formed from information about adolescents and generalized to preschoolers, or vice versa, may be legitimate, but caution should be used. One must examine the information carefully and decide, on a case-by-case basis, the appropriateness of the generalization. For example, people often speak of dementia in the elderly as a "second childhood," but in reality the cognitive losses of dementia do not cause the individual to think as a young child does. Such comparisons and confusions may lead to inappropriate conclusions, as when a frustrated and distressed school-age child is regarded as "a big baby."

Where Did the Information Come From?

Definitions and developmental concepts can be clues to mistaken conclusions about child development, but the most significant question relates to the way information was collected and analyzed—the research design.

Systematic investigations of child development can lead to reliable information and permit valid conclusions. What conclusions are permitted depends on the research design, so examination of a claim needs to include examination of the sources of the information. The lengthy, detailed research reports one finds in professional journals are lengthy and detailed for precisely this reason: They allow readers to examine the background of the information that led to a conclusion.

Understanding how a study was carried out is essential for most questions about child development, but in no case is it more important than for studies of interventions, which are defined as any procedure or treatment used to assist or improve development. Interventions for children may include psychotherapy; educational programs, such as specialized reading approaches; dietary improvements, such as the sale of fruit instead of candy in school lunchrooms; or sex education programs, whether abstinence focused or otherwise. Conclusions about the effectiveness of interventions have enormous practical significance, both in terms of the children helped and in terms of the allocation of resources to programs or localities. Understanding the systematic research used to test an intervention is an essential step toward concluding whether the intervention is, or is not, effective. Concern about the evidentiary basis of treatments is of great importance in clinical psychology today, and authors commenting about clinical issues have provided important ways to think about various childhood interventions.

Anecdotes and Testimonials

Statements about child development that are based on personal experience should be taken for exactly what they are—a description of a single experience—and should not be generalized to other children. A story about a specific child is interesting and valuable as a story about an individual. However, it is impossible to determine how typical the child is of children in general—or to judge the uniqueness of the child compared with other children—from reading an anecdote or a testimonial. Unfortunately, readers can be easily distracted by the vivid details of a personal story and assume that there is more meaning in the anecdote than there is in "dry" statistics, but the truth is the opposite (Stanovich, 2003). Stories can be valuable ways for students to imagine some flesh on the bare bones of academic description, but conclusions drawn from them must be examined with care.

Testimonials are a special type of anecdote. A testimonial is a statement given by a person who has received an intervention and feels that he or she has benefited from the treatment or program. (You will notice that testimonials never say the person thought the treatment was a waste of time.) Again, even if one assumes that the testimonial is an accurate description, it is not appropriate to conclude that everyone would have the same response to the treatment. In fact, dozens of other people may not have been helped or even may have been harmed by the intervention. Testimonials should never be

taken as reliable evidence for a statement about child development, and if they are offered, other aspects of the claim should be examined carefully. The ethics codes of some professions, such as clinical social work, prohibit professionals from asking for testimonials.

What if the testimonial is your own? Is your own experience to be weighed more heavily than data gathered from a large number of other people? Are you unique, so it's not surprising that research does not seem to apply to you? Or do your contradictory experiences (if any) invalidate reports of research on other people? These are all difficult questions because there is no doubt that people intuitively feel their own experiences are the most important of all sources of information. Looking at the matter objectively and honestly, however, people need to be aware that, if a testimonial about another individual is untrustworthy, so are one's own personal stories. Like every other individual, you have much in common with the average person's experience, but you also share in the variability of the group and are thus different from the average. Research reports based on participants who are like you speak to some aspects of yourself but do not reflect every detail of individual difference. Unusual individual characteristics or experiences deserve careful study but do not usually mean that information based on a large group can be dismissed as wrong.

Systematic Investigations

Anecdotes and testimonials are based on information collected without any particular plan or design. Acceptable statements about child development need to be supported by investigating ideas systematically, following established rules, and drawing conclusions on the basis of those rules. However, there is more than one kind of systematic investigation into child development, and more than one kind of conclusion that can be drawn. An important step in examining a statement about child development is to examine the type of investigation performed and the appropriateness of the suggested conclusion.

Experimental research and randomized designs. In considering experimental designs, one needs to begin with the definition issue. Although in everyday speech people often use the word *experiment* interchangeably with *research* or *study* or *investigation*, the term *experiment* is a technical term with a specific meaning. In an experiment, a researcher can determine whether participants have one set of experiences or another and thus can compare people who have had one treatment to those who have had a different treatment, but who are similar in all other ways. (*Treatment* in this case could mean an intervention, a learning condition, a book to read, a food to eat, or any other experience.)

The researcher assigns participants *randomly* to one treatment or another. This does not mean that the researcher assigns participants on impulse; rather, random assignment involves a repeatable randomization

procedure, perhaps using a random number list, and assignment to a treatment without consideration of participant characteristics or the whim of the researcher. The assumption is that there will be nothing about a participant that will make him or her more likely to get one treatment or the other, so any differences in outcome are the result of the treatments, not of preexisting characteristics of the participants. Studies of interventions that follow this pattern are sometimes called randomized controlled trials (RCTs).

Randomized designs are considered the gold standard for investigation. Because existing characteristics of participants are randomly distributed across the two groups, any differences in results (e.g., children perform better with one reading program than another) may be said to have been *caused* by the treatment, provided that the statistical differences in results are big enough. If a statement about a child development issue claims that a treatment has caused the outcome, but the design is not randomized, the reader should seriously question the conclusion. A number of the essays later in this book address this issue.

The purpose of randomization is to allow researchers to *isolate* variables and study the effects of each one independently of the others. When only one variable is being considered, participants can be randomized to two groups, each experiencing a particular level of the variable (including its presence or absence). If there are two or more variables at work, though, randomization has to be to more than two groups, each with its own combination of variables and levels. For instance, randomization of children to a group in a low-quality orphanage and a group in high-quality foster care does not isolate the variables of care method and of quality but leaves them confused with each other.

Randomized designs sound like a desirable approach to investigation, and they are—when they can be carried out. But studies of child development cannot always employ randomized designs, for several reasons. For one, some of the treatments or conditions under study are of interest precisely because they are potentially harmful. Ethical considerations prevent intentional exposure of children to harmful situations, so no matter how useful it would be to know about certain outcomes, researchers cannot find out about them in an experimental way. Second, many of the factors researchers would like to study are not under their control, and thus children cannot be randomly assigned to one group or another. For example, researchers would like to know about the effects of gender or ethnicity on a number of developmental outcomes, but boys cannot be transformed into girls or children of one ethnicity changed to another ethnicity. And, of course, the central question about child development relates to change with age, and researchers can only wait for a child's age to change, not control what age a child is.

Even where a randomized design is possible, it may not be very clear what to randomize. For example, a burning issue in schools involves bullying: Is it possible to establish effective antibullying programs? How do we find out whether or not a program is effective? Assigning individuals to treatments does not make much sense because this would mean that different children in

a classroom receive different treatments, but the children affect each other, so researchers cannot know for sure whether one treatment or another was effective. What if researchers assign classrooms randomly to different treatments? These children still meet on the playground or in the neighborhood, and the treatment one group received can indirectly affect the others. What if researchers randomly assigned entire schools to treatments? This would be better in terms of conclusions but would require a large number of schools and children. The simple term *randomized design* does not seem so simple when considering specific applications. Examining these issues is essential as one tries to assess claims about child development.

Why is there such emphasis on control groups—perhaps better termed *comparison groups?* Why not just see how a group of children is doing at the beginning of the school year, make sure they receive an important educational program, and then test them again at the end of the year? This can be a reasonable approach for adults, but it is not acceptable for children, and researchers who take this approach should be questioned about their conclusions. Children continue to develop in all ways even though their experiences are limited. The process of *maturation*, or change with age caused by genetic factors, is always operating, even in severely handicapped children. Children change in the course of a school year, whether they are in a wonderful or a mediocre school, whether they spend their time herding goats or whether they are bedridden for serious medical treatment. The question is not whether children change during a treatment; children do change. The question one should ask is *how much* of the change is caused by the treatment and how much by maturation. The more rapidly change occurs at a particular point in development, the more important it is that a comparison group's progress be charted and compared to the development of a group receiving a treatment. Without such a comparison, it is all too easy to assume that any change was caused by the treatment, and without a comparison, one cannot know whether a treatment actually did harm rather than good.

Nonrandomized designs. When investigating aspects of child development, researchers can easily find themselves dealing with factors that cannot be randomized, or problems where it is not clear how to do the job of randomization. In these cases, researchers turn to *nonrandomized* approaches in which there is much less control over the many factors that can influence an outcome. This is perfectly acceptable—there is little choice in the matter, in fact—but it means that readers must be especially alert in their assessments of conclusions from the investigation.

When a randomized design is used, it is assumed that characteristics of the children are similarly organized in the two groups being compared. These characteristics (called *variables* because they can vary from person to person or over time) are not exactly the same for all participants, but one expects randomization to mean, for instance, that redheads or hockey fans are equally likely to be in either group. The only consistent difference between the groups is initially the *treatment variable*, or the condition they

experience. (This is a variable because it varies from one group to the other.) If the two groups are different on the *outcome variable*, the characteristic measured (e.g., school success), and there were no other consistent differences between the groups that could have caused their outcomes to be different, then one can say that the treatment caused the outcome.

In a nonrandomized design, however, one cannot be sure that the treatments are the only differences between the groups. Therefore, it is not possible to draw a clear conclusion that a treatment caused an outcome. To make this assessment, one needs to decide whether the design was randomized or nonrandomized. If the design was nonrandomized, caution in drawing conclusions is essential. Many of the essays in this book repeat this caution.

One common nonrandomized design is a *quasi-experiment*. This term is misleading, causing some students to assume that a quasi-experiment is a type of experiment. It is not, by definition, because experiments always involve a type of randomization or a similar approach that ensures that treatment variables are not mixed with other variables. Quasi-experiments are studies in which a researcher compares outcomes for people who were nonrandomly assigned to groups. This nonrandomized assignment might mean that people assigned themselves, for instance by seeking out a certain kind of psychotherapy. Or participants may have been placed into a group by another person. For example, a mother might have decided that her shy child would benefit from camp or karate lessons, or a teacher may have wanted all the bullies in her class to be in the program she personally believed in. These are situations where characteristics of the child had an effect on the treatment received.

When a child's characteristics contribute to the choice of treatment, there is no way to know whether the outcome results from the treatment or from something directly related to the children. The two treatment groups are different on more than one variable, but there is little information about anything but the treatment variable. A poorly understood characteristic of each child is accompanying the child's treatment, and the variables cannot be separated from each other. When two variables go together in this way, they are said to be *confounded*, although *confused* and *confusing* might be better words. Confounded variables make it difficult to draw a clear conclusion, as many of the essays in this book attest.

Nonrandomized studies of all kinds, including those to be described in the next section, may be especially useful for research on infants and toddlers. Healthy, typically developing, very young children are difficult for researchers to find in large numbers. Access to the children depends entirely on parents or other caregivers, and ethical considerations require a great deal of care about exposing the little ones to any experience that might conceivably be harmful. One recent approach to research on young children has been to enlist their mothers to collect information on topics from breastfeeding to part-time schooling (Rabesandratana, 2018).

Studies of Age Differences

Nonrandomized studies are used to investigate age differences because, of course, researchers cannot assign children to ages or make them older or younger than they actually are. As children age, they have varied experiences to learn from, different diets or disease exposures to affect their development, and so on. Children of different age groups are different in ways that are associated with their chronological ages but are not necessarily caused by the genetic factors that guided their maturation. This means that comparison of age groups can be confounded with accidental differences between the groups.

Although some complex designs have been brought to bear on the investigation of age differences, two fairly simple types of design are common and need to be understood. One is a *longitudinal* design, in which one group of children is tested or measured repeatedly over a period of time to discover changes that occur with age. When the data are analyzed, each child is compared to him- or herself at different ages, rather than to other children. In this way, individual experiences, such as cultural differences, are ruled out of the discussion, and the focus is on the basic changes over time. This approach is in many ways ideal, but it can take a long time (depending on the period of life being studied) and requires a lot of clerical work to keep track of participants. If families move away or lose interest, the work already done on those children may be lost. Nonetheless, there are ongoing longitudinal studies that have gone on for decades, like a New Zealand study in which the researchers have tried to work out ways to predict the occurrence of bad outcomes like prison or homelessness (Starr, 2018).

A second fairly simple design for studying age differences is the *cross-sectional* approach, which studies groups of children of different ages but tests each child once. The results from each age group are then compared to the other age groups. This seems like a short, sweet, sensible way to do things, but there is a problem: What if there were something unusual about one of the groups? For instance, what if an epidemic during the gestation of one group caused a developmental problem that was not obvious? The development of members of that group could be slowed, causing the researchers to assume that development was slow during a certain age period, then sped up rapidly (this would appear to be the case when looking at the normally developing, slightly older group). If the groups are close together in age, medical problems would probably be the primary source of confusion, but if younger and much older children were compared, social changes such as new methods of teaching reading or reductions in school athletic activity could become confused with age differences.

Correlation: A different nonrandomized approach. Another type of nonrandomized design involves a *correlational study*. In this type of design, there is no comparison of groups or treatments. Instead, each member of a large group of children is examined on two or more measurable characteristics.

For example, a researcher might look at skeletal age (the development of the bones toward their mature form) and at measures of reproductive maturity, such as breast development. For each child tested, two measures would be labeled so that researchers would know which skeletal age measure went with which breast assessment. All of these paired measures would be analyzed by means of a statistical test for correlation, and the results would tell whether one measure predicted the other—that is, do girls with less-mature skeletal development also have less-developed breasts, and do those with more advanced development in one area also show advancement in the other area? If the numbers are related in the way just described, skeletal age and breast development would be said to be positively correlated.

Correlational studies can be very informative and good guides to further work on a topic. However, conclusions drawn from correlations must be carefully stated. Correlational studies are not good enough to support the claim that one factor *causes* the other. Both may be caused by one or many other variables. Unfortunately, writers of headlines and speakers of television sound bites regularly ignore this fact and confidently declare correlations to be evidence of causality. Many studies of child development use a correlational approach, especially if they are dealing with an important issue where variables cannot easily be controlled, such as education, delinquent behavior, or adolescent sexual activity. Caution is needed when claims are made about causality based on the outcomes of correlational studies.

Sources of Information: Safe or Sorry?

So far, our discussion of ways to examine child development claims and beliefs has focused on assumptions and ways of investigating issues. Consideration of these points is indeed the best way to examine claims and reject myths or mistakes. Some claims are perfectly adequate in these ways but nevertheless should be rejected or given limited acceptance. These claims fail to take into account other existing evidence, either because the author missed its existence or failed to understand it completely. (Isn't there enough trouble for students without this? Yes, published authors can and do make mistakes.) Unfortunately, some authors practice cherry-picking and include only material that supports their own conclusion; this is an unethical practice and not likely to be found in work published in professional journals, but it has been known to occur.

How can you find further evidence about a claim or belief about child development? Often students become frustrated by electronic searches and cannot figure out a suitable keyword. It may be easier and more effective to start with the publication in which the claim was made. Whether reading a book, a professional publication, or a popular magazine, you will often find a bibliography or reading list at the end of the article or book that provides a good starting place for your search—and in many cases it will be all you need. Reading the listed materials provides an idea of whether the author of the

original publication was correct in citing those sources as supporting his or her conclusion. Don't forget that each listed reference is also likely to have its own bibliography, and if you follow up on those lists you will soon have a great deal of information to examine.

Textbooks also are an important source. Although textbooks may not have much to say on a particular topic, a textbook's bibliography provides relevant references. Follow these leads for further information.

Two outstanding professional journals provide excellent research reports on child development issues: *Child Development* and *Developmental Psychology*. Unfortunately, the growth of child development studies and the shortage of journal space have made some articles in these publications so concise and complex that they can be quite difficult for beginning students to follow. Even so, if a given article is overwhelming, reading the abstract, introduction, and discussion sections can be very informative.

Parenting magazines and similar popular publications can provide articles with useful overviews, but generally these articles do not provide references to background material, making it difficult to follow up on the evidence or rationale for claims. If you want to follow up on an unusual topic in such a magazine, searching for other work by the same author may provide helpful background. Magazine materials intended for life coaches or parent educators should be considered with caution; they may be excellent, or they may simply repeat common myths and mistakes. Internet sources on child development range from brilliant to dangerously deceptive. A Google search can be a wonderful way to find statements of common beliefs that may be myths or mistakes. A keyword search using *child discipline* can bring up thousands of websites for advocacy organizations, support groups, and concerned individuals, providing a picture of popular positions on this topic. Such a search shows whether a mistaken claim is just an unusual error or whether it is part of a popular belief system. Inspection of these websites reveals whether proponents of a position refer to serious systematic evidence for their stance or whether they operate at the level of anecdotes or testimonials. Inspection can also reveal whether the site is run by a commercial organization with a primary interest in sales of products and services rather than in the sharing of information.

In some cases, an Internet search can show research evidence itself, but this depends on whether authors have posted published material on websites. Many professional journals place an embargo on publications for some months after they are issued, and of course many authors do not choose to put material on the Internet when it is available in print. But searching the Internet for specific research material is worthwhile. Students should keep in mind that a publication that appears only online may not be as well managed or edited as one that has a print version, although some online publications are excellent. When an Internet search yields references to journal articles that must be paid for, students should be sure to check their own college or university library to see whether the publication is available there in print or electronic form.

Some excellent websites specialize in guiding readers to reliable child development material. One of these, https://ase.tufts.edu/cfw/, has existed for some years and provides links to other websites that provide good information about children and families. Links on this site are presented by topic and by age group, so it is easy to use. The Society for Research in Child Development (SRCD), the organization that publishes *Child Development*, has an informative website that includes material about children of all ages. For information about the infant and preschool periods, a very helpful website is that of the organization Zero to Three. Questions about psychological treatments for children can be answered at the website effectivechildtherapy.org.

The study of child development has an important characteristic that makes it different from, for instance, the study of psychological testing. Child development studies involve a *multidisciplinary* approach. Children develop in an environment shaped by family, school, community, national, and world events, all of which can affect developmental change. Information relevant to child development can come from psychology, social work, nursing, pediatrics, public health, epidemiology, psychiatry, occupational therapy, physical therapy, education, and many other sources. Students who are searching for supporting and challenging information related to a claim should remember this and look to more than one discipline for evidence.

The Work Ahead

The main part of this book involves a series of essays on child development claims that may be myths, mistakes, or misunderstandings. These essays are marked according to age group and topic, so they can be used in conjunction with textbooks that are organized either chronologically or topically. The essays discuss the claims and consider them with respect to appropriate issues of research design, internal logic, and supporting or opposing evidence from other sources. Because the goal of this book is to encourage critical thinking and thorough consideration of claims about child development, each essay is followed by a short reading list and a set of questions for active student involvement. Referring to this introductory section may be helpful if you have trouble answering a question, especially if you forget the names or descriptions of critical thinking problems.

The ability to analyze and evaluate claims comes only with practice. No amount of reading or instruction can provide you with assessment skills that must be honed through active involvement with relevant questions and answers. Such active involvement can be fun but can also be a painful struggle at times when your favored mantra is "just tell me the answer." Unsupported claims do just tell the answer, which is why they are so attractive to readers. But unsupported claims, accepted when they should not be, can cause problems for children, families, communities, and schools if no one attempts to evaluate them. In the long run, adults who are able to evaluate

child development claims can provide the best environment for children and the best future for all of us.

What Difference Does It Make If You Can or Can't Think Critically About Child Development?

What will happen when you master ways of assessing claims about child development? Will you be able to win arguments at holiday dinners and in bars? Regrettably, no such short-term benefit can be predicted. It's more likely that your dissection of a mistaken claim will get the response "Well, I believe it, anyway." Just like children, adults are more likely to depend on the statements of sources they trust than to try to examine evidence. Where values are concerned (as is the case with child development), this tendency is even stronger (Bloom & Weisberg, 2007). But even though you will still lose arguments, the task of evaluating evidence is well worth doing, for yourself and for others, and once you have mastered these skills you will know that you have learned something important.

If you always think uncritically about child development, you may well make a great many mistakes in real life as well as in your coursework. You may be persuaded to buy or use methods that claim research support but do not actually have any. As a teacher or school board member, you might decide to use tests or teaching methods that are not what they claimed to be. As a parent, you might seek lessons or treatments for your children that turn out to be potentially harmful as well as ineffective. As a mental health professional working with children, you might accept practices as effective when in fact they are not. There is no Food and Drug Administration to protect adults and children from mistakes made through uncritical thinking about child development! Critical thinking and correct conclusions about children's lives are up to you, and the purpose of this book is to help you protect yourself and others against mistakes that can have serious outcomes.

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