2. Scientific and Theoretic Perspectives on Human Development

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To raise new questions, new possibilities, to regard old questions from a new angle, requires creative imagination and marks real advances in science.

–Albert Einstein

The Scientific Approach to Human Development

A Research Question Worth Pursuing?

It appears that the Internet and other computer-based information sources may replace printed media such as newspapers and magazines as the primary outlets for news and information. Perhaps these will replace books like this one as well (or at least provide an alternative way to access them). Encyclopedias, such as the *Encyclopedia Britannica* (or *Britannica* for short) are now available in CD ROM format, and dictionaries can be found online (e.g., dictionary.com). Obviously, the newer media will impact education and therefore children's learning and development – they already have, and will do so at an even greater rate in the future.

What is interesting is the ways in which technology makes information not only more accessible but cheaper as well. One example is *Wikipedia*, the free online encyclopedia. (A "wiki" is a web site that allows people to add to or edit the content collaboratively).

A recent study in the journal *Nature* (Giles, 2005) compared selected scientific articles in *Britannica* and *Wikipedia* by sending these to anonymous but expert peer reviewers to check for errors in accuracy. Reviews were "blind" in that the experts were not told the source of the material they received. Only 8 major errors were found, four in Britannica and four in *Wikipedia*. Less serious errors concerning facts, omissions, or misleading statements were also found: 162 for *Wikipedia* as compared with 123 for *Britannica*.

Perhaps the two surprises were (1) that *both* sources contained unacceptable errors, and (2) that *Wikipedia* was a surprisingly close competitor to *Britannica* in terms of overall accuracy and error rate. This is surprising because *Britannica* employs paid experts to contribute their specialized knowledge whereas contributors to *Wikipedia* are not paid, and in fact their credentials as experts are not verified, nor are their contributions edited by proofreaders.

The study was limited in scope and far from definitive. As the editors of *Britannica* noted, *Wikipedia* could use some serious editing for style, structure, and readability[3]. But more generally, this study raises interesting questions regarding the effectiveness of free online educational material versus professionally published educational resources. Using this as a starting point, it might be asked how one might plan and conduct a broad research program to test the relative effectiveness of each in a classroom setting. This topic will be used as an example in the subsequent discussion.

How Science Progresses

In the previous chapter developmental science was defined as the scientific study of human development, or the ways in which people change or remain constant throughout the lifespan. By including the word "science" in this definition, students should be assured that developmental science, like biology, geology, psychology, or physics, is scientific in the sense that its practitioners deal with observable events (i.e., is ***empirical***), formulate and test ***hypotheses*** (testable assertions) about the relationships between events (e.g., motivating factors and behavior), and formulate ***theories*** that provide a comprehensive framework for understanding developmental phenomena. Hypotheses and theories can, at least in principle, be evaluated empirically – by using the ***scientific method***. This method pertains to the objective way in which scientists pursue knowledge through research. The scientific process proceeds through a number of steps, which can include all of the following – though steps 2 through 5 are the most essential:

1. **Formulate research questions.**

   Example: In the information age, are traditional encyclopedias really useful for children's learning, or do modern computer search engines render them obsolete?

2. **Formulate hypotheses** to address such general questions. Hypotheses are specific testable assertions.

   Example: computers may be faster, but can also lead one to misleading or incorrect information; therefore, hypothesize that encyclopedia reading will produce more *accurate* results than using computer search engines.

3. **Create a research design** to test the hypotheses.

   Example: Construct an experiment in which children are randomly assigned to conditions in which one group uses a computer search engine to research an assignment and the other uses a standard encyclopedia. Choose a limited topic, such as the war in North America which lasted from 1754 to 1763 (known in the U. S. as the French and Indian War; in the former French provinces of Canada [Ontario and Quebec] as the War of Conquest; and in Britain, France, and the rest of Canada as the Seven Year's War[1]).

4. **Gather and analyze data**, using appropriate measurement and statistical techniques for analysis.

   Example: Use an objective, multiple-choice test. Example question: In what Canadian city did the Battle of the Plains of Abraham take place? (a) Toronto, (b) Halifax, (c) Quebec City, (d) Montreal. Examine the results (average scores) between the two groups.

5. **Evaluate the results and make a decision.**

   Example: State which method produces more accurate results, and whether or not results were in line with the hypothesis, based on sound statistical analysis of the observed mean difference in scores between the two groups.

6. **Disseminate the results.**

   Example: Publish them in a professional journal.

7. **Replicate the results** under various conditions.

   Examples: Repeat the experiment with students at different grade levels; with students in remedial classes. (Replication takes time! Many researchers and studies are ordinarily involved before results become well-accepted.)

8. **Confirm, modify, or discard a theory** on the basis of many related research studies.

   Example: Perhaps this particular experiment partially confirms a broad theory concerning the way in which children learn.

The scientific method leads to results that are ***publicly verifiable*** (or at least verifiable by those trained in scientific procedures). Scientific conclusions *do not involve conjecture, anecdote, or supposition* – these may all be factors leading to the formulation of hypotheses and theories, but they are *never* factors in their acceptance.

The "Two Faces" of Developmental Science

Developmental science (like its ancestral field of psychology) does differ from most other scientific disciplines in this respect: it is both a social science (think of the areas of personality and social development) and a biological science (think of neuropsychology and brain development, or psychopharmacology, and the effects of neurotransmitters on behavior). Some people may think that this dualistic aspect gives the field a kind of a “split personality” – but remember – both of these “faces” of developmental science in reality are scientific, in the sense just discussed, despite their differences in emphasis: developmental science overlaps both the social and biological domains.

Students with a basic social science background should also be familiar with research methods used by developmental scientists. If the reader is not comfortable with concepts in research design like “experimental versus observational studies,” “control and experimental groups,” “correlational research,” and “case study research,” then the following section on research designs should be reviewed before proceeding with the rest of the chapter.

Qualitative and Quantitative Research

The kinds of research questions asked by developmental scientists can be very broad, as when attempting to learn something new – say the attachment patterns (bonding of mother and chick) in a species of bird that has not been widely studied. A study such as this one might employ several field researchers whose job it is to observe and photograph the birds in their native habitat and take extensive notes on their behavior while nesting. Although the researchers may have some very general questions in mind – for instance, that in this species the mothers will spend lots of time feeding their hatchlings by regurgitating small insects or worms as do many other species – there are really no formal hypotheses being tested. Rather, the purpose is simply to discover something about the ways in which the mother bird and her chicks interact in their native environment.

Other research questions have a very narrow focus, as in the case of testing a new drug treatment for attention deficit hyperactive disorder (ADHD) in teenagers. In this research a very specific hypothesis is tested, namely that the new drug will work more efficiently in reducing hyperactivity than existing ones, such as Ritalin or other currently used medications. It is further assumed that the outcome is measurable via a memory test for learning in the presence of environmental noise. Specifically, it is predicted that those taking the newer drug will do better on the average on this test than both a control group taking no drug and a second group taking an existing drug.

The drug study probably strikes the reader as more quantitative because something is being precisely measured and tightly controlled. Though not everyone agrees that a distinction should be made between qualitative and quantitative research, some of the criteria offered to set them apart are given in Table 2.1. In that table ***ecological validity*** pertains to the ability to generalize the results of the study beyond the controlled conditions of a laboratory to the natural environment. ***Internal validity*** means that the results are essentially valid under the experimental conditions, but do not *necessarily* generalize beyond the lab.

From Table 2.1 it can be seen that some research studies do not fall clearly into either the qualitative side or the quantitative side of the table. For example, suppose researchers want to observe the behavior of young chimpanzees in their natural environment and compare their incidences of observed violence with their presumably more peaceful bonobo cousins, in which counts of aggressive and violent behavior are made, and the results are subjected to a statistical test. The study is indeed observational and naturalistic, but also quantitative and statistical. Thus the qualitative-quantitative differences can be thought of as lying on a continuum rather than as an either-or typology, though arguably closer to the qualitative than the quantitative side of the table for the above stated reasons. It must be acknowledged that the distinction is somewhat arbitrary. However, in the following discussion of research designs, true experiments as well as the three designs used to assess developmental changes will be considered “quantitative” (because all involve at least some kinds of controls as well as statistical tests), whereas other kinds of correlational research, naturalistic observation, case studies, and survey research will be considered “qualitative” – largely because of tradition, even if somewhat arbitrary.

Table 2.1
Distinctions Sometimes Made Between Qualitative and Quantitative Research Methods

Qualitative is *more often*….	Quantitative is *more often* …
Exploratory (to discover something new; induction)	Confirmatory (to verify existing hypotheses; deduction)
Observational	Experimental
Conducted in the natural environment (ecologically valid)	Conducted in a laboratory or other artificial or structured setting (internally valid)
Unobtrusive (no changes in the entities studied are attributable to the research)	Obtrusive (the entities studied are changed as a result of the research)
Lacking in statistical tests	Based on statistical tests

Research Designs for Developmental Science

The Concept of Correlation

In general terms, ***correlation*** refers to the degree of association between two variables. In other words, the occurrence of one tends to be accompanied by the occurrence of the other. As an example, sociologists look at measures of social class in terms of ***socioeconomic status (SES)***, which is partly a matter of affluence and wealth, but also partially depends on occupational status, educational attainment, area of residence, and other considerations. Some social scientists have found correlations between intelligence and SES. Could there be a causal connection between these two variables – for example, does being more intelligent lead to higher SES?

This question is not as easy to answer as it might seem at first glance. Beginning students have all no doubt learned the mantra that *correlation does not imply causation* – just because two variables are related does not necessarily imply that one must be the cause the other. Often, as in the present example, there are too many additional variables that can influence or moderate the association between the two variables of interest. Yes, it could be argued that more intelligent people are better suited for higher education and therefore (in most cases) they will earn more income than those with less education. But is it not also true that many otherwise intelligent people who live in conditions of poverty lack the opportunity for such upward mobility? Thus, being intelligent by itself may not be enough to bring about a better life.

But wait, should it be assumed that intelligence itself is a fixed, immutable characteristic of each person? As will be seen (Chapter 6) opinions about the nature of intelligence differ widely among psychologists. For these and other reasons, generalized assertions about the relationship between intelligence and SES are bound to be overly simplistic and misleading – there are far too many additional factors to take into account.

Statistically there are many methods for assessing correlation but the most common of these – what is usually referred to as a ***correlation coefficient*** – is most likely to be the ***Pearson product-moment correlation***. In computing this coefficient, scores are paired for a sample of persons on two variables of interest – say scores on a standardized achievement test taking in high school and college grade-point average (GPA). The correlation coefficient is a numerical index that specifies the degree of relationship. If the relationship is perfect – as when there is a one-to-one correspondence between the two sets of measure (highest GPAs matching highest achievement test scores, and so on down to the lowest), then the coefficient achieves its maximum value of +1.0. This implies not only that the relative rankings of the pairs of scores are the same, but also that if the pairs of scores are plotted on an ***X-Y scatterplot*** (Fig. 2.1a), all pairs of points fall in a straight line (the assumption of ***linearity*** is required in computing correlation coefficients). A correlation coefficient of 0.0 obtains when there is no clear linear relationship between the two sets of scores, or in other words, the scatterplot shows a random appearing pattern (Fig. 2.1b).

Most correlations are not perfect. A correlation of +.80 is relatively large (much greater than 0.0, but not quite 1.0). This situation is illustrated in Fig. 2.1c, in which the point scatter resembles an upward slanting football.

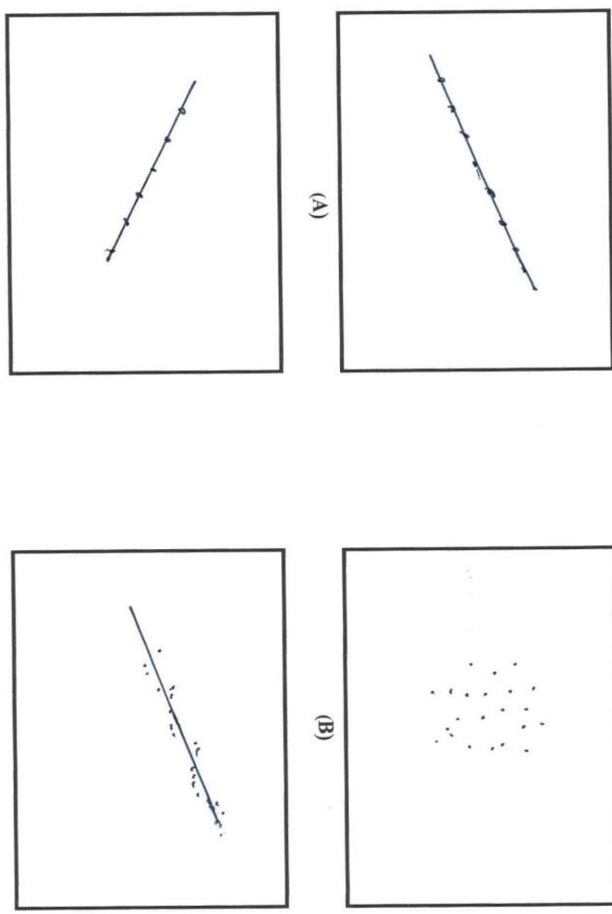


Figure 2.1. Scatterplots Illustrating Different Values of Correlation Coefficients
A: Perfect positive correlation (+1.0)
B: Zero correlation (0.0)
C: Perfect negative correlation (-1.0)
D: Large but not perfect positive correlation (+0.80)

Negative correlations are also sometimes found. A perfect negative correlation is -1.0. This value is found when every point falls on a straight line, but as scores on one variable increase (say hours of intense exercise) there is a corresponding decrease in the other (weight loss, for example). Again, perfect negative correlations are uncommon; a large but negative correlation is illustrated in Fig. 2.1d.

To assess the ***predictable variation*** in one variable that is due to another statisticians use a squared correlation. For example, squaring a correlation of +.60 results in a value of +.36, and a correlation of -.701 when squared is about +.50. And of course +1.0 and -1.0 squared are both equal to +1.0. A detailed, statistical explanation of the concept of predictable variation is beyond the scope of the present discussion, but it should be noted that squared correlations are sometimes considered better measures of the size or magnitude of relationships than simple unsquared correlations – though unlike the raw correlation coefficient they tell nothing of the direction of the relationship – whether it is positive or negative (because squared values are always positive).

There are many useful research designs that are based on correlational methods. The most basic of these is the simple case in which measurements are taken over a group of people on two or more variables of interest and the correlations are reported. These are usually of limited value unless certain assumptions can be made about the causal nature of these relationships – which is not in itself a function of the correlation coefficients. But more sophisticated correlational designs also exist, as considered next.

Research Designs for Assessing Developmental Differences

There are certain kinds of research designs that apply especially to research in human development that merit review and/or introduction here; many of these tend to be correlational (as opposed to experimental) designs that are conducted over time, or in comparing groups at different stages of development. Some of these designs are used to study development as an unfolding process within individuals on variables of interest to human development over a period of weeks, months, or even years. Although these designs are correlational, certain kinds of controls can nonetheless be introduced; but caution must still be exercised in drawing causal conclusions from them. Correlational designs used to study development include:

Longitudinal research designs. In longitudinal research designs, repeated measures on one or more attributes (e.g., self-concept and school achievement) are taken over an extended period of time. Measures are compared, and trends in growth are noted. The emphasis is on charting both the stability and change in the outcome measures over the time points selected (see Fig. 2.2a).

In the New York longitudinal study of temperament (discussed more fully in Chapter 14), children were observed from infancy to adulthood (Thomas & Chess, 1977). The purpose of this study was to identify different aspects of temperament (e.g., is a child nervous and irritable or cheerful) that appear early in infancy, then to discover how such temperamental indicators predict later adjustment, and how parenting practices and personalities of parents interact with temperament to influence the child's development.

Cross-sectional research designs. Another type of research that is sometimes used in the study of development is called cross-sectional research. In a cross-sectional research design, the same measures are taken on intact groups of people (e.g., children in different grades) at the same, given time (e.g., the spring semester of the current year). (See Fig. 2.2b.) Longitudinal designs are considered superior to cross-sectional designs because with the latter, differences between groups may not be due only to psychological growth, they may also be due to some particular circumstances – or unique historical event – that happened somewhere between grades (Campbell & Fiske, 1959).

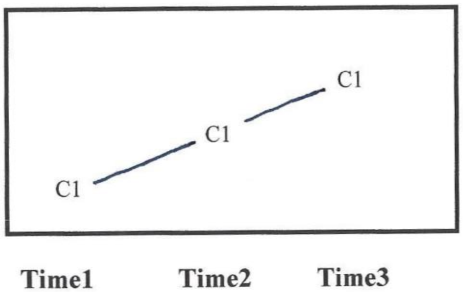
One may wonder, for instance, to what extend the attack on the World Trade Center in 2001 disrupted young children's learning that year, but especially those who were closest to the event, or who lost family members or friends and acquaintances because of that attack.

Cross-sequential research designs. The ideal design for studying change over time in developmental science combines the two previously discussed approaches: This design calls for following several different ***cohorts*** (groups that differ by age) across a given time span – a number of years, for example. This hybrid is called cross-sequential research (Schaie, 1996). Keep in mind that this type of research is particularly difficult because it tracks many different groups for possibly long periods of time – it can get to be very expensive! But it also aids the researcher in "teasing out" differences due to actual growth from those that are due to presumed (or perhaps unknown) intervening circumstances, or to cohort differences (See Fig. 2.2c.)

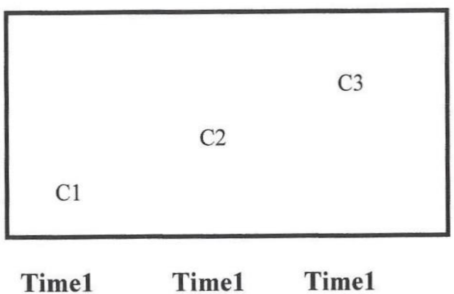
Results from a well-known cross-sequential study used to assess mental abilities across the lifespan (Schaie's Seattle Study) are discussed in Chapter 6. There it will be seen how cross-sectional studies misled researchers into falsely believing that there is a continuing gradual decline in mental functioning from late adolescence onward.

Other Useful Research Designs for Developmental Scientists. In addition to methods geared primarily for the study of change, other kinds of research designs are also useful to developmental psychologists. These include experimental studies, case studies, and observational studies.

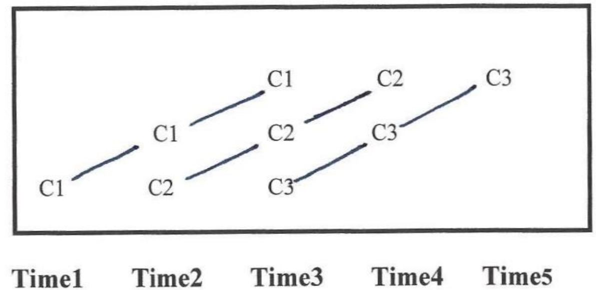
- **Experimental research designs** are at the heart of any science, including developmental science, and at the heart of experimental research are ***controls***. These include the use of ***control groups***, ***random assignment*** to experimental groups, and keeping ***extraneous conditions constant and equal*** (e.g., time of day; distractions from noise) in all groups. Though not uncommon, experiments are somewhat less commonly used in developmental science than in a field such as, say, social psychology, because of the obvious ethical concerns as well as expense considerations. For example, if a researcher believes that corporal punishment is less effective than other means of



(A) Longitudinal



(B) Cross-sectional



(C) Cross-sequential

Figure 2.2. Some Research Designs for Developmental Psychology.
Cs indicate cohorts. Height of Cs indicate average score level. Cs connected with lines indicate continuity of a given cohort over time.

A: Longitudinal Design: Average score for Cohort 1 (C1) at three different times.

B: Cross-sectional Design: Average scores for three different cohorts (C1, C2, C3) at the same time, but different age levels.

C: Cross-sequential Design: Average scores for three different cohorts over three times each, showing increases with age.

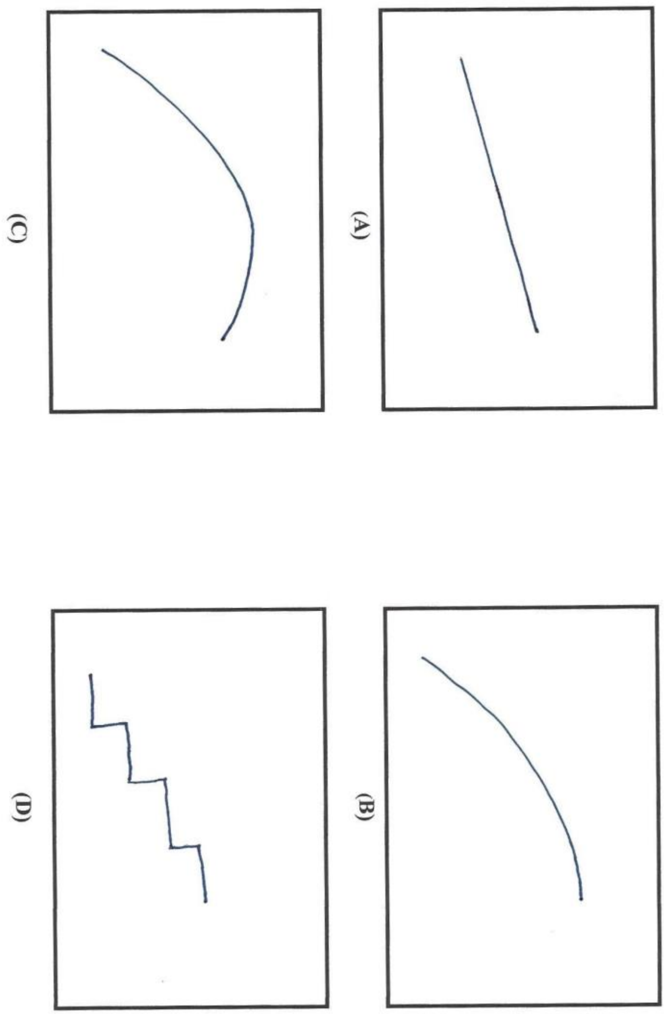


Figure 2.3. Hypothetical Pathways of Development Over Time.
A: Gradual linear growth.
B: Curvilinear but continued growth.
C: Nonlinear – growth in initial phases followed by later decline.
D: Step function, indicating development in discrete stages.

parental control, it is hardly feasible for that researcher to randomly assign children to one group in which parents are told to spank their children and another in which other, non-physical forms of discipline are utilized, then to wait and see the long-term effects of these different approaches. (Parents already have their own ideas about disciplining their children.) There are indeed opportunities for meaningful experiments with children, but not usually involving the long-term effects of different kinds of parenting or teaching practices. Instead, researchers are often left with correlational or observational or retrospective case studies as their chief options.

An example of an experimental design was given earlier which illustrated the steps in the scientific method in assessing the effects on learning of search engines versus traditional encyclopedias.

- **Case studies and observational studies** both involve the intensive study of individuals. Case studies are usually based on clinical interviews, medical and psychosocial histories, or other kinds of data pertinent to the psychological development of a particular person. When case studies are constructed from memories (as perhaps from a patient in psychoanalysis) they are known as ***retrospective studies***. ***Observational studies*** involve observations of people (or in some cases, animals) in their natural environments. Case studies and observational studies have both advantages and disadvantages.

  Case studies can include massive amounts of data gathered on a single individual, whereas observational studies are especially useful for studying social interactions between two or more individuals. But both lack the kinds of controls that allow experimental researchers to test hypotheses and make causal attributions.

  Many important theories of development originated not from large-scale studies of many children or adults over time, or from laboratory experiments, but rather from a limited number of observations on a small number of people (case and/or observational studies). Many notable examples can be found, including the theoretical positions of Sigmund Freud and Jean Piaget. The ethologists Konrad Lorenz and Niko Tinbergen formulated their ideas about critical periods of behavior – limited periods in the life cycle in which certain types of learning are possible – based on observations of animals and birds in their natural environments. Many very important ideas and principles in human development began with observations on just a handful of people (or even of animals). But single case studies are really just the beginning point of scientific theory building. What is important from a scientific standpoint is that these observations are replicable, and that they can be subjected to more rigorous research designs. Yet no amount of statistical sophistication or scientific expertise can replace the kinds of critical discoveries that developmental researchers have made based essentially on observation of individuals and a keen sense of intuition on the part of the observer.

- **Survey research**, in the form of questionnaires or interviews, can be used to collect large amounts of data from many individuals. For example, parents can report on child-rearing practices (e.g., what forms of discipline they use with their children), teachers can describe the methods they use in their classes (e.g., group and individual exercises), and children of different ages can answer questions about their study habits (e.g., when they do homework). Surveys can also capture important status or ***demographic data*** to determine socioeconomic status, educational background, ethnic identification, and so forth. A problem with surveys is that they are ***self-report measures***, which opens the possibility that people may report inaccuracies or even lie about themselves.

The Importance of Theory in Human Development

The Nature of Scientific Theories

A ***scientific theory*** is a framework for understanding natural phenomenon, including human development. A theory consists of a series of statements linking facts, observations, and propositions into a cohesive whole. For example, Piaget's theory posits (among other things) that development of cognition in children proceeds in a stage-like fashion. He describes four major periods as well as some minor stages within each of these. These periods and stages are thought to unfold in an invariant sequence (stage 3 never comes before stage 2, for example), and universal (applies to children in all cultures).

Theories vary in terms of their structural formality. Truly formal theories are rare in science – think of Einstein's theory of relativity as an example, which was formalized in Hans and Maria Reichenbach's (1969) *Axiomatization of the Theory of Relativity*. According to Patricia Miller (2016, p. 3), "An ideal, formal *scientific theory* is a set of interconnected statements – definitions, axioms, postulates, hypothetical constructs, and so on . . . The function of this set of interconnected statements is to describe unobservable structures, mechanisms, or processes and to relate them to each other and to observable events." In other words, the most formal of theories is stated something like the proof of a mathematical theorem – only with many more statements! Of importance here is the fact that some terms of the theory – in psychology these are called ***hypothetical constructs*** – are not directly observable, yet they can still lead to prediction of outcome measures which are observable.

In psychology, "general intelligence" (discussed in Chapter 6) is such a hypothetical construct. General intelligence, or *g* as the British psychologist Charles Spearman termed it, can be measured only indirectly, via intelligence tests. It cannot be directly observed, and it really isn't exactly a "thing," but rather a kind of ability. Psychologists still disagree in their understanding of the nature of intelligence. Nonetheless, scores on intelligence tests can be used to predict other kinds of outcomes.

Many theories have been advanced in developmental science, as will be seen in subsequent chapters. These vary in the degree to which they are formalized.

The Value of Theories

What exists today is not a grand, formal theory of development, but rather, a number of theoretical positions or ***perspectives*** (a perspective is a theory, a model, or sometimes more simply a way of looking at things) that give us meaning (in terms of psychological understanding) and direction (or ideas about where to go with further research). Developmental theories help us to:

- Gain insight into developmental phenomena by providing a “big picture” of those phenomena by organizing findings within a domain of study.

- Describe, explain and predict behavior.

- Suggest ideas (hypotheses) for further research studies.

To encapsulate all of this, theories help us to “get a grasp” on some big ideas in developmental science about how we grow and develop; they lead to new predictions and generate research. Accordingly, new findings will suggest ways in which a theory can be modified, for good theories are never stagnant; they are constantly being revised to accommodate new findings. Put differently, a theory that does not generate research is likely to be trivial or uninteresting.

Some Basic Issues in Developmental Theory and Research

Willis Overton (2006) noted that psychology and developmental science have historically been held captive by many fundamental but contradictory positions. Among the dichotomies of seemingly opposite positions (or ***antimonies*)** he mentions are: nature versus nurture, continuity versus discontinuity of development, and mind versus body. The divisive error that developmental scientists too often make is to stress one or the other sides of the antimony, as though only one would ultimately prevail. Some of the traditional controversies in developmental science are discussed in this section and in the next section on philosophical positions on human nature.

The Influences of Nature and Nurture on Development

This is a very old and basic issue in psychology and developmental science. To what extent are we the product of our genetic inheritance and biology? How much are we shaped by life's experiences? Although developmental scientists agree that both are important contributors, some theories place more emphasis on one rather than the other. And at different times in our history, one explanation has been favored over another as the primary determinant of behavior.

Freud's psychoanalytic theory assumed that mental disorders can be traced to repressed anxieties from childhood, and later attachment theorists like Bowlby and Ainsworth placed great importance on the secure bonding of mother and child for later psychological health. By the middle of the twentieth century, many and perhaps most clinical psychologists assumed that the majority of mental disorders were rooted in childhood trauma or dysfunctional parental practice. Today, schizophrenia, manic depressive disorder, attention deficit hyperactivity disorder (ADHD), and a host of other candidates are often viewed as disorders of the brain and nervous system. Imbalances of hormones and ***neurotransmitters*** (substances in the brain that facilitate or inhibit transmission of nerve impulses) now rightly or wrongly tend to receive the lion's share of the blame rather than unsatisfactory parenting. In many cases, the evidence does suggest that genetic components accompany, and perhaps cause, some psychological disorders. Hence, medical interventions are often prescribed in the form of psychotropic drugs. But increasingly, these are being administered to "problem children" at younger and younger ages. A question that must be asked, then, is whether the "nature/nurture" pendulum now swung too far in the biological/genetic direction. Is it true that today we now expect "a pill for every ill"? How is it that one member of a set of identical twins experiences a schizophrenic episode in her youth whereas her twin does not?

Also, discovering that certain psychological disorders have some basis in biology does not obviate the need for psychotherapy; there will ordinarily be problems of adjustment associated with any disorder that require psychotherapy to accompany medical treatment.

Discussions of the relative influences of nature and nurture on development recur throughout this text. (In addition to the other study questions at the end of each chapter, the student might well ask in each case whether this particular perspective leans more heavily toward nature, toward nurture, or toward a balance between them.) But it is well to remember that no phenomenon of any importance in psychology and developmental science is due *only* to nature, or *only* to nurture: *it is always a matter of the interplay between the two*. This interdependence is sometimes difficult for people to accept because it seems almost natural to seek simple answers to complex problems – but perhaps this is how scientific discourse differs from everyday conceptions of political realities!

The Shape of the Course of Development over Time

Do human beings develop in more or less discretely identifiable stages, or is development more like a continuous, gradually sloping learning curve?

Behavioral psychologists working in the tradition of learning theory, such as Ivan Pavlov, John B. Watson, and B. F. Skinner (Chapter 10), believed that acquisition of knowledge and skills was gradual, even though the curve of learning was not necessarily linear, or in the shape of a perfectly straight line (see Figures 2.3a through 2.3d). Piaget and others thought that learning curves followed discrete ***stages*** of development (as in Figure 2.3e). In a sense, both were right, as certain types of skills are gradually accumulated, yet others required a kind of reorganization of thinking that Piaget believed marked a higher stage of development that comes through maturation and experimentation with the physical environment.

Maturationism versus Developmentalism

There are two seemingly opposing concepts that developmental scientists have advanced in the relatively short history of the field. There is no question that physical development unfolds in a sequence that is determined by nature, beginning with the embryo and continuing on with the fetus, the infant, the child, the sexual maturation that occurs in adolescence, and so on. But is psychological development similarly determined from within, determined as it were by our genetic makeup? ***Maturationists*** such as Arnold Gesell (e.g., Gesell, 1954) believed so. It is certainly true, for example that a child cannot learn to walk and talk until the nervous system and the skeletal-muscular system have matured and the child is physically ready to learn these complex tasks. But carried to an extreme, the maturationist position depends too much on genetic endowment (nature versus nurture again) to the exclusion of environmental factors.

On the other hand, ***developmentalists*** such as Piaget (Chapter 4) place considerable importance on the child's interaction with the environment in development and learning. While recognizing that maturation is a factor in development, they also give much of the credit to the child him/herself in the process of development, who is seen by them as an active agent. For developmentalists psychological development does not simply "happen" in the course of time without the child's very active involvement. Some developmentalists, Vygotsky, for example (Chapter 5), also stress the importance of interacting with peers and adults, and in fact, of learning through teaching, to development. That is why development (particularly cognitive development) takes somewhat different courses within different cultural contexts; and it also helps to explain why the strict maturationists' position fails to adequately account for development.

Some maturationists (Gesell, for instance) are also stage theorists, whereas others (such as Albert Bandura, Chapter 11) are gradualists. Developmentalists on the other hand, usually tend to be stage theorists. And today, most people who call themselves developmental scientists are also developmentalists.

Units of Study: (a) Which Species to Study?

The reader has already seen that different theorists study different aspects of development – personality, cognition, morality, and so forth – but there are also sometimes differences in the units of analysis employed by developmental researchers. It was once the belief of some psychologists that one could learn all important laws of behavior by studying learning processes in vertebrates, so that research findings on the behaviors of laboratory rats or pigeons would be all that was required to understand human behavior. While this view no longer predominates, readers should be aware that it guided most of the research of the early behaviorists (Chapter 10).

Nevertheless, developmental scientists have indeed gained new insights into human behavior from studying other species. Ethologists like Konrad Lorenz and Niko Tinbergen (Chapter 12) discovered that certain species (geese, for example) learn a "following" response pattern in which they will follow their mother (or even other moving creatures or objects), but this specialized learning must take place during a certain stage of development that they called a "critical period."

The ethologists studied species in their natural habitats. But the experimental psychologist Harry Harlow demonstrated that rhesus monkeys need love and affection in the form of "contact comfort" by using laboratory experiments, just as most of us imagine that human children do. Yet many psychologists at that time were urging parents not to "coddle" or spoil their children with unneeded attention at about the time this research was done. John Bowlby and Margaret Ainsworth's work on the importance of mother-child bonding during certain sensitive periods of development was greatly influenced by such animal research.

Today developmental scientists recognize that we cannot learn about humans by studying animals exclusively – but they also recognize the important contribution of comparative studies with other species as well.

Units of Study (b): Context of Analysis

For the learning theorist in the early to mid-Twentieth Century the context of analysis was simply the behavior of the organism under study as directly influenced by environmental contingencies (rewards and punishments). But for Jean Piaget the unit of study was not simply the child, but the child in the context of the environment; essentially he was focused on the *interaction* of the child *with* the environment. The child was considered an active participant in learning rather than a passive recipient. By comparison, Lev Vygotsky (Chapter 5) also studied children's interaction with their environments, but all within the *sociocultural* context of family and society. For Vygotsky, then, the unit of analysis was not only the child interacting with the environment, but also within the given sociocultural context. The attachment theorists, John Bowlby and Margaret Ainsworth (Chapter 13), were highly focused on the dynamic interaction between mother and child in forming attachment bonds. For them the unit of study was the parent-child dyad.

As discussed in the last chapter, today the “bigger picture” of psychological development is viewed not simply as a series of individual journeys, but as a process embedded within an interpersonal, sociocultural, and sometimes even a historical, context (individual ↔ context) as well.

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For Thought and Discussion

1. Why is astrology not considered a science? What aspects of astrology might give it a scientific appearance, even though it isn't scientific?
2. Consider the three research designs for assessing changes over time (Figure 2.2). Suppose some event – perhaps a "Columbine" type disaster – happens in a school. How would one be able to assess the effects of this event on learning and separate them out from other effects by using a cross-sequential design?
3. If a study finds that "the correlation between IQ and family income is +.50," what other information do you want to know before you draw any conclusions? What is the actual size or magnitude of this effect?
4. Try to think of some examples where the association of two events (correlation) can mislead people into assuming that the first event caused the second.
5. Name a few hypothetical constructs you are likely to encounter in psychological research, aside from intelligence.

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Notes

1. The source is Wikipedia, downloaded on September 12, 2006, from: http://en.wikipedia.org/wiki/French_and_Indian_War. Although the war actually lasted nine years it is called the Seven Year’s War because it is dated in Europe not from the time that the battles began, but from the time that war was officially declared.

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