Chapter 1 Psychology: The Science of Behaviour

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1. The Nature of Psychology
    a. Definition and Classification of Psychology
        i. **Psychology** is the scientific study of behaviour and the mind.
            1) The term **behaviour** refers to actions and responses that we can directly observe;
            2) Whereas the **mind** refers to internal states and processes, such as thoughts and feelings, that cannot be seen directly and that must be inferred from observable, measurable responses.
        ii. **Clinical Psychology**: the study and treatment of mental disorders.
        iii. **Cognitive psychology** specializes in the study of mental processes, especially from a model that views the mind as an information processor.
        iv. **Biopsychology/neuroscience** focuses on the biological underpinnings of behaviour.
        v. **Developmental psychology** examines human physical, psychological, and social development across the lifespan.
        vi. **Experimental psychology** focuses on such basic processes as learning, sensory systems (e.g., vision, hearing), perception, and motivational states (e.g., sexual motivation, hunger, thirst).
        vii. **Industrial-organizational (I/O) psychology** examines people's behaviour in the workplace.
        viii. **Personality psychology** focuses on the study of human personality.
        ix. **Social psychology** examines people's thoughts, feelings, and behaviour pertaining to the social world: the world of other people.
    b. Psychology's Scientific Approach
        i. Definitions
            1) **Science** is a process that involves systematically gathering and evaluating empirical evidence to answer questions and test beliefs about the natural world.
            2) **Empirical evidence** is evidence gained through experience and observation, and this includes evidence from manipulating with things and then observing that happens.
            3) In science these observations need to be **systematic** (i.e., performed according to a system of rules or conditions) so that they will be as objective and precise as possible.
        ii. Understanding Behaviour: Some Pitfalls of Everyday Approaches
            1) We often take **mental shortcuts** when forming judgements - shortcuts that sometimes serve us poorly.
            2) Because many factors in real life may operate simultaneously to influence behaviour, we may **fail to consider alternative explanations** for why a behaviour has occurred and assume that one factor has caused it when in fact some less obvious factor was the true cause.
            3) We tend to display a **confirmation bias** by selectively paying attention to information that is consistent with our beliefs and downplaying or ignoring information that is inconsistent with them.
        iii. Using Science to Minimize Everyday Pitfalls
            1) By adopting a scientific approach, psychologists can take concrete steps to avoid or at least minimize biases and problems that can lead to inaccurate conclusions: various recording instruments, observing and then comparing as a group, using statistics to analyze their data, examining behaviour under highly controlled experimental conditions.
            2) Publication enables scientists to scrutinize and challenge each other's findings if the wish, and this collective approach reduces the risk of confirmation bias.

3) Science has limitations and its own pitfalls: it is ideally suited to examining testable questions about the natural world, but cannot examine those that cannot be tested by science or is based on personal values.
4) Even when studies are designed well and conducted properly, "false starts" can occur in which other researchers later are unable to duplicate the experiment.
5) Overtime, new research often modifies or completely overturns existing scientific beliefs, but it is important to realize that **in principle, science ultimately is a self-correcting process**.

c. Thinking Critically about Behaviour
   i. **Critical thinking** involves taking an active role in understanding the world around you rather than merely receiving information. **Critical thinking** also means evaluating the validity of something presented to you as fact.
   ii. Questions to Ask about Any Claim
      1) What is the claim or assertion?
      2) Who is making the claim? Is the source credible and trustworthy?
      3) What's the evidence, and how good is it?
      4) Are other explanations possible? Can I evaluate them?
      5) What is the most appropriate conclusion?

d. Psychology's Goals
   i. Four central goals of psychology as a science
      1) To **describe** how people and other animals behave
      2) To **explain and understand** the causes of these behaviours
      3) To **predict** how people and animals will behave under certain conditions
      4) To **influence or control** behaviour through knowledge and control of its causes to enhance human welfare

e. Psychology as a Basic and Applied Science
   i. **Basic research** is the quest for knowledge purely for its own sake.
   ii. **Applied research** is designed to solve specific practical problems.

f. Psychology's Broad Scope: A simple Framework
   i. **Levels of Analysis**:
      1) **Biological level**: behaviour and its causes
      2) **Psychological level**: thoughts, feelings, and motives
      3) **Environmental level**: past and current physical and social environments to which we are exposed
   ii. Mind-Body and Nature-Nurture Interactions
      1) **Mind-body interactions** are the relations between mental processes in the brain and the functioning of other bodily systems.
      2) The levels-of-analysis frame work also addresses an issue that has been debated since antiquity: Is out behaviour primarily shaped by nature (our biological endowment) or nurture (our environment and learning history)?
         a) As the levels-of-analysis frame work implies, nature, nurture, and psychological factors must all be taken into account to gain the fullest understanding of behaviour.

2. Perspectives on Behaviour
   a. Introduction
      i. Because psychology has roots in such varied disciplines as philosophy, medicine, and the biological and physical sciences, different ways of viewing people, called **perspective**, became part of psychology's intellectual traditions.
      ii. In science, new perspectives are engines of progress. Advances occur as existing beliefs are challenged, a debate ensues, and scientists seek new evidence to resolve the debate.
      iii. Perspectives serve as lenses through which psychologists examine and interpret behaviour.
   b. Psychology's Intellectual Roots
      i. **Mind-body dualism** is the belief that the mind is a spiritual entity not subject to physical laws that govern the body.

ii. **Monism** holds that mind and body are one and that the mind is not a separate spiritual entity.
iii. **British empiricism** holds that all ideas and knowledge are gained empirically - that is, through the senses.
iv. **Psychophysics** is the study of how psychologically experienced sensations depend on the characteristics of physical stimuli (e.g., how the perceived loudness of a sound changes as its physical intensity increases).
v. **Charles Darwin's theory of evolution**: evolution implied that the mind was not a spiritual entity, but rather the product of biological continuity between humans and other species. It also implied that scientists might gain insight about human behaviour by studying other species.

c. Early Schools: Structuralism and Functionalism
   i. **Structuralism** is the analysis of the mind in terms of its basic elements.
      1) In their experiments, structuralists used the method of **introspection** ("looking within") to study sensations, which they considered the basic elements of consciousness.
      2) Although this method of studying the mind was criticized as being too subjective, and it died out after a few decades, the structuralists left an important mark by establishing a scientific tradition for studying cognitive processes.
   ii. **Functionalism** holds that psychology should study the functions of consciousness rather than its structure.
      1) Although functionalism no longer exists as a school of thought within psychology
      2) Its tradition endures in two modern-day fields: **cognitive psychology**, which studies mental processes, and **evolutionary psychology**, which emphasizes the adaptiveness of behaviour.

d. The Psychodynamic Perspective: The Forces Within
   i. Introduction
      1) The **psychodynamic perspective** searches for the causes of behaviour within the inner working of our personality (out unique pattern of traits, emotions, and motives), emphasizing the role of unconscious processes.
   ii. Psychoanalysis: Freud's Great Challenge
      1) Freud treated his patients who experienced blindness, pain, and phobias that were not caused by bodily malfunction or disease with a technique called **free association**, in which the patient expressed any thoughts that came to mind and they eventually described painful and long "forgotten" childhood experiences.
      2) **Psychoanalysis** is the analysis of internal and primarily unconscious psychological forces.
      3) He proposed that humans have powerful inborn sexual and aggressive drives and that because these desires are punished in childhood, we learn to fear them and become anxious when we are aware of their presence. This anxiety leads us to develop defence mechanisms, which are psychological techniques that help us with anxiety and the pain of traumatic experiences.
      4) Freud's work forever broadened the face of psychology to include the study and treatment of psychological disorders.
   iii. Modern Psychodynamic Theory
      1) **Modern psychodynamic theories** continues to explore how unconscious and conscious aspects of personality influence behaviour.
      2) However, they downplay the role of hidden sexual and aggressive motives and focus more on how early relationships with family members and other caregivers shape the views that people form of themselves and others.
      3) In turn, these views can unconsciously influence a person's relationships with other people throughout life.

e. The Behavioural Perspective: The Power of the Environment
   i. Introduction

1) The **behavioural perspective** focuses on the role of the external environment in governing our actions.
2) From this perspective, our behaviour is jointly determined by habits learned from previous life experiences and by stimuli in our immediate environment.

ii. Origins of the Behavioural Perspective
1) The behavioural perspective has roots in the philosophical school of British empiricism.
2) Learning is the key to understanding how experiences moulds behaviour.

iii. Behaviourism
1) **Behaviourism** is a school of thought that emphasizes environmental control of behaviour though learning.
2) John B. Watson argued that the proper subject matter of psychology was observable behaviour, not unobservable inner consciousness.
3) Behaviourists sought to discover laws that govern learning, and they believed that the same basic principles of learning applied to all organisms.
4) **Behaviour modification** refers to the techniques aimed at decreasing problem behaviours and increasing positive behaviours by manipulating environmental factors.
5) Radical behaviourism's influence waned after the 1970s, as interest in studying mental processes expanded, but still, behaviourists continue to make important contributions, and their discovery of basic laws of learning was one of the greatest contributions made by 20th-century American psychology.

iv. Cognitive Behaviourism
1) In **cognitive behaviourism**, learning experiences and the environment affect our behaviour by giving us the information we need to behave effectively.

f. The Humanistic Perspective: Self-actualization and Positive Psychology
i. Definitions
1) The **Humanistic perspective** emphasized free will, personal growth, and the attempt to find meaning in one's existence.
2) Abraham Maslow proposed that each of us has an inborn force toward **self-actualization**, the reaching of one's individual potential.
3) When humans develop in a supportive environment, the positive inner nature of a person emerges. In contrast, misery and pathology occur when environments frustrate our innate tendency toward self-actualization.
4) Humanists emphasized the importance of personal choice, responsibility, personality growth, and positive feelings of self-worth.

ii. Comments:
1) Few early humanists were scientists and, historically, humanism has had a more limited impact on mainstream psychological science than have other perspectives.
2) However, humanistic concepts also stimulated research on self-esteem and self-concept.

iii. Humanism's focus on self-actualization and growth is seen in today's growing **positive psychology movement**, which emphasizes the study of human strengths, fulfillment, and optimal living.

g. The Cognitive Perspective: The Thinking Human
i. Definitions
1) The **cognitive perspective** examines the nature of the mind and how mental processes influence behaviour.

ii. Origins of the Cognitive Perspectives
1) **Gestalt psychology** examined how the mind organizes elements of experience into a unified or "whole".

iii. Renewed Interest in the Mind
1) After the invention of computer technology, a new metaphor developed - the mind as a system that processes, stores, and retrieves information - and it remains influential today.

2) On another front in the 1950s, behaviourists and linguists debated how children acquire language.
    a) The behaviourists, led by Skinner, claimed that language is acquired through basic principles of learning.
    b) The linguists, led by Noam Chomsky, argued that humans are biologically "preprogrammed" to acquire language and that children come to understand language as a set of "mental rules."

iv. The Modern Cognitive Perspective
1) **Cognitive psychology**, which focuses on the study of mental processes, embodies the cognitive perspective.
2) Cognitive psychologists study the processes by which people reason, make decisions, solve problems, form perceptions, and produce and understand language.
3) **Cognitive neuroscience**, which uses sophisticated electrical recording and brain-imaging techniques to examine brain activity while people engage in cognitive tasks, is a rapidly growing area that represents the intersection of cognitive psychology and the biological perspective within psychology.
4) Cognitive neuroscientists seek to determine how the brain goes about its business of learning language, acquiring knowledge, forming memories, and performing other cognitive activities.

h. The Sociocultural Perspective: The Embedded Human
i. Definition
1) The **sociocultural perspective** examines how the social environment and cultural learning influence our behaviour, thoughts, and feelings.

ii. The Social Psychological Component
1) For over a century, **social psychologists** have studied how the presence of other people influence our behaviour, thoughts, and feelings.
    a) The word **presence** includes actual physical presence (e.g., you're in a group), implied presence (e.g., you're dressing for a party, aware that the party people will evaluate how you look), and imagined presence (e.g., driving a car, you slow down because you incorrectly think the car behind you is an unmarked police car).
2) The social psychological approach overlaps with many other perspectives.

iii. The Cultural Component
1) **Culture** refers to the enduring values, beliefs, behaviours, and traditions that are shared by a large group of people and passed from one generation to the next.
    a) All cultural groups develop their own **social norms**, which are rules (often unwritten) that specify what behaviour is acceptable and expected for members of that group.
    b) For culture to endure, each new generation must internalize, or adopt, the norms and values of the group as their own.
    c) **Socialization** is the process by which culture is transmitted to new members and internalized by them.
2) Throughout much of the 20th century, psychological research largely ignored non-Western groups. Yet over time, psychologists increasingly began to study diverse ethnic and cultural groups.
3) Today the growing field of **cultural psychology** (sometimes called **cross-cultural psychology**) explores how culture is transmitted to its members and examines psychological similarities and differences among people from diverse cultures.
4) One important difference among cultures is the extent to which they emphasize individualism versus collectivism.
    a) Most industrialized cultures of northern Europe and North America promote **individualism**, and emphasis on personal goals and self-identity based primarily on one's own attributes and achievements.
    b) In contrast, many Asian, African, and South American cultures nurture

collectivism, in which individual goals are subordinated to those of the group and personal identity is defined largely by the ties that bind one to the extended family and other social groups.

c) These differences are created by social learning experiences that begin in childhood and continue throughout our lives in the form of social customs.

i. The Biological Perspective: The Brain, Genes, and Evolution

i. Definition

1) The **biological perspective** examines how brain processes and other bodily functions regulate behaviour.

ii. Behavioural Neuroscience

1) **Behavioural neuroscience** examines brain processes and other physiological functions that underlie our behaviour, sensory experiences, emotions, and thoughts.
2) **Neurotransmitters** are chemicals released by nerve cells that allow them to communicate with one another.

iii. Behaviour Genetics

1) **Behaviour genetics** is the study of how behavioural tendencies are influenced by genetic factors.

iv. Evolution Psychology

1) Through a process Darwin called **natural selection**, if an inherited trait gives certain members an advantage over others (such as increasing their ability to attract mates or escape from danger), these members will more be likely to survive and pass on these characteristics to their offspring.
2) **Evolution psychology** seeks to explain how evolution shaped modern human behaviour.
3) Evolution psychologists stress that human mental abilities and behavioural tendencies evolved along with a changing body.
4) Within any generation, genetically based variations in brain structure and functioning occur among individuals.
    a) Ancestors whose brain characteristics better supported adaptive mental abilities were more likely to survive and reproduce.
5) **Sociobiology** holds that complex social behaviours are also built into the human species as products of evolution.
    a) Sociobiologists argue that natural selection favours behaviours that increase the ability to pass on one's genes to the next generation.
    b) These social behaviours include aggression, competition, and dominance in males, and cooperative and nurturing tendencies in females.
    c) A major point is that, in the eyes of sociobiologists, one's **genetic survival** (i.e., the transmission of one's genes) is more important than one's own physical survival.
        i) This principle can explain certain altruistic behaviours, including giving up one's life to same children or relatives
6) Evolutionary theorists with a more cultural orientation suggest that the evolved brain structures that underlie psychological mechanisms (such as the ability to use language) developed to enhance the adaptation of social and group living rather than simply to further the survival of one's genes.

3. Using Levels of Analysis to Integrate The Perspectives

a. Introduction

i. Fortunately, we can distill the essence of psychology's six major perspectives into the simple three part framework.

ii. Behaviours can be examined at biological, psychological, and environmental levels.

1) At the **biological level of analysis**, we can study behaviour and its causes in terms of brain functioning, hormones, and genetic factors shaped over the course of evolution.

2) At the **psychological level of analysis**, we might look to the cognitive perspective and analyze how thought, memory, and planning influence behaviour. Borrowing from the psychodynamic and humanistic perspectives, we can examine how motives and personality traits influence behaviour.
3) Finally, at the **environmental level of analysis**, the behavioural and sociocultural perspectives lead us to examine how stimuli in the physical and social environment shape our behaviour, thoughts, and feelings.

b. An Example: Understanding Depression
   i. Definition
      1) **Interaction** means that the way in which one factor influences behaviour depends on the presence of another factor.
   ii. Biological Level of Analysis
      1) People's genetic inheritance influence their susceptibility toward developing depression.
      2) Abnormal activity of neurotransmitters in the brain can cause depression.
      3) Antidepressant drugs restore more normal levels of neurotransmitter activity and relieve symptoms of depression for many people.
   iii. Psychological Level of Analysis
      1) A pessimistic thinking style and negative interpretations of events may trigger or intensity depression.
      2) Perfectionistic expectations can make people overly sensitive to how other people evaluate them.
      3) Heightened sensitivity to loss or rejection may lead people to overreact to setbacks.
   iv. Environmental Level of Analysis
      1) Prior losses and rejections, especially early in life, may lead people to overreact to current losses or rejections.
      2) A significant decrease in pleasurable experiences may help trigger depression.
      3) Social support may decrease if people avoid the depressed person.
      4) Cultural norms may influence how people react to negative events and express unhappiness.

c. Summary of Major Themes
   i. As a science, **psychology is empirical**, meaning that it favours direct observation over pure intuition or reasoning as a means of attaining knowledge about behaviour.
   ii. Though committed to an objective study of behaviour, psychologists recognize that **our experience of the world is subjective** and that we respond to a psychological reality created by our own thought processes, motives, and expectations. Many of these influences operate beyond our conscious awareness.
   iii. As our level-of-analysis them shows us, **behaviour is determined by multiple causal factors** that can interact with one another in complex ways. This interaction increases the challenge of understanding behaviour.
   iv. **Nature and nurture** not only combine to shape our behaviour, but also influence each other. Our biological endowment helps to determine the kinds of experiences we can have, and biological processes are, in turn, influenced by our experiences.
   v. Behaviour is a means of adapting to environmental demands, and **psychological capacities have evolved** because they facilitated adaptation and survival.
   vi. Behaviour and mental processes are strongly affected by the **cultural environment** in which they develop. In an increasingly multicultural world, there is a growing need to understand and appreciate the role of cultural factors in behaviour.

4. Psychology Today
   a. Major specialty Areas within Psychology
      i. Animal Behaviour: Study of nonhuman species in natural or laboratory environments; includes genetics, brain processes, social behaviour, evolutionary processes.

ii. Cognitive and behavioural neuroscience: Examination of brain and hormonal processes that underlie behaviour; behaviour genetics and evolutionary psychology are sometimes grouped under cognitive and behavioural neuroscience
iii. Clinical: Diagnosis and treatment of psychological disorders; research on causes of disorders and treatment effectiveness
iv. Counselling: consultation with clients on issues of personal adjustment; vocational and career planning; interest and aptitude test
v. Developmental: Study of physical, mental, emotional, and social development throughout the entire lifespan
vi. Educational: study of the psychological aspect of the educational process; curriculum and instructional research; teacher training
vii. Industrial/Organizational: Examination of behaviour in work settings; study of factors related to employee morale and performance; development of test to select job applicants; development of machines and tasks to fit human capabilities
viii. Personality: study of individual differences in personality and their effects on behaviour; development of personality test
ix. Quantitative: measurement issues and data analysis; development of mathematical models of behaviour

Chapter 1 Summary and Review of Different Psychological Perspectives

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	Psychodynamic	Behavioural	Humanistic	Cognitive	Sociocultural	Biological
Conception of human nature	The human as controlled by inner forces and conflicts	The human as reactor to the environment	The human as free-agent, seeking self-actualization	The human as thinker	The human as social being embedded in a culture	The human as animal
Major causal factors in behaviour	Unconscious motives, conflicts, and defences; early childhood experiences and unresolved conflicts	Past learning experiences and the stimuli and behavioural consequences that exist in the current environment	Free will, choice, and innate drive toward self-actualization; search for personal meaning of existence	Thoughts, anticipations, planning, perceptions, attention, and memory processes	Social forces, including norms, social interactions, and groups processes in one's culture and social environment	Genetic and evolutionary factors; brain and biochemical processes
Predominant focus and methods of discovery	Intensive observation of personality processes in clinical settings; some laboratory research	Study of learning processes in laboratory and real-world settings, with an emphasis on precise observation of stimuli and responses	Study of meaning, values, and purpose in life; study of self-concept and its role in thought, emotion, and behaviour	Study of cognitive processes, usually under highly controlled laboratory conditions	Study of behaviour and mental processes of people in different cultures; experiments examining people's responses to social stimuli	Study of brain behaviour relations; role of hormones and biochemical factors in behaviour; behavioural genetics research

1. Different Psychological Perspectives
    a. Several perspectives have shaped psychology's scientific growth. Each perspective views human nature differently and focuses on different causes of behaviour.
    b. Psychology's intellectual roots lie in philosophy, biology, and medicine. In the late 1800s, Wundt and James helped found psychology. **Structuralism**, which examined the basic components of consciousness, and **functionalism**, which focuses on the purses of consciousness, were psychology's two earliest schools of thought.
    c. The **psychodynamic perspective** calls attention to unconscious motives, conflicts, and defence mechanisms that influence personality and behaviour. Freud's **psychoanalytic theory** emphasized unconscious sexual and aggressive impulses and early childhood experiences that shape personality.
    d. With roots in 18th-century British empiricism, the **behavioural perspective** emphasizes how the external environment and learning shape behaviour. **Behaviourists**, such as Watson and Skinner, believed that psychology should study only observable stimuli and responses, not unobservable mental processes. They argued that the key to changing behaviour is modifying the environment. Behaviourists discovered basic laws of learning through controlled research with laboratory animals and successfully applied these principles to

enhance human welfare.

e. **Humanists** reject the notion that people are controlled by unconscious forces or merely react to environmental stimuli. Instead, the **humanistic perspective** emphasizes personal freedom and choice, psychological growth, and self-actualization.
f. The **cognitive perspective** views humans as information processors who think, judge, and solve problems. Its roots lie in the early schools of **structuralism**, **functionalism**, and **Gestalt psychology**. Piaget's work on cognitive development, the study of linguistics, and the advent of computers sparked new interest in mental processes that underlie mental activity.
g. The **sociocultural perspective** examines how the social environment and cultural learning influence our behaviour and thoughts. **Cultural psychologists** study how culture is transmitted to its members and examine similarities and differences among people from various cultures. An orientation toward individualism versus collectivism represents one of many ways in which cultures vary.
h. With roots in physiology, medicine, and Darwin's theory of evolution, the **biological perspective** examines how bodily functions regulate behaviour. **Physiological psychologists** study brain processes and other physiological functions that underlie our behaviour, sensory experiences, emotions, and thoughts. Behaviour geneticists study how behaviour is influenced by our genetic inheritance. **Evolutionary psychologists** examine behaviour in terms of its adaptive functions and seek to explain how evolution has biologically predisposed modern humans toward certain ways of behaving.

2. Three Level Analysis
    a. Factors that influence behaviour can be organized into three broad levels of analysis. The **biological level of analysis** focuses on brain processes, hormonal and genetic influences, and evolutionary adaptations that underlie behaviour. The **psychological level of analysis** examines mental processes and psychological motives, and how they influence behaviour. The **environmental level of analysis** calls attention to physical and social stimuli, including cultural factors, that shape our behaviour and thoughts.
    b. To understand behaviour, we often move back and forth between these levels of analysis. For example, when we are first exposed to cultural norms as children, those norms reflect a characteristic of our environment. However, once we adopt norms as our own, they become a part of our world view and now represent the psychological level of analysis.
    c. Biological, psychological, and environmental factors contribute to the development of depression. These factors can also interact to influence a given behaviour. It may take only a mild setback to trigger in a person who has a strong biological predisposition toward depression, whereas a person who does not have such a biological predisposition may become depressed only after suffering a severe setback.
3. Psychology Today
    a. Psychologists specialize in numerous subfields and work in many settings. Their professional activities include teaching, research, clinical work, and application of psychological principles to solve personal and social problems.
    b. Psychologists today conduct research and provide services around the globe.
    c. You can use principles derived from psychological science to enhance your learning and increase your likelihood of performing well on tests. These include time-management principles, strategies for studying more effectively, test-preparation strategies, and techniques for test-taking.

Chapter 2 Studying Behaviour Scientifically

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1. Scientific Principles in Psychology
    a. Scientific Attitudes
        i. **Curiosity**, **skepticism**, and **open-mindedness** are driving forces behind scientific inquiry.
        ii. **Diffusion of responsibility** is a psychological state in which each person feels decreased personal responsibility for intervening.
    b. Steps in the Scientific Process
        i. Step 1: **Identify a question of interest**.
        ii. Step 2: **Gather information and form hypothesis**
            1) **Hypothesis** is a specific prediction about some phenomenon that often takes the form of an "If-Then" statement.
        iii. Step 3: **Test hypothesis by conducting research**
        iv. Step 4: **Analyze data, draw tentative conclusions, and report findings to the scientific community**
        v. Step 5: **Build a body of knowledge**
            1) They ask further questions, formulate new hypotheses, and test those hypotheses by conducting more research.
            2) As evidence mounts, scientists may attempt to build theories. A **theory** is a set of formal statements that explains how and why certain events are related to one another.
            3) Theories are broader than hypotheses, and in psychology theories typically specify lawful relations between certain behaviours and their causes.
            4) Scientists use theories to develop new hypotheses, which are then tested by conducting more research.
            5) In this manner, the scientific process becomes self-correcting.
    c. Two Approaches to Understanding Behaviour
        i. Hindsight (After-the-Fact Understanding)
            1) The main problem with relying solely on hindsight reasoning is that related past events can be explained in many creative, reasonable, and sometimes contradictory, ways.
            2) Despite this problem, hindsight reasoning can provide valuable insights and is often the foundation on which further scientific inquiry is built.
        ii. Understanding through Prediction, Control, and Theory Building
            1) Assumption
                a) If we understand the causes of a given behaviour, then we should be able to predict the conditions under which that behaviour will occur in the future.
                b) Furthermore, if we can control those conditions, then we should be able to produce that behaviour.
            2) Theory development is the strongest test of scientific understanding because good theories generate an **integrated network of predictions**.
            3) A good theory has several important characteristics:
                a) It incorporate existing facts and observations within a single broad framework.
                b) It is testable. It generates new hypotheses and predictions whose accuracy can be evaluated by the findings of new research.
                c) It conforms to the **law of parsimony**: if two theories can explain and predict the same phenomena equally well, the simpler theory is the preferred one.
            4) It is always possible that future observation will contradict it, or that a newer, more accurate theory will displace it.

5) Although scientists use prediction as a test of understanding, this does not mean that prediction requires understanding. But prediction based on understanding has important advantages: it satisfies our curiosity, increases knowledge, and generates principles that we can apply to new situations.

d. Defining and Measuring Variables
   i. Introduction
      1) A **variable** is any characteristic or factor that can vary.
      2) Many variables that psychologists study represent abstract concepts that cannot be observed directly (e.g., self-esteem, intelligence, stress).
      3) When conducting research, scientists must also define variables operationally. An **operational definition** defines a variable in terms of the specific procedures used to produce or measure it.
   ii. Self-reports and Reports by Others
      1) **Self-report measures** ask people to report on their own knowledge, beliefs, feelings, experiences, or behaviour.
         a) This information is often gathered through interviews or questionnaires.
         b) The accuracy of self-report measures hinges on people's ability and willingness to respond honestly, especially when research questions focus on sensitive topics, such as sexual habits and drug use.
         c) Participants' self-reports may be distorted by a **social desirability bias**, the tendency to respond in a socially acceptable manner rather than according to how one truly feels or behaves.
         d) Delroy Paulhus suggests that researchers can minimize the social desirability bias by wording questions so that social desirability is not relevant or, if that is impossible, by guaranteeing respondents anonymity and confidentiality so that can respond honestly without fear of future consequences.
         e) **Over-Claiming Questionnaire (OCQ)** is used to measure the degree of a respondent's social desirability bias by having respondents rate their familiarity with a large number of items on a questionnaire, of which 20 percent didn't exist.
      2) We also can gather information about someone's behaviour by conducting interviews with or administering questionnaires to **other people**, such as parents, spouses, and teachers, who know the person.
   iii. Measures of Overt Behaviour
      1) Another measurement approach is to record **overt behaviour** (i.e., directly observable behaviour).
         a) Example: **Reaction time** is an measurement about how participants respond to a stimulus.
      2) Psychologists also develop **coding systems** to record different categories of behaviour.
         a) Example: while a parent and child jointly perform a task, we might code the parent's behaviour into such categories as "praises child", "assists child", and "criticizes child".
         b) Observers must be trained to use the coding system properly so that their measurements will be **reliable** - **consistent observations**.
      3) Humans and other animals may behave differently when they know that they are being observed.
         a) To counter this problem, researchers may disguise their presence or use **unobtrusive measures**, which records behaviour in a way that keeps participants unaware that certain responses are being measured.
      4) Psychologists also gather information about behaviour by using **archival measures**, which are records or documents that already exist.
      5) Psychological test
         a) Psychologists develop and use specialized tests to measure many

types of variables.

b) **Personality test** assesses personality traits, often contain questions about how a person typically feels or behaves. Other personality tests present ambiguous stimuli, and personality traits are judged based upon how a person interprets these stimuli.

c) Other psychological tests consist of performance tasks.

i) **Intelligence tests** may ask people to assemble objects or solve arithmetic problems.

ii) **Neuropsychological tests** help to diagnose normal and abnormal brain functioning by measuring how well people perform mental and physical tasks.

6) Physiological measures

a) Psychologists also record Physiological responses to assess what people are experiencing.

b) Measures of heart rate, blood pressure, respiration rate, hormonal secretions, and brain functioning have long been the mainstream of biopsychologists, but these measures have become increasingly important in many other areas of psychology.

c) Physiological responses can have their own interpretive problems, the main one being that we don't always understand what they mean.

7) In sum, psychologists can measure behaviour in many ways, and each has advantages and disadvantages. To gain greater confidence in their findings, researchers may use several types of measures within a single study.

2. Methods of Research

a. Introduction

i. The research method chosen depends on the problem being studied, the investigator's objectives, and ethical principles.

b. Descriptive Research: Recording Events

i. Introduction

1) In psychology, **descriptive research** seeks to identify how humans and other animals behave, particularly in natural settings.

2) It provides information about the diversity of behaviour and may yield clues about potential cause-effect relations that are later tested experimentally.

3) Case studies, naturalistic observation, and surveys are research methods commonly used to describe behaviour.

ii. Case Studies

1) A **case study** is an in-depth analysis of an individual, a group, or an event.

2) Case studies have several advantages:

a) When a rare phenomenon occurs, this method enables scientists to study it closely.

b) A case study may challenge the validity of a theory or widely held scientific belief.

c) A case study can be a vibrant source if new ideas and hypotheses that subsequently may be examined by using more controlled research methods.

3) Case studies have several limitations:

a) They are a poor method for determining **cause-effect** relations.

b) Case study findings may not generalize to other people or situations.

i) To establish the **generalization** of a principle, investigators must conduct more case studies, use other research methods, and test a variety of cultural groups.

c) Observers may not be objective in gathering and interpreting the data.

i) **Measurement bias** (also called **observer bias**) can occur in any type of research.

ii) Case study are particularly worrisome because often they are based on an observer's subjective impressions.

iii. Naturalistic Observation

1) In **naturalistic observation**, the researcher observes behaviour as it occurs in a natural setting, and attempts to avoid influencing that behaviour.
2) Like case studies, naturalistic observation does not permit clear causal conclusions.
    a) In the real world, many variables simultaneously influence behaviour, and they cannot be disentangled with this research technique.
    b) Bias in how researchers interpret what they observe is also possible.
    c) Even the mere presence of an observer may disrupt a person's or animal's behaviour.
        i) **Disguise**: researchers may disguise their presence so that participants are not aware of being observed.
        ii) **Habituation**: when disguise is not feasible, people and other animals typically adapt to and ignore the presence of an observer as time passes.

iv. Survey Research
1) In **survey research**, information about a topic is obtained by administering questionnaires or interviews to many people.
2) A **Population** consists of all the individuals about whom we are interested in drawing a conclusion.
3) **Sample** is a subset of individuals drawn from the larger population of interest.
    a) A **representative sample** is one that reflects the important characteristics of the population.
    b) To obtain a representative sample, survey researchers typically use a procedure called **random sampling**, in which every member of the population has an equal probability of being chosen to participate in the survey.
    c) A common of this procedure, called **stratified random sampling**, is to divide the population into subgroups based on such characteristics as gender or ethnic identity.
4) Results
    a) When a representative sample is surveyed, we can be confident that the findings closely portray the population as a whole.
    b) In contrast, unrepresentative samples can produce distorted results.
    c) Other things being equal, larger samples are better than small ones, but it is better to have a smaller representative sample than a larger, unrepresentative one.
5) Internet questionnaires
    a) Disadvantages
        i) respondents can lie about their ages, identities, and genders, and anonymity permits respondents to answer frivolous or maliciously.
        ii) Sample bias can occur because there is no method for randomly sampling the population of Internet users.
    b) Advantages
        i) Internet results have been shown to be less influenced by issues such as missing data and socially desirable responding than those of paper-based surveys.
        ii) Recent research suggests that data from Internet surveys has similar properties to the same type of data collected by the standard paper-and-pencil format.
6) Drawbacks of survey
    a) Survey data cannot be used to draw conclusions about cause and effect.
    b) Surveys rely on participants' self-reports, which can be distorted by social desirability bias, interviewer bias, people's inaccurate perceptions of their own behaviour, and misinterpretation of survey

questions.
    c) Unrepresentative samples can lead to faulty generalizations about how an entire population would respond.
    d) Even when surveys use proper random sampling procedures, once in a while - simply by chance - a sample that is randomly chosen will turn out not to be representative of the larger population (in properly conducted professional and scientific surveys, this happens less than 5 percent of the time, but it does happen)

c. Correlational Research: Measuring association between Events
  i. Definitions
    1) To examine associations between naturally occurring events or variables, scientists typically conduct **correlational research**, which in its simplest form has three components:
      a) The researcher measures one variable (X)
      b) The researcher measures a second variable (Y)
      c) The researcher statistically determines whether X and Y are related
    2) Correlational research involves measuring variables, not manipulating them.
    3) Naturalistic observation and surveys often are used not only to describe events, but also to study associations between variables.
  ii. Correlation Does not Establish Causation
    1) **Bidirectionality** (i.e., **two-way causality**) problem
      a) In correlational research, you must consider the possibility that variable X has caused variable Y, that Y has caused X, or that both variables have influenced each other.
    2) Third-variable problem
      a) The association between social relationships and happiness may be artificial, or what scientists call **spurious** (not genuine)
      b) Z is responsible for what looks like a relation between X and Y. As Z varies, it causes both X and Y to change. The net result is that X and Y change in unison, but this is caused by Z, not by and direct effect of X or Y on each other.
    3) In sum, we cannot draw causal conclusions from correlational data, which is the major disadvantage of correlational research.
  iii. The Correlation Coefficient
    1) A **correlation coefficient** is a statistic that indicates the direction and strength of the relation between two variables.
    2) Variables can be correlated either positively or negatively.
      a) A **positive correlation** means that higher scores on one variable are associated with higher scores on a second variable.
      b) A **negative correlation** occurs when higher scores on one variable are associated with lower scores on a second variable.
    3) Correlation coefficients range from values of +1.00 to -1.00.
      a) The plus or minus sign tells you the direction of a correlation (i.e., whether the variables are positively or negatively correlated).
      b) The absolute value of the statistic tells you the strength of the correlation.
    4) **Scatterplots** are graphs that show the correlation between two variables.
  iv. Correlation as a Basis for Prediction
    1) Benefits of Correlational Research
      a) Correlational research can help to establish whether relations found in the laboratory generalize to the outside world.
      b) Correlational studies can discover associations that are subsequently studied under controlled laboratory conditions.
      c) For practical or ethical reasons, some questions cannot be studied with experiments but can be examined with correlational methods.
      d) Correlational data allow us to make predictions.

d. Experiments: Examining Cause and Effect

i. Introduction
    1) In contrast to descriptive and correlational methods, experiments are a powerful tool for examining cause-and-effect relations.
    2) An **experiment** has three essential characteristics:
        a) The researcher **manipulates (i.e., controls) one or more variables**.
        b) The researcher **measures whether this manipulation influences other variables**.
        c) The researcher **attempts to control extraneous factors that might influence the outcome of the experiment**
    3) The Logic of Experimentation
        a) Start out with equivalent groups of participants.
        b) Treat them equally in all respects except for the variable that is of particular interest.
        c) Isolate this variable and manipulate it
        d) Measure how the groups respond
        e) If the groups respond differently, then the most plausible explanation is that these differences were caused by the manipulated variable.

ii. Independent and Dependent Variables
    1) The term **independent variable** refers to the factor that is manipulated or controlled by the experimenter.
    2) The **dependent variable** is the factor that is measured by the experimenter and that may be influenced by the independent variable.
    3) Some experiments have only one dependent variable, but we could have many.

iii. Experimental and Control Groups
    1) An **experimental group** is the group that receives a treatment or an active level of the independent variable.
    2) A **control group** is not exposed to the treatment or receives a zero-level of the independent variable.
        a) The purpose of the control group is to provide a standard of behaviour to which the experimental group can be compared.
    3) In an experiment, the **independent variables must have at least two levels**.
    4) In some experiments, the concept of a control group may not apply, like in a taste-test experiment in which participants taste and rate how much they like Coca-Cola versus Pepsi-Cola, each drink represents an experimental condition and we simply make a direct comparison between them.
    5) Experiments with one independent variable often include more than two experimental groups.

iv. Two Basic Ways to Design an Experiment
    1) Between Groups (or between subjects) design
        a) One common experimental design is called a **between groups (or between subjects) design** because each group in the experiment is composed of a different set of participants.
        b) To address the issue that any other participants-related conditions might influence the results of the experiments, researchers typically use **random assignment**, a procedure in which each participant has an equal likelihood of being assigned to any one group within an experiment.
        c) This procedure does not eliminate the fact that participants differ from one another in the experiment-related conditions. Instead, random assignment is used to **balance these differences** across the various conditions of the experiment.
    2) Repeated measures (or within subjects) design
        a) A second experimental design is called a **repeated measures (or within subjects) design**, in which each participant is exposed to all the conditions of an independent variable.
        b) This approach, however, can create problems if not used properly: the

participants can become bored, fatigued, or overconfident by the time they are in the second experiment.

c) To avoid this problem, researchers use **counterbalancing**, a procedure in which the order of conditions is varied so that no condition has an overall advantage relative to the others.

v. Manipulating Two Independent Variables

1) To better capture the complexity of real life, researchers often study several causal factors within a single experiment by manipulating two or more independent variables simultaneously.
2) The concept of **interaction** means that the way in which one independent (X1) variable influences the dependent variable (Y) differs depending on the various condition of another independent variable (X2).

3. Threats to the Validity of Research
   a. Definitions
      i. **Validity** refers to how well an experimental procedure actually tests what it is designed to test.
      ii. **Internal validity** represents the degree to which an experiment supports clear causal conclusions.
         1) If an experiment is well designed and properly conducted, we can be confident that the independent variable really was the cause of differences in the dependent variable.
         2) Such and experiment would have **high internal validity**
   b. Confounding of Variables
      i. **Cofounding of variables** means that two variables are intertwined in such a way that we cannot determine which one has influenced a dependent variable.
      ii. The third variable other than the independent variable is called a **confound** or a **confounding variable**.
      iii. Confounding of variables prevents one from drawing clear causal conclusions, and therefore it ruins the internal validity of the experiment.
      iv. Confounding is a key reason why causal conclusions cannot be drawn from correlational research.
   c. Placebo Effects
      i. In medical research, the term **placebo** refers to a substance that has no pharmacological effect.
      ii. In experiments testing the effectiveness of new drugs for treating diseases, one group of patients - **the treatment group** - receives the actual drug being investigated, and a second group, the **placebo control group**, receives only a placebo. Typically, participants are told that they will be given either a drug or a placebo, but they are not told which one they will receive.
      iii. **Placebo effect:** people receiving a treatment show a change in behaviour because of their expectations, not because the treatment itself had any specific benefit.
      iv. Placebo effects decrease internal validity by providing an alternative explanation for why responses change after exposure to treatment.
   d. Experimenter Expectancy Effects
      i. In psychology, the term **experimenter expectancy effects** refers to the subtle and unintentional ways researchers influence their participants to respond in a manner that is consistent with the researcher's hypothesis.
      ii. The **double-blind procedure**, in which both the participant and the experimenter are kept blind as to which experimental condition the participant is in, simultaneously minimizes participant placebo effects and experimenter expectancy effects.
   e. Replicating and Generalizing the Findings
      i. **External validity** is the degree to which the results of a study can be generalized to other populations, settings, and conditions.
      ii. Typically, judgement about external validity concern the **generalizability of underlying principles**.
      iii. **Replication** is the process of repeating a study to determine whether the original

findings can be duplicated.

iv. **Meta-analysis** is a statistical procedure for combining the results of different studies that examine the same topic to test the overall significance of the findings.
    1) Meta-analysis inform researchers about the direction and statistical strength of the relationships between two variables.
    2) Many researchers consider meta-analysis to be the most objective way to integrate the findings of multiple studies and reach overall conclusions about behaviour.

v. Increasingly, psychologists are paying more attention to **cross-cultural replication**: examining whether findings generalize across different cultures.

vi. Research findings that fail to replicate may lead to better research and new discoveries as scientists search for clues to explain why the results were different from one study to another.

vii. Studies that consistently fail to replicate the original results of earlier research may suggest that the original research was flawed or that the finding was a fluke.

4. Ethical Principles in Human and Animal Research
    a. Introduction
        i. Investigators are obliged to adhere to a set of ethical standards based on both government regulations and guidelines developed by national psychological organizations.
    b. Ethical Standards in Human Research
        i. Tri-council Policy for Ethical Conduct for Research Involving Humans
            1) In Canada, university research in large part is funded by one of three national government agencies: the Canadian Institutes of Health Research (CIHR), the Natural Sciences and Engineering Research Council (NSERC), and the Social Sciences and Humanities Research Council (SSHRC).
            2) These three agencies developed a "tri-council policy for ethical conduct for research involving humans", which universities must follow if they receive funding from any of the three councils.
            3) Universities are required to have **ethics review boards (ERBs)** that review the ethical issues involved in every research proposal.
        ii. Canadian Code of Ethics for Psychologists
            1) Protect and promote the welfare of participants
            2) Avoid doing harm to participants
            3) Not carry out any studies unless the probable benefit is proportionately greater than the risk
            4) Provide **informed consent** - that is, explain all aspects of the procedure and ensure that the procedure is understood. Oral or written consent is usually required, and assurance is given that one can withdraw from the study without penalty. For those not able to give informed consent, consent must be obtained from parents or guardians.
            5) Take all reasonable steps to ensure that consent is not given under coercion.
            6) Ensure privacy and confidentiality.
        iii. Incomplete Disclosure
            1) The use of **incomplete disclosure**, or **deception**, that occurs when participants are misled about the nature of a study, is highly controversial.
            2) Proponents of deception research argue that, when studying certain types of behaviours, deception is the only way to obtain natural, spontaneous responses from participants.
            3) The guideline permit incomplete disclosure only when no other feasible alternative is available and when the scientific, educational, or applied benefits clearly outweigh the ethical costs of deceiving participants.
            4) If incomplete disclosure is used, participants must be **debriefed** - told the true purpose of the study at the end of the experiment.
        iv. Ethics in the use of the Internet
            1) Internet researchers must take special care to ensure that they protect participants' privacy and confidentiality, obtain informed consent, and

debrief participants.
2) These actions can be difficult when deception is used because Internet respondents can drop out at any point in the study.

v. It should be noted that participants generally enjoy participating in psychological research.

c. Ethical Standards in Animal Research
   i. In Canada, both CPA and federal government codes of ethics state that experimental animals should not be subject to pain, stress, or privation unless no alternative procedure is available and the research is justified by prospective scientific or educational benefits.
   ii. The Canadian tri-council granting agency requires university ERBs (which usually include non-scientists) to review and approve all animal research proposals.
   iii. Most ERBs follow the rules set down by the Canadian Council on Animal Care in its **Guide to the Care and Use of Experimental Animals**.
   iv. Most psychologists and university psychology majors believe that animal research is necessary for scientific progress in psychology. And Proponent point to important medical and psychological advances made possible by animal research and also note that animal research has benefited animals.
   v. American Anti-Vivisection Society maintains that animals should never be used in research which is not for the benefit of the animals involved.

5. Critical Thinking in Science and Everyday Life
   a. Especially in the popular media, we encounter oversimplifications, overgeneralizations, and **pseudoscientific misinformation**: bunk and psychobabble that is made to sound scientific.
   b. We should recognize that our beliefs and emotions can act as psychological blinders that allow us to accept inadequate evidence uncritically, especially when this evidence supports our current views.
   c. We need to balance open-mindedness with a healthy skepticism and evaluate evidence for what it is worth.

Chapter 2 Summary

September 17, 2017 9:22 PM

1. Scientific Principles in Psychology
    a. The scientific process proceeds through several steps: 1) asking questions based on some type of observation; 2) gathering information and formulating a testable hypothesis; 3) conducting research to test the hypothesis; 4) analyzing the data, drawing tentative conclusions, and reporting one's findings to the scientific community; and 5) building a body of knowledge by asking further questions, conducting more research, and developing and testing theories.
    b. In everyday life, we typically use hindsight to explain behaviour. Hindsight is flawed because there may be many possible explanations for behaviour and no way to ascertain which one is correct. Psychologists prefer to test their understanding through prediction, control, and theory building.
    c. A good theory organizes known facts, gives rise to additional hypotheses that are testable, is supported by the findings of new research, and is parsimonious.
    d. An operational definition defines a concept or variable in terms of the specific procedures used to produce or measure it.
    e. To measure behaviour, psychologists obtain people's self-reports and reports from others who know the participants, directly observe behaviour using unobtrusive measures, analyze archival data, administer psychological tests, and record physiological responses.
2. Methods of Research
    a. The goal of descriptive research is to identify how organisms behave, particularly in natural settings. Case studies involve the detailed study of a person, group, or event. Case studies often suggest important ideas for further research, but they are a poor method for establishing cause-effect relations.
    b. Naturalistic observation can yield rich descriptions of behaviour in real-life settings and permits examination of relations between variables. Researchers must avoid influencing the participants they observe.
    c. Survey involve administering questionnaires or interviews to many people. Most surveys study a sample of people that is randomly drawn from the larger population. Representative samples allow researchers to estimate the responses of the entire population. Unrepresentative samples also can lead to inaccurate estimates. Survey results also can be distorted by interviewer bias or biases in the way participants report about themselves.
3. Correlational Research
    a. Correlational research measures the association between naturally occurring variables. A positive correlation means that higher scores on one variable are associated with higher scores on a second variable. A negative correlation occurs when higher scores on one variable are associated with lower scores on a second variable.
    b. Causal conclusions cannot be drawn from correlational data. Variable X may cause Y; Y may cause X; or some third variable (Z) may be the true cause of both X and Y. Nevertheless, if two variables are correlated, then knowing the scores of one variable will help to predict the scores of the other.
4. Experiments: Examining Cause and Effect
    a. A well-designed experiment is the best way to examine cause-effect relations. Experiments have three essential characteristics: 1) one or more variables called independent variables are manipulated; 2) their effects on other variables called dependent variables are measured; and 3) extraneous factors are eliminated or reduced so that cause-effect conclusions can be drawn. The independent variable is viewed as the cause, and the dependent variable as the effect.
    b. In some experiments, different participants are randomly assigned to different conditions, creating experimental and control groups that are equivalent at the start of

the study. This is called a between group design.
    c. In other experiments, the same participants are exposed to all the conditions, but the order in which the conditions are presented is counterbalanced. This is called a repeated measures design.
    d. Researchers can examine several causal factors within a single experiment by simultaneously manipulating two or more independent variables. The separate influence of each variable on behaviour can be determined, as well as any interactions between them - that is, when particular combinations of variables produce distinct effects.
5. Threats to the Validity of Research
    a. An experiment has high internal validity when it is well designed and permits clear causal conclusions.
    b. Confounding occurs when the independent variable becomes mixed up with an uncontrolled variable. Confounding ruins internal validity because we can no longer tell which variable caused the changes in the dependent variable.
    c. Internal validity is weakened by 1) placebo effects, in which the mere expectation of receiving a treatment produces a change in behaviour, and 2) experimenter expectancy effects, which are the subtle ways a researcher's behaviour influences participants to behave in a manner consistent with the hypothesis being tested.
    d. The double-blind procedure prevents placebo effects and experimenter expectancy effects from biasing research results.
    e. External validity is the degree to which the findings of a study can be generalized to other populations, settings, and conditions. By replicating (repeating) a study under similar and dissimilar circumstances, researchers can examine its external validity.
    f. Researchers can assess external validity by statistically combining the results of many studies that test the same variables by using meta-analysis.
6. Ethical Standards in Animal Research
    a. Psychological research follows extensive ethical guidelines. In human research, key issues are the use of informed consent, the participants' right to privacy, the degree of risk, and the use of deception.
    b. Ethical guidelines require that animals be treated humanely and that the risks to which they are exposed be justified by the potential importance of the research.
    c. Before human and animal research can be conducted, it must be reviewed and approved by ethics review boards that often include non-scientists.
7. Critical Thinking in Science and Everyday life
    a. Critical thinking is an important life skill. However, we should also be open-minded to ideas that are supported by solid evidence, even when they conflict with out preconceptions.
    b. There is no generally accepted, replicable scientific evidence of paranormal phenomena.
    c. In science and everyday life, critical thinking can prevent us from developing false impressions about how the world operates and from being duped in everyday life by unsubstantiated claims.

Method	**Primary Feature**	**Main Advantages**	**Main Disadvantages**
Case Studies	An individual, group, or event is examined in detail, often by using several techniques (observations, interviews, psychological tests).	Provides rich descriptive information, often suggesting hypotheses for further study.	Poor method for establishing cause-effect relations. The person or event may not be representative.

		Can study rare phenomena in-depth.	Often relies heavily on the researcher's subjective interpretations.
Naturalistic Observation	Behaviour is observed in the setting in which it naturally occurs	Can provide detailed information about the nature, frequency, and context of naturally occurring behaviour.	Poor method for establishing cause-effect relations. Observer's presence, if known, may influence participants' behaviour.
Surveys	Questions or tests are administered to a sample drawn from a larger population.	A properly selected, representative sample typically yields accurate information about the broader population.	Unrepresentative samples may yield misleading results. Interviewer bias and social desirability bias can distort the findings.
Correlational Studies	Variables are measured and the strength of the association is determined. Naturalistic observation and surveys also are often used to examine associations between variables.	Correlation allows prediction. May help establish how well findings from experiments generalize to more natural settings. Can examine issues that cannot be studied ethically or practically in experiments.	Correlation does not imply causation because of the bidirectionality problem and the third-variable problem, which can create a confounding of variables.
Experiments	Independent variables are manipulated and their effects on dependent variables are measured.	Optimal method for examining cause-effect relations. Ability to control extraneous factors helps rule out alternative explanation.	Confounding of variables, placebo effects, and experimenter expectancies can threaten the validity of causal conclusions.

Appendix: Statistics in Psychology

September 20, 2017 4:22 PM

1. Descriptive Statistics
    a. **Descriptive statistics** summarize and describe the characteristics of a set (also called a **distribution**) of scores
    b. **Frequency distribution** shows how many participants received each score.
        i. Sometimes the researchers choose to use **intervals** of scores rather than each individual score.
        ii. The number of intervals chosen is somewhat arbitrary, but frequency distribution often contain 10 to 12 categories.
    c. **Histogram** is a graph of a frequency distribution.
2. Measures of Central Tendency
    a. **Measures of central tendency** describe a distribution in terms of a single statistic that is in some way "typical" of the sample as a whole.
    b. The **mode** is the most frequently occurring score in a distribution.
    c. The **mean** represents the arithmetic average of a set of scores.
    d. The **median** is the point that divides the distribution in half when the individual scores are arranged in order from lowest to highest.
        i. It is unaffected by extreme scores.
3. Measures of Variability
    a. **Measure of variability** provide information about the spread of scores in a distribution.
    b. The **range**, which is the difference between the highest and the lowest score in a distribution, is the simplest but least informative measure of variability.
    c. **Deviation score** measures the distance between each score and the mean.
    d. **Variance** is the average of the squared deviation scores about the mean.
    e. **Standard deviation** is the square root of the variance.
4. The Normal Curve
    a. The **normal curve** is a symmetrical bell-shaped curve that represents a theoretical distribution of scores in the population.
    b. In the normal curves, 50 percent of the cases fall on each side of the mean, and the median and mode have the same value as the mean.
    c. The standard deviation can be used to divide the normal curve into areas containing known percentages of the population.
5. Statistical Methods for Data Analysis
    a. Accounting for Variance in Behaviour
        i. In any experiment, the total amount of variation in people's behaviour may be divided into two components: the amount of variance accounted for by the differences in the independent variables being manipulated and the amount of variance that is left over and therefore must be due to other factors.
        ii. Some of these other factors, which are random and beyond the control of the experimenter, produce what is called **error variance**.
        iii. The rest of the unexplained variance results from factors that systematically affect the result but which the researcher either does not know about or were not controlled for in the experiment.
        iv. From this perspective, understanding and/or predicting behaviour involves isolating factors that account for behavioural variance.
    b. Correlational Methods
        i. The Correlation Coefficient
            1) Relations between variables can differ in **direction** (positive or negative) and in **strength**.
            2) **The Pearson product-moment correlation coefficient** is a statistic that reflects the direction and strength of the relation between two variables.
            3) The correlation coefficient can range in magnitude from -1.00 to +1.00.

4) Squaring the correlation coefficient indicates the amount of variance in one measure can be accounted for by differences in the other measure.

ii. Correlation and Prediction
   1) The more highly two variables are correlated, the more accurate our predictions will be.

iii. Factor Analysis
   1) **Factor analysis** reduces a large number of correlations among many measures to a smaller number of clusters, with each cluster containing variables that correlate highly with one another.
   2) The term **factor** refers to the underling characteristic that presumably accounts for why the measures within each cluster are linked together.
   3) Correlation matrix
      a) The correlation coefficients of 1.00 along the diagonal of the matrix reflex reflect the obvious fact that each variable correlates perfectly with itself.
      b) Because the bottom half of the matrix contains the same correlations as the top.

c. Inferential Statistics and Hypothesis Testing
   i. **Inferential statistics** tell us how confident we can be in drawing conclusions or inferences about a population based on findings obtained from a sample.
   ii. **Statistical significance** means that it is unlikely that the particular finding occurred by chance alone.
      1) Psychologists typically consider a result to be statistically significant only if it could have occurred by chance alone less than 5 times in 100.
   iii. **Null hypothesis** states that any observed differences between the samples are due to chance.

Chapter 3 Biological Foundations of Behaviour

September 25, 2017 11:53 AM

1. The Neural Bases of Behaviour
    a. Neurons
        i. Specialized cells called **neurons** are the basic building blocks of the nervous system.
        ii. Each neuron has three main parts: a cell body, dendrites, and an axon.
            1) The cell body, or **soma**, contains the structures needed to keep the neuron alive, and its nucleus contains the genetic information that determines how the neuron develops and functions.
            2) Emerging from the cell body are branch-like fibres called **dendrites**.
                a) These specialized receiving units are like antennas that collect messages from neighbouring neurons and send them on to the cell body.
                b) There, in the soma, the incoming information is combined and processed.
                c) The surface of the cell body also has receptor areas that can be directly stimulated by other neurons.
            3) Extending from one side of the cell body is a single **axon**, which conducts electrical impulses away from the cell body to other neurons, muscles, or glands.
                a) The axon branches out at its end to form a number of **axon terminals** - as many as several hundred in some cases.
                b) Each axon may connect with dendritic branches from other neurons, making it possible for a single neuron to pass messages to as many as 50 000 other neurons.
        iii. Neurons can vary greatly in size and shape. Yet regardless of their shape or size, neurons share a common overall structure and function.
        iv. Neurons are supported in their functions by **glial cells**.
            1) Glial cells surround neurons and hold them in place.
                a) During prenatal brain development, as new neurons are being formed, glial cells send out long fibres that guide newly divided neurons to their eventual place in the brain.
            2) Glial cells also manufacture of transport nutrients, form the myelin sheath around some axons, and absorb toxins and waste materials that might damage neurons.
                a) Within the nervous system, glial cells outnumber neurons about ten to one.
            3) Another function of glial cells is to protect the brain from toxins.
                a) Many foreign substances can pass from the circulation into the different organs of the body but cannot pass from the blood into the brain.
                b) A specialized barrier, the **blood-brain barrier**, prevents many substances, including a wide range of toxins, from entering the brain.
                c) The walls of the blood vessels within the brain contain smaller gaps than elsewhere in the body, and they are also covered by a specialized type of glial cell. Together, the smaller gaps and glial cells keep many foreign substances from gaining access to the brain.
            4) Recent research has found evidence for much more complex glial function, such as a role in modulating the communication among neurons.
        v. Neurons do two important things: generate electricity and release chemicals that allow them to communicate with others and with muscles and glands.
    b. The Electrical Activity of Neurons

i. Introduction
    1) How the nerve impulses occur
        a) Step1: at rest, the neuron has an electrical resting potential due to the distribution of positively and negatively charged chemicals (ions) inside and outside the neuron.
        b) Step2: when stimulated, a flow of ions in and out through the cell membrane reverses the electrical charge of the resting potential, producing an action potential, or nerve impulse.
        c) Step3: the original distribution of ions is restored, and the neuron is again at rest.
    2) Iron Channels
        a) Neurons are surrounded by body fluids and separated from this liquid environment by a protective membrane.
        b) This cell membrane is a bit like a selective sieve, allowing certain substances to pass through **ion channels** into the cell while refusing or limiting passage to other substances.
        c) An icon channel is a channel in the membrane that can open to allow certain ions to pass through.
    3) The Chemical Environment
        a) The Chemical environment inside the neuron differs from its external environment in significant ways, and the process that allows a nerve impulse to be created involves the exchange of electrically charged atoms called **ions**.
        b) In the salty fluid outside the neuron, there are positively charged sodium ions (Na+) and negatively charged chloride ions (CL-).
        c) Inside the neuron are large negatively charged protein molecules (anions or A-) and positively charged potassium ions (K+).
        d) The high concentration of sodium ions in the fluid outside the cell, together with the negatively charged protein inside, results in an uneven distribution of positive and negative ions that makes the interior of the cell negative compared to the outside.
        e) This internal difference of around 70 millivolts (thousandths of a volt) is called the neuron's **resting potential**.

ii. The Action Potential
    1) An **action potential** is a sudden reversal in the neuron's membrane voltage, during which the membrane voltage momentarily moves from -70 millivolts (inside) to +40 millivolts.
    2) The shift from negative to positive voltage is called **depolarization**.
    3) The Process of Action Potential
        a) In a resting state, the neuron's sodium and potassium channels are closed, and the concentration of Na+ is 10 times higher outside the neuron than inside it.
        b) When a neuron is stimulated sufficiently, sodium channels open. Attracted by the negative protein ions inside, positively charged sodium ions flood into the axon, creating a state of depolarization.
        c) In a reflex action to restore the resting state, the cell closes its sodium channels, and positively charged potassium ions flow out through their channels, restoring the negative resting potential.
        d) Eventually, the excess sodium ions flow out of the neuron, and the escaped potassium ions are recovered.
    4) Once an action potential occurs at any point on the membrane, its effects spread to adjacent sodium channels and the action potential flows down the length of the axon to the axon terminals.
    5) Immediately after an impulse passes a point along the axon, there is an **absolute refractory period**, during which the membrane is not excitable and cannot generate another action potential.
        a) This places an upper limit on the rate at which nerve impulses can

occur. In humans, the limit is about 300 impulses per second.
    b) It also means that once an action potential starts it travels in only one direction, from soma along the axon to the dendrites.
6) <u>It's All or Nothing</u>:
    a) **All-or-none Law**: for a specific type of neuron, action potentials occur at a uniform and maximum intensity, or they do not occur at all.
    b) The negative potential inside the axon has to be changed from 070 millivolts to about -55 millivolts (the **action potential threshold**) by the influx of sodium ions into the axon before the action potential will be triggered.
    c) Changes in the negative resting potential that do not reach the -55 millivolts action potential threshold are called **graded potentials**.
        i) Under certain circumstances, graded potentials caused by several neurons can add up to trigger an action potential in the postsynaptic neuron, but changes below the threshold usually go no further.

iii. The Myelin Sheath
1) Many axons that transmit information throughout the brain and spinal cord are covered by a **myelin sheath**, a fatty, whitish insulation layer derived from glial cells during development.
2) The myelin sheath is interrupted at regular intervals by the **node of Ranvier**, where the myelin is either extremely thin or absent.
3) In unmyelinated axons, the action potential travels down the axon length like a burning fuse. In myelinated axons, electrical conduction can skip from node to node, and these "great leaps" from one gap to another account for high conduction speeds of more than 300 kilometres per hour.
4) The myelin sheath is most commonly found in the nervous systems of higher animals.
    a) In many nerve fibers, including important motor nerves in humans, the myelin sheath is not completely formed until after birth.
5) The tragic effects of damage to the myelin coating can be seen in people who suffer from **multiple sclerosis**.
    a) This progressive disease occurs when the person's own immune system attacks the myelin sheath.
    b) Damage to the myelin sheath disrupts the delicate timing of nerve impulses, resulting in jerky, uncoordinated movements and, in the final stages, paralysis.

c. How Neurons Communicate: Synaptic Transmission
i. Introduction
1) The famous Spanish anatomist Santiago Ramou y Cajal and the British scientist Charles Sherrington demonstrated that neurons were individual cells that did not make actual physical contact with each other, but communicated at a **synapse**, a functional (not physical) connection between a neuron and its target.
2) Otto Loewi demonstrated that neurons released chemicals, and it was these chemicals that carried the message from one neuron to the next cell in the circuit.
3) With the advent of the electron microscope, researchers were able to actually see that there is indeed a tiny gap or space, called the **synaptic cleft**, between the axon terminal of one neuron and the dendrite of the next neuron.

ii. Neurotransmitters
1) In addition to generating electricity, neurons produce and release substances called **neurotransmitters**, chemicals that carry messages across the synapse to either excite or inhibit the activity of the next cell.
2) This process of chemical communication involves five steps: synthesis, storage, release, binding, and deactivation.

a) In the **synthesis** stage, the chemical molecules are formed inside the neuron.
b) The molecules are then stored in chambers called **synaptic vesicles** within the axon terminals.
c) When an action potential comes down the axon, these vesicles move to the surface of the axon terminal and release the chemical neurotransmitter into the fluid-filled space between the axon of the sending (**presynaptic**) neuron and the membrane of the receiving (**postsynaptic**) neuron.
d) The molecules of neurotransmitter cross the synaptic space and bind (attach) to **receptor sites** - large protein molecules embedded in the receiving neuron's cell membrane.

iii. Excitation, Inhibition, and Deactivation

1) The binding of a transmitter molecule to the receptor site produces a chemical reaction that can have one of two effects on the postsynaptic neuron, making it either more or less likely that the postsynaptic neuron will generate an action potential.
    a) In some cases, the reaction will depolarize (**excite**) the postsynaptic cell membrane by stimulating the inflow of sodium or other positively charged ions, making it more likely the neuron will reach the threshold to generate an action potential.
        i) Neurotransmitters that create depolarization are called **excitatory transmitter**.
        ii) This stimulation, alone or in combination with activity at other excitatory synapses on the dendrites or the cell body, may exceed the action potential threshold and cause the postsynaptic neuron to fire an action potential.
    b) In other cases, the chemical reaction created by the docking of a neurotransmitter at its receptor site will **hyperpolarize** the postsynaptic membrane by stimulating ion channels that allow positively charged potassium ions to flow out of the neuron or negatively charged ions, such as chloride, to flow into the neuron. This makes the membrane potential even more negative and makes it more difficult for excitatory transmitters at other receptor sites to depolarize the neuron to its action potential threshold.
        i) Transmitters that create hyperpolarization are thus **inhibitory** in their function.
2) Every neuron is constantly bombarded with excitatory and inhibitory neurotransmitters from other neurons, and the interplay of these influences determines whether the cell fires an action potential or not.
    a) An exquisite balance between excitatory and inhibitory processes must be maintained if the nervous system is to function properly.
    b) The process of inhabitation allows a fine-tuning of neural activity and prevents an uncoordinated discharge of the nervous system, as occurs in a seizure, when large numbers of neurons fire off action potentials in a runaway fashion.
3) Once a neurotransmitter molecule binds to its receptor, it continues to activate or inhibit the neuron until it is shut off, or **deactivated**. This deactivation occurs in two major ways.
    a) Some transmitter molecules are deactivated by other chemicals located in the synaptic space that break them down into their chemical components.
    b) In other instances, the deactivation mechanism is **reuptake**, in which the transmitter molecules are reabsorbed into the presynaptic axon terminal.
4) Most commonly used, and abused, psychoactive drugs influence one of these steps in chemical neurotransmission.

a) Drugs may target the transmitter's receptor, biding to the receptor in place of the neurotransmitter, or one of the steps in the synthesis or release of the neurotransmitter.
b) Drugs can also alter synaptic transmission by influencing how the transmitter is cleared from the synaptic cleft after it has been released.
c) A drug's exact psychological effects, however, are not determined by its actions at the synapse, but by which specific chemical transmitter it targets.

iv. Specialized Transmitter Systems
1) At present, 100 to 150 different substances are known or suspected transmitters in the brain, but there may be many more.
a) Each substance has a specific excitatory or inhibitory effect on certain neurons.
b) The chemical specificity protects the brain from "crosstalk" and allows specific chemical systems to serve specific functions.
2) Glutamate and GABA
a) Two widespread neurotransmitters are simple amino acids, glutamate, or glutamic acid, and gamma-aminobutyric acid, or GABA. Both are found throughout the central nervous system, and hence have some role in mediating virtually all behaviours.
b) Glutamate is excitatory and has particularly important role in the mechanisms involved in learning and memory.
i) Over-activation of glutamate will induce seizure activity within the brain, especially within the cerebral cortex.
c) GABA is especially important for motor control and the control of anxiety.
i) The drugs most commonly used to treat anxiety disorders, the benzodiazepines, act by enhancing GABA activity.
ii) A commonly used drug, alcohol, acts, in parts, to make the brain more sensitive to GABA, although in a less specific way than the anti-anxiety benzodiazepines.
iii) The symptoms of intoxication reflect the progressive inhabitation of brain function with increasing GABA-induced inhibition.
3) Acetylcholine (ACh)
a) **Acetylcholine (ACh)** is involved in memory and muscle activity.
b) Reduction
i) Underproduction of ACh is thought to be an important factor in **Alzheimer's disease**, a degenerative brain disorder involving profound memory impairment that afflicts between 5 and 10 percent of all people over 65 years of age.
c) ACh is also an excitatory transmitter at the synapses where neurons activate muscle cells.
i) Drugs that block the action of ACh, therefore, can prevent muscle activation, resulting in muscular paralysis .
ii) One example occurs in **botulism**, a serious type of food poisoning that can result from improperly canned food. The toxin formed by the botulinum bacteria blocks the release of ACh from the axon terminal, resulting in a potentially fatal paralysis of the muscles, including those of the respiratory system.
iii) The opposite effect of ACh occurs with the bite of the black widow spider. The spider's venom produces a torrent of ACh, resulting in violent muscle contractions, convulsions, and even death.
4) Dopamine

a) The neurotransmitter of **dopamine** mediates a wide range of functions, including motivation, reward, and feeling of pleasure; voluntary motor control; and control of thought processes.
b) Diseases
i) In Parkinson's disease, one specific group of dopamine-producing neurons degenerate and die.
One. As dopamine is lost in the affected brain areas, there is a concomitant loss of voluntary motor control.
Two. The symptoms of Parkinson's disease are most commonly treated with a drug (L-DOPA) that increases the amount of dopamine within the brain.
ii) The treatment of emotionally disturbed people was revolutionized by the development the antipsychotic drugs.
One. Antipsychotic drugs attach to dopamine receptors and block dopamine from having its effects.
Two. Such blockade of dopamine is effective in treating symptoms of schizophrenia, and led to the theory that schizophrenia is due to overactivity in specific dopamine systems.
iii) Dopamine has also been associated with the motivating and rewarding properties of the major drugs of abuse.

5) Serotonin
a) **Serotonin** is a neurotransmitter that influences mood, eating, sleep, and sexual behaviour.
b) Depression involves abnormal sensitivity to serotonin.
i) Antidepressant drugs increase serotonin activity in several ways. Drugs like Prozac, known as selective serotonin-reuptake inhibitors (SSRIs), block the reuptake of serotonin from the synaptic space, allowing serotonin molecules to remain active and exert their mood-altering effects.
ii) Other antidepressant drugs inhibit the activity of enzymes in the synaptic space that deactivate serotonin by breaking it down into simpler chemicals. In so doing, they prolong serotonin activity at the synapse.

6) Endorphins
a) **Endorphins** reduce pain and increase feelings of well-being.
b) They bind to the same receptors as the ones activated by opiate drugs, such as opium and morphine, which produce similar psychological effects.
c) The ability of people to continue to function despite severe injury is due in large part to the release of endorphins and their ability to act as analgesics.

7) Neuromodulators
a) **Neuromodulators** have a more widespread and generalized influence on synaptic transmission.
b) These substances circulate through the brain the either increase or decrease (i.e. modulate) the sensitivity of neurons to their specific transmitters.
c) Neuromodulators play important roles in functions such as eating, sleep, and stress.

8) Thus, some chemical transmitters have very specific effects (neurotransmitters) whereas others have more general effects on neural activity (neuromodulators).

2. The Nervous System
a. Introduction
i. Three major types of neurons carry out the system's input, output, and integration functions.

1) **Sensory neurons** carry input messages from the sense organs to the spinal cord and brain.
2) **Motor neurons** transmit output impulses from the brain and spinal cord to the body's muscles and organs.
3) **Interneurons**, which far outnumber sensory and motor neurons, perform connective or associative functions within the nervous system.

ii. The nervous system can be broken down into several interrelated subsystems.
1) The **Central nervous system** consists of all the neurons in the brain and spinal
2) The **peripheral nervous system** is composed of all the neurons that connect the central nervous system with the muscles, glands, and sensory receptors.

b. The Peripheral Nervous System
i. Introduction
1) The peripheral nervous system has two major divisions, the somatic nervous system and the autonomic nervous system.

ii. The Somatic Nervous System
1) The **somatic nervous system** consists of the **sensory neurons** that are specialized to transmit the messages from the eyes, ears, and other sensory receptors, and the **motor neurons** that send messages from the brain and spinal cord to the muscles that control our voluntary movements.
2) The axons of sensory neurons group together like the many strands of a rope to form **sensory nerves**, and motor neuron axons combine to form **motor nerves**.
3) Inside the brain and spinal cord, nerves are called **tracts**.
4) The somatic system allows you to sense and respond to your environment.

iii. The autonomic Nervous System
1) Function of Autonomic Nervous System
a) The body's internal environment is regulated largely through the activities of the **autonomic nervous system**, which controls the glands and the smooth (involuntary) muscles that form the heart, the blood vessels, and the lining of the stomach and intestines.
b) The autonomic system is largely concerned with involuntary functions, such as respiration, circulation, and digestion.
c) It is also involved in many aspects of motivation, emotional behaviour, and stress responses.

2) Two Subdivisions of Autonomic Nervous System
a) Sympathetic Nervous System
i) The **sympathetic nervous system** has an activation or arousal function, and it tends to at as a total unit.

b) Parasympathetic Nervous System
i) Compared to the sympathetic branch, which tends to act as a unit, the **parasympathetic nervous system** is far more specific in its opposing actions, affecting one or a few organs at a time.
ii) The **parasympathetic nervous system** slows down body processes and maintains or returns you to a state of rest.

c) Cooperation of the Two Systems
i) By working together to maintain equilibrium in our internal organs, the two divisions can maintain **homeostasis**, a delicately balanced or constant internal state.
ii) Some acts also require a coordinated sequence of sympathetic and parasympathetic activities.
One. For example, sexual function in the male involves penile erection (through parasympathetic dilation of blood vessels) followed by ejaculation (a primarily sympathetic function)

c. The Central Nervous System
i. The Spinal Cord

1) Structure of the Spinal Cord
    a) Most nerves enter and leave the central nervous system by way of the spinal cord, a structure that in a human adult is 40 to 45 centimetres long and about 2.5 centimetres in diameter.
    b) The spinal cord's neurons are protected by the **vertebrae** (bones of the spine).
    c) The H-shaped portion of the spinal cord consists largely of grey-colored neuron cell bodies and their interconnections.
    d) Surrounding the grey matter are white-colored myelinated axons that connect various levels of the spinal cord with each other and with the higher centres of the brain.
    e) Entering the back side of the spinal cord along its length are sensory nerves.
    f) Motor nerves exit the spinal cord's front side.
2) Some simple stimulus-response sequences, known as **spinal reflexes**, can be triggered at the level of the spinal cord without any involvement of the brain.

ii. The Brain
1) The brain is 1.4 kilograms of protein, fat, and fluid in the skull.
2) Although the brain accounts for only about 2 percent of your total body weight, it consumes about 20 percent of the oxygen you use in a resting state.

iii. Unlocking the Secrets of the Brain
1) Neuropsychological tests
    a) Psychologists have developed a variety of **neuropsychological tests** to measure verbal and non-verbal behaviours that are known to be affected by particular types of brain damage.
    b) These tests are used in clinical evaluations of people who may have suffered brain damage through accident or disease.
    c) Trail Making Test is used to test memory and planning. Scores on the test give an indication of the type and severity of damage the person may have.
        i) The Trail Making Test consists of a randomly scattered set of numbers and letters. On this timed test, the patient must connect the numbers and letters consecutively with a continuous line, or "trail".
2) Destruction and stimulation techniques
    a) How to destroy
        i) Researchers can produce brain damage (lesions) under carefully controlled conditions in which specific nervous tissue is destroyed with electricity, with cold or heat, or with chemicals.
        ii) They can also surgically remove some portion of the brain and study the consequences.
        iii) Most experiments of this kind are performed on animals, but humans also can be studied when accident or disease produces a specific lesion or when abnormal brain tissue must be surgically removed.
    b) How to stimulate
        i) An alternative to destroying neurons is stimulating them, which typically produce opposite effects.
        ii) A specific region of the brain can be stimulated by a mild electric current or by chemicals that excite neurons.
        iii) Electrodes can be permanently implanted so that the region of interest can be stimulated repeatedly.
        iv) In chemical stimulation studies, a tiny tube is inserted into the brain so that a small amount of the chemical can be delivered directly to the area to be studied.

c) TMS
    i) A recent advance in these techniques is **transcranial magnetic stimulation** or **TMS**.
    ii) TMS uses a magnetic coil placed close to the person's head to generate a magnetic field that disrupts activity in the brain region just under the coil.
    iii) This allows the activity of specific brain areas to be disrupted temporarily without any form of surgery or other invasive action.
    iv) Together with its use to explore the functions of brain areas close to the scalp, TMS has also been used to treat stroke, multiple sclerosis, migraine, and some chronic pain diseases.

3) Electrical Recording
    a) Because electrodes can record brain activity as well as stimulate it, it is possible to "eavesdrop" on the electrical conversations occurring within the brain.
    b) Neuron's electrical activity can be measured by inserting small electrodes into particular areas of the brain or even into individual neurons.
    c) In addition to measuring individual voices, scientists can tune in to crowd noise by placing larger electrodes on the scalp to measure the activity of large groups of neurons with the **electroencephalogram (EEG)**.
    d) Although the EEG is a rather gross measure that taps the electrical activity of thousands of neurons in many parts of the brain, specific EEG patterns correspond to certain states of consciousness, such as wakefulness and sleep.
    e) Clinicians also use the EEG to detect abnormal electrical patterns that signal the presence of brain disorders.
    f) Changes in the EEG that accompany such certain psychological events are called **event-related potentials**.
4) Brain imaging
    a) Introduction
        i) CT scans, PET scans, and magnetic resonance imaging are the most important methods of brain imaging.
        ii) CT scans and MRIs are used to visualize brain structure, where PET scans and fMRIs allow scientists to view brain activity.
    b) Computerized axial tomography
        i) Developed in the 1970s, computerized axial tomography (CT) scans use X-ray technology to study brain structures.
        ii) A highly focused beam of X-ray takes pictures of narrow slices of the brain, and a computer analyzes the X-rayed slices and creates pictures of the brain's interior from many different angles.
    c) Position Emission Tomography Scans
        i) While CT scans provide pictures of brain structures, **position emission tomography (PET) scans** measure brain activity, including metabolism, blood flow, and neurotransmitter activity.
        ii) PET is based on the fact that glucose, a natural sugar, is the major nutrient of neurons. Thus when neurons are active, they consume more glucose.
        iii) To prepare a patient for a PET scan, a harmless form of radioactive glucose is injected into the bloodstream and travels to the brain.
        iv) The energy emitted by the radioactive substance is measured by the PET scan, and the data are fed into a computer that uses the readings to produce a colour picture of the brain on a display

screen.

v) Researchers can tell how active particular neurons are by measuring the amount of radioactive glucose that accumulates in them.

d) Magnetic Resonance Imaging

i) **Magnetic resonance imaging (MRI)** combines features of CT and PET scans and can be used to study both brain structures and brain activity.

ii) Functions

One. MRI creates images based on how atoms in living tissue respond to a magnetic pulse delivered by the device.

Two. MRI can make out details one-tenth the size of what CT scans can detect, and it distinguishes much better between different types of brain tissue.

Three. In addition to providing colour images

iii) Processes

One. To obtain an MRI, the researcher places the part of the body to be studied in the hollow core of a log magnetic cylinder and exposes the atoms in the subject's body to a uniform magnetic field.

Two. The field is then altered, and when the magnetic field is shut off, the magnetic energy absorbed by the atoms in the tissue emits a small electrical voltage.

Three. The voltage is picked up by detectors and relayed to a computer for analysis.

e) Functional MRI

i) The conventional MRI yields pictures taken several minutes apart, while a **functional MRI (fMRI)** can produce pictures of blood flow in the brain taken less than a second apart.

ii) Researchers now can watch "live" presentations as different regions of the brain light up when subjects are given various types of tasks to perform.

iii) Researchers thereby can identify brain regions involved in specific psychological functions.

3. The Hierarchical Brain: Structures and Behavioural Functions

a. The Hindbrain

i. Introduction

1) As the spinal cord enters the brain, it enlarges to form the structures that compose the stalk-like **brain stem**.

2) Attached to the brain stem is the other major portion of the hindbrain, the **cerebellum**.

ii. The Brain Stem: Life Support System

1) Medulla

a) The **medulla** is the first structure encountered after leaving the spinal cord.

b) Well developed at birth, the 3.8 centimeter-long medulla plays an important role in vital body functions, such as heart rate and respiration.

i) Because of your medulla, these functions occur automatically.

ii) Damage to the medulla usually results in death or, at best, the need to be maintained on life support systems.

iii) Suppression of medulla activity can occur at high levels of alcohol intoxication, resulting in death by heart of respiratory failure.

c) The Medulla is also a two-way thoroughfare for all the sensory and motor nerve tracts coming up from the spinal cord and descending from the brain.

i) Most of these tracts cross over within the medulla, so the left side of the brain receives sensory input from and exerts motor control over the right side of the body, and the right side of the brain serves the left side of the body.

2) Pons
   a) The **pons** (meaning bridge in Latin) lies just above the medulla, and it indeed serves as a bridge carrying nerve impulses between higher and lower levels of the nervous system.
   b) The pons also has clusters of neurons that help to regulate sleep and are involved in dreaming, and it contains motor neurons that control the muscles and glands of the face and the neck.
   c) Like the medulla, the pons helps to control vital functions, especially respiration, and damage to it can produce death.

iii. The Cerebellum: Motor Coordination Center
   1) The cerebellum (meaning *little brain* in Latin) does indeed look like a miniature brain attached to the rear of the brain stem directly above the pons.
   2) Its wrinkled cortex, or **covering**, consists mainly of grey cell bodies (grey matter).
   3) The **cerebellum** is concerned primarily with muscular movement coordination, but it also plays a role in certain types of learning and memory.
   4) Specific motor movements are initiated in higher brain centres, but their timing and coordination depend on the cerebellum.
      a) The cerebellum regulates complex, rapidly changing movements that require exquisite timing, such as those of a ballet dancer or a competitive driver.
      b) Within the animal kingdom, cats have an especially well-developed cerebellum, helping to account for their graceful movement abilities.
   5) The motor control functions of the cerebellum are easily disrupted by alcohol, producing the coordination difficulties that police look for in their roadside tests of sobriety.
      a) Intoxicated people may be unable to walk a straight line or touch their nose with their index finger.
      b) Physical damage to the cerebellum results in severe motor disturbances characterized by jerky, uncoordinated movements, as well as an inability to perform habitual movements, such as walking.

b. The Midbrain
   i. Introduction
      1) Lying just above the hindbrain, the **midbrain** contains clusters of sensory and motor neurons, as well as many sensory and motor fibre tracts that connect higher and lower portions of the nervous system.
      2) The sensory portion of the midbrain contains important relay centres for the visual and auditory systems.
         a) Here, nerve impulses from the eyes and ears are organized and sent to forebrain structures involved in visual and auditory perception.
      3) The midbrain also contains motor neurons that control eye movements.
   ii. The Reticular Formation: The Brain's Gatekeeper
      1) **Reticulum** (net) is the finger-shaped structure buried within the midbrain, extending from the hindbrain up into the lower portions of the forebrain.
      2) The **reticular formation** acts as a kind of sentry, both alerting higher centres of the brain that messages are coming and then either blocking those messages or allowing them to go forward.
         a) The reticular formation has an <u>ascending</u> part, which sends input to higher regions of the brain to alert it, and a <u>descending</u> portion, through which higher brain centres can either admit or block out sensory input.

3) Roles of Reticular Formation
    a) Consciousness
        i) The ascending reticular formation rouses higher centres in the brain, preparing them to receive input from our sense organs.
        ii) Without reticular stimulation of higher brain regions, sensory messages do not register in conscious awareness, even though the nerve impulses may reach the appropriate higher areas of the brain.
    b) Sleep
        i) Electrical stimulation of different portions of the reticular formation can produce instant sleep in a wakeful cat and sudden wakefulness in a sleeping animal.
        ii) Severe damage to the reticular formation can produce a permanent coma.
    c) Attention
        i) Attention is an active process in which only important or meaningful sensory inputs get through to out consciousness.
        ii) Other inputs have to be toned down or complete blocked out or we'd be overwhelmed by stimulation.
        iii) The descending reticular formation plays an important part in this process, serving as a kind of gate through which some inputs are admitted while others are blocked out by signals coming down from higher brain centres.

c. The Forebrain
    i. Introduction
        1) The most profound biological difference between your brain and that of other animals is the size and complexity of your forebrain, or **cerebrum**.
        2) The **forebrain** consists of two large cerebral hemispheres, a left side and a right side, that wrap around the brain stem.
        3) The outer portion of the forebrain has a thin covering, or cortex, and there are a number of important structures buried in the central regions of the hemispheres.
    ii. The Thalamus: The Brain's Sensory Input
        1) The thalamus is located above the midbrain, resembling two small footballs, one within each cerebral hemisphere.
        2) The **thalamus** is an important sensory processing and relay station, sometimes likened to a switchboard that organizes input from sense organs and routes them to the appropriate areas of the brain.
        3) The visual, auditory, and body senses (balance and equilibrium) all have major relay stations in the thalamus.
            a) In each case, nerve tracts from the sensory receptors are sent to specific areas of the thalamus.
            b) There they synapse with neurons that send the messages on their way to the higher brain regions that create our perceptions.
            c) The only sense that does not send information through the thalamus is the evolutionarily ancient sense of smell.
        4) Recent evidence indicates that the thalamus has functions that go beyond that of a simple relay station.
            a) It functions as an active, dynamic filter selecting what information is passed to higher brain regions.
    iii. The Basal Ganglia: Movement
        1) Surrounding and enveloping the thalamus is a group of at least five distinct structures that are collectively called the **basal ganglia**.
        2) The **basal ganglia** is critical for voluntary motor control.
            a) Where as the cerebellum is critical for controlling reflexive, automatic, and rapid movements, the basal ganglia plays an important role in deliberate and voluntary control of movement, especially in initiating

voluntary movements.

3) Parkinson's disease.
    a) In Parkinson's disease, the neurons that supply dopamine to the basal ganglia degenerate and die.
    b) Since dopamine is lost from the basal ganglia, the basal ganglia does not function properly, and the ability to initiate voluntary movement is lost.
    c) Initially, the signs of Parkinson's disease are small tremors of the hands and head, but as the basal ganglia loses more and more of its supply of dopamine, the tremors become shaking, then slow and jerky movements, then slow and jerky movement that can be performed only if there is assistance with initiating the movement.
    d) When the basal ganglia has been largely depleted of dopamine and hence does not function, there is complete paralysis.
    e) If, however, the movement depends on other, older brain structures, such as the cerebellum, they can perform it.

iv. The Hypothalamus: Biological Drive
1) The hypothalamus (literally, "under the thalamus") consists of tiny groups of neuron cell bodies that lie at the base of the brain, above the roof of the mouth.
2) The **hypothalamus** plays a major role in controlling many different basic biological drives, including sexual behaviour, temperature regulation, eating, drinking, aggression, and the expression of emotion.
    a) Damage to the hypothalamus can disrupt all these behaviours.
3) Hypothalamus has important connections with the endocrine system, the body's collection or hormone-producing glands.
    a) Through its connection with the pituitary gland (the master gland that exerts control over other glands of the endocrine system), the hypothalamus directly controls many hormonal secretions that regulate sexual development and behaviour, metabolism, and reaction to stress.

v. The Limbic System: Memory and Goal-Directed Behaviour
1) Limbic system is a set of structures, which are shaped like a wishbone, lying deep within the cerebral hemisphere.
2) Functions
    a) The **limbic system** helps to coordinate behaviours needed to satisfy motivational and emotional urges that arise in the hypothalamus, and it is also involved in memory.
    b) The limbic system appears to organize many instinctive activities in lower animals, such as mating, attacking, feeding, and fleeing from danger.
    c) Human behaviours are similarly organized into goal-directed sequences.
        i) If certain parts of your limbic system were injured, you would be unable to carry out organized sequences of actions to satisfy your need.
        ii) A small distraction would make you forget what you had set out to do.

a) Two key structures in the limbic system are the hippocampus and the amygdala.
    a) The **hippocampus** is involved in forming and retrieving memories.
        i) Damage to the hippocampus can result in severe memory impairment for recent events and an inability to transfer information from short-term memory to long-term memory.
    b) The **amygdala** organizes emotional response patterns, particularly those linked to aggression and fear.
        i) Electrically stimulating certain areas of the amygdala causes

animals to snarl and assume aggressive postures, where stimulation of other areas results in a fearful inability to respond aggressively, even in self-defence.
ii) The amygdala is a key part of a larger control system for anger and fear that also involves other brain regions.
iii) The amygdala has a role in inhibiting potentially risky actions.
iv) An interesting feature of the amygdala is that it can produce emotional responses without the higher centres of the brain "knowing" that we are emotionally aroused.

c) Neural events have important roles in motivation.
i) The hypothalamus was the brain area critical for motivation and reward.

b) Electrical stimulation of the hypothalamus activates neurons within that brain region and also activates axons that are going from neuron cell bodies in the midbrain to a limbic structure called the **nucleus accumbens**.
a) It is the activation of axons going to the nucleus accumbens that is important for reward and motivation.
b) Roy Wise has shown that the reward value of electrical stimulation of the hypothalamus can be either amplified or diminished by drugs that enhance or block, respectively, dopamine actions within the nucleus accumbens.
i) This brain area has also been linked to the rewarding and motivating effects of drugs of abuse.
ii) Drugs such as cocaine, amphetamines, opiates, nicotine, and alcohol, all stimulate the release of dopamine in the nucleus accumbens of the limbic system.

c) Alain Gratton has found that naturally occurring rewards such as food, sexually relevant event cues, and sexual behaviour also lead to the release of dopamine from axon terminals in the nucleus accumbens.
i) Interestingly, Gratton has shown that not only do drugs of abuse and preferred food activate the nucleus accumbens, but also cues that reliably predict the arrival of drugs or food have a similar effect.

d. The Cerebral Cortex: Crown of the Brain
i. Introduction
a) The **cerebral cortex**, a two-third centimeter-thick sheet of grey (unmyelinated) cells that form the outermost layer of the human brain, is the crowning achievement of brain evolution.
a) The progression from more primitive to more advanced mammals is marked by a dramatic increase in the proportion of cortical tissue.
b) In humans, the cortex constitutes fully 80 percent of brain tissue.
c) The cerebral cortex is not essential for physical survival in the way that the brain stem structures are, but it is essential for a human quality of living.

b) Because the cortex is wrinkled and convoluted, like a wadded-up piece of paper, a great amount of cortical tissues is compressed into a relatively small space inside the skull.
a) Perhaps 75 percent of the cortex's total surface area lies within its **fissures**, or folds.

c) Three of these fissures are important landmarks.
a) One large fissure runs up the front and along the top of the brain, dividing it into right and left hemispheres.
b) Another major fissure within each hemisphere divides the cerebrum into front and rear halves.
c) The third fissure runs from front to rear along the side of the brain.

d) On the basis of these landmarks, neurologists have divided each hemisphere into four lobes: **frontal, parietal, occipital,** and **temporal**.

a) Each of the four cerebral lobes is associated with particular sensory and motor functions
b) Although different areas of cortex are associated with specific functions, many complex behaviours involve the integrated activity across many areas of cortex.
c) Most sensory systems send information to specific regions of the cerebral cortex.
d) Motor systems that control the activity of skeletal muscles are situated in other cortical regions.
e) The basic organization of the cortex's sensory and motor areas is quite similar in all mammals, from rats to humans.

ii. The Motor Cortex
a) The **motor cortex**, which controls the 600 or more muscles involved in voluntary body movements, lies at the rear of the frontal lobe adjacent to the central fissure.
b) Each hemisphere governs movement on the opposite side of the body.
a) Thus, severe damage to the right motor cortex would produce paralysis in the left side of the body.
c) Specific body areas are represented in different parts of the motor cortex, and the amount of cortex devoted to each area depends on the complexity of the movements that are carried out by the body part.
d) If we electrically stimulate a particular point on the motor cortex, then movements occur in the muscles governed by that part of the cortex.

iii. The Sensory Cortex
a) Introduction
a) Specific areas of the cortex receive input from out sensory receptors.
b) With the exception of taste and smell, at least one specific area in the cortex has been identified for each of the senses.
b) The **somatic sensory cortex** receives sensory input that gives rise to our sensations of heat, touch, cold, and our senses of balance and body movement (kinesthesis).
a) It lies in the parietal lobe just behand the motor cortex, separated from it by the large fissure that divides the frontal lobe from the parietal lobe.
b) Each side of the body sends sensory input to the opposite hemisphere.
c) The somatic sensory area is basically organized in an upside-down fashion, with the feet being represented near the top of the brain.
i) Likewise, the amount of cortex devoted to each body area is directly proportional to that region's sensory sensitivity.
ii) Note also that the organization of the sensory cortex is such that the body structures it serves lie side by side with those in the motor cortex, an arrangement that enhances sensory-motor interactions in the same body area.
d) The senses of hearing and sight are well represented in the cortex.
i) Hearing
One. The auditory area lies on the surface of the temporal lobe at the side of each hemisphere.
Two. Each ear sends messages to the auditory areas of both hemispheres, so the loss of one temporal lobe has little effect on hearing.
ii) Vision
One. The major sensory area for vision lies at the rear of the occipital lobe.
Two. Here messages from the visual receptors are analyzed, integrated, and translated into sight.
Three. As in the auditory system, each eye sends input to both hemispheres.

e) Within each sensory area, neurons respond to particular aspects of the sensory stimulus.
    i) They are tuned in to specific aspects of the environment.
    ii) Thus, certain cells in the visual cortex fire only when we look at a particular kind of stimulus, such as a vertical line or a corner.
    iii) Many of these single-cell responses are present at birth, suggesting that we are "pre-wired" to perceive many aspects of our sensory environment.
f) Nonetheless, the sensory cortex, like other parts of the brain, is also sensitive to experience.
    i) For example, when people learn to read Braille, the area in the sensory cortex that receives input from the fingertips increases in size, making the person more sensitive to the tiny sets of raised dots.
g) The representation of the face in the **somatosensory** cortex may be upside-down, with the chin toward the top.
    i) This position would better align the head with the rest of the body since an upside-down representation of the head within the somatosensory cortex would place the chin near the neck of and shoulders.

iv. Speech Comprehension and Production
a) Two specific areas that govern the understanding and production of speech are also located in the cortex.
b) **Wernicke's area** in the temporal lobe is involved in language comprehension.
    a) The area is named for Carl Wernicke, who in 1874 discovered that damage to this cortical region left patients unable to understand written or spoken speech.
c) **Broca's area** in the frontal lobe is necessary for normal speech production.
    a) The neural circuits in and around Broca's area are important for the ability to perform the sequences of fine-motor movement needed to speak, and are involved in the abilities to use grammar and find the correct word.
    b) Its discoverer, Paul Broca, found that damage to this frontal area left patients with the ability to comprehend speech but not to express themselves in words or sentences.
d) Even relatively small acts usually involve the coordinated action of several brain regions.
    a) These two speech areas normally work in concert when you are conversing with another person.
    b) Input is sent from the ears to the auditory cortex and is routed to Wernicke's area for comprehension.
    c) When you decide to reply, nerve impulses are sent from Wernicke's area to Broca's area, and impulses passed on from Broca's area to the motor cortex result in the mouthing of a verbal response.

v. Association Cortex
a) **Association cortex**, found within all lobes of the cerebral cortex, is critically involved in the highest level of mental functions, including perception, language, and thought.
b) These areas are sometimes referred to as "**silent areas**" because electrically stimulating them does not give rise to either sensory experiences or motor responses.
    a) Damage to specific parts of the association cortex causes disruption or loss of functions such as speech, understanding, thinking, and problem solving.
c) Since the association cortex is involved in higher mental processes, the amount of association cortex increases dramatically as we move up the

brain ladder from lower animals to human beings.
    a) It consists about 75 percent of the human cerebral cortex and accounts for human's superior cognitive abilities.
  d) The importance of the association cortex is demonstrated in people who suffer from **agnosia**, the inability to identify familiar objects.

vi. The Frontal Lobes: The Human Difference
  a) Facts
    a) In a human, the frontal lobes constitute 29 percent of the cortex.
    b) The site of such human qualities as self-awareness, planning, initiative, and responsibility, the frontal lobes are in some respects the most mysterious and least understood part of the brain.
    c) The frontal cortex has recently been found to contain neurons that are active both when an activity is planed and performed, but also when watching another perform this action.
  b) Early Indications
    a) Early indications about the functions of the frontal cortex come from the tragic case of Phineas Gage.
      i) As the tragic accident to Phineas Gage shows us, biological and psychological processes are intimately related.
      ii) Physical damage to Gage's brain changed his thinking and behaviour so radically that a psychologically different person emerged.
    b) Frontal lobe damage results not so much in a loss of intellectual abilities as in a loss of the ability to plan and carry out a sequence of actions, and judge the order in which a series of events has occurred or will occur in the future.
  c) The frontal cortex is also involved in emotional experience.
    a) In people with normal brains, PET scans show increased activity in the frontal cortex when these people are experiencing feelings of happiness, sadness, or disgust.
    b) In contrast, patients with frontal lobe damage often exhibit attitudes of apathy and lack of concern.
  d) The **prefrontal cortex**, located just behind the forehead, is the seat of the so-called "executive functions".
    a) Executive functions, mental abilities involving goal setting, judgement, strategic planning, and impulse control, allow people to direct their behaviour in an adaptive fashion.
    b) Deficits in executive functions seem to underlie a number of problem behaviours.
      i) People with prefrontal cortex disorders seem oblivious to future consequences of their actions and seem to be governed by immediate consequences.
      ii) Using brain-imaging, **Adrian Raine** studied 41 violent murderers who had pleaded not guilty by reason of insanity.
        One. The murderers' PET scans showed clear evidence of reduced activity in the prefrontal cortex.
    c) During the 1940s and 1950s, many thousands of psychiatric patients who suffered from disturbed and violently emotional behaviour were subjected to operations called **prefrontal lobotomies**.
      i) The operation was performed by inserting an instrument with sharp edges into the brain, and then wiggling it back and forth to sever the nerve tracts that connected the frontal lobes with the subcortical regions associated with emotion.
      ii) The calming effects was so dramatic that Egas Moniz, the developer of the technique, was awarded a Nobel Prize.
      iii) However, the devastating side effects on mental functions that occurred as the executive functions were destroyed were

equally dramatic, and the development of antipsychotic drugs resulted in the abandonment of this form of "treatment".

e. Hemispheric Lateralization: the Left and Right Brains
    i. Introduction
        a) The **corpus callosum** is a neural bridge that acts as a major communication link between the two hemispheres and allows them to function as a single unit.
        b) **Lateralization** refers to the relatively greater localization of a function in one hemisphere or the other.
        c) Medical studies of patients who suffered various types of brain damage provided the first clues that certain complex psychological functions were lateralized on one side of the brain or the other.
            a) When Broca's or Wernicke's speech areas are damaged, the result is **aphasia**, the partial or total loss of the ability to communicate using language.
            b) When the right hemisphere is damaged, language functions are not ordinarily affected, but the person has great difficulty in performing tasks that demand the ability to perceive spatial relations.
            c) It appears that mental imagery, musical and artistic abilities, and the ability to perceive and understand spatial relationships are primarily right-hemisphere functions.
        d) Even among individuals who have not experienced any brain damage and who do not have a history of abnormal brain function, the lateralization of function can be detected.
            a) It is possible to present stimuli such as words or music, for example, in such a way that the information arrives first in one hemisphere.
            b) Verbal stimuli such as letters and words are identified more quickly and accurately when they are presented in such a way the information goes first to the left hemisphere.
            c) Recognizing faces or melodies is faster and more accurate if that information goes first to the right hemisphere.
        e) The two hemispheres differ not only in the cognitive functions that reside there, but also in their links with particular types of emotions.
            a) EEG and imaging studies have shown that the right hemisphere is relative more active when negative emotions such as sadness and anger are being experienced.
            b) Positive emotions such as joy and happiness are accompanied by relatively greater left-hemisphere activation.
    ii. The Split Brain: Two in One Body?
        a) Despite the lateralization of specific functions in the two cerebral hemispheres, the brain normally functions as a unified whole because the two hemispheres communicate with each other through the corpus callosum.
        b) Human Disease Leading to Research
            a) Some patients suffer from a form of epilepsy in which a seizure that begins as an uncontrolled electrical discharge of neurons on one side of the brain spreads to the other hemisphere.
            b) Neurosurgeons found that by cutting the nerve fibres of the corpus callosum, they could prevent the seizure from spreading to the other hemisphere.
            c) Moreover, the operation did not seem to disrupt other major psychological functions.
        c) Split Brain Research
            a) Basis
                i) Split-brain research was made possible by the way in which our visual input to the brain is "wired".
                ii) Some of the fibres of the optic nerve from each eye cross over

at the **optic chiasm** and travel to the opposite brain hemisphere.
iii) Fibres that transmit messages from the right side of the visual field project to the right hemisphere, and fibres from the left visual field project to the right hemisphere.
iv) We normally experience a unified visual world rather than two half-world because the hemispheres' visual areas are connected by the corpus callosum.

b) Experiment
i) In Sperry's experiments, split-brain patients focused on a fixation point, a dot on the centre of a screen, while slides containing visual stimuli (word, pictures, and so on) were flashed to the right or left side of the fixation point.
ii) When words were flashed to the right side of the visual field, resulting in their being sent to the language-rich left hemisphere, subject could describe verbally what they had seen.
iii) However, if words were flashed to the left side of the visual field and sent on to the right hemisphere, the subjects could not describe what they had read on the screen.
iv) If subjects were given an object, until the object was transferred to the right hand, the left hemisphere had no knowledge of what the right hemisphere was experiencing.

c) Explanation
i) Split-brain patients can function adequately in daily life because visual input is not usually restricted to only one visual field.
ii) The split-mind phenomena shown in the laboratory approach appeared because the patients were tested under experimental conditions that were specifically designed to isolate the functions of the two hemispheres.

d) Certainly, there is some degree of localization of brain functions, but a far more important principle is that in the normal brain, most functions involve many areas of the brain working together.

iii. Hemispheric Lateralization of Language

a) Right-handed and Left-handed
a) About 90 percent of people are right-handed, and among this majority, 95 percent have left hemisphere language dominance.
b) Among left-handers, half have language in the left hemisphere, 25 percent have it localized in the right hemisphere, and the rest have language functions in both hemispheres.
c) Those who use both hemispheres for language functions have larger corpus callosum, perhaps because more interhemispheric communication is required.

b) Abilities in both
a) PET scan studies measuring cerebral blood flow in the brains of normal people indicate that both hemispheres are involved in speaking, reading, and listening.

c) Males and Females
a) Males and females may differ in the extent to which certain language functions are lateralized.
i) When viewing randomly arranged vowels and consonants and asked if two nonsense words rhymed, women showed more activity in the right hemisphere than did men.
b) Brain-imaging studies indicate that during a language task men show greater left hemisphere activation, while women show activity in both hemispheres.
c) On the whole, however, the brains of men and women are far more similar than they are different.

f. Plasticity in the Brain: The Role of Experience and the Recovery of Function

i. Introduction
    a) Learning and practising a mental or physical skill may change the size or number of brain areas involved and alter the neural pathways used in the skill.
        a) This process of brain alteration begins in the womb and continues throughout life.
        b) It is governed in important ways by genetic factors but also is strongly influenced by the environment.
    b) **Neural plasticity** refers to the ability of neurons to change in structure and function.
        a) Two aspects of neural plasticity - the effects of early experience on brain development and recovery from brain damage - are at the forefront of current research.
    c) Researches
        a) Early-Stage Development
            i) Exposure of the developing fetus to drugs, such as alcohol, and other toxins can disrupt brain development and produce the lifelong mental and behavioural damage seen in fetal alcohol syndrome.
            ii) There is evidence that being raised in a stimulating environment leads to lasting changes such as large neurons with more dendritic branches, and greater concentrations of acetylcholine, the neurotransmitter involved in motor control and memory.
        b) Other Development
            i) Experienced string musicians who do elaborate movements on the strings with their eft hands had a larger right-hemisphere somatosensory area devoted to these fingers than did non-musicians.

ii. Recovery of Function After Injury
    a) When an injury results in the destruction of brain tissue, other neurons must take over the lost functions of the dead neurons if recovery is to occur.
    b) Brain damage suffered early in life is less devastating than damage suffered as an adult.
    c) The one- to two- year-old child has about 50 percent more brain synapses than mature adults do.
        a) Unused or weaker synapses deteriorate with age so that the brain loses some of its plasticity.
        b) Moreover, cell death is programmed into every neuron by its genes, and what some neuroscientists refer to as the neuron's "suicide apparatus" is activated by a lack of stimulation from other neurons and by many other unknown factors.
        c) As a result, adults actually have fewer synapses in the brain than do children, despite their more advanced cognitive and motor capabilities.
    d) Yet even adults can maintain or recover some functions after neuron death.
        a) When nerve tissue is destroyed or neurons die as part of the aging process, surviving neurons can restore functioning by modifying themselves either structurally or biochemically.
            i) They can modify their structure by extending axons from surviving neurons to form new synapses.
            ii) Surviving neurons may also make up for the loss by increasing the volume of neurotransmitters they release.
        b) Finally, recent research findings have begun to challenge the long-standing assumption of brain scientists that dead neurons cannot be replaced in the mature brain.
            i) The development of new cells (**neurogenesis**) has been demonstrated in the brains of rodents and primates within the

hippocampus, which is involved in memory.

ii) In 1998, evidence for the birth of new cells in human adult hippocampus appeared.

e) Behavioural and lifestyle measures also can help to preserve brain functioning.
    a) In elderly people, for example, continued intellectual stimulation and activity seem to preserve synapses and their resulting cognitive functions.

f) One controversial technique for neurogenesis involves the transplantation into the brain of neural stem cells - immature cells that can mature into any type of neuron or glial cell.

Chapter 3 Summary

September 25, 2017 12:01 PM

1. The Neural Bases of Behaviour
    a. Each neuron has dendrites, which receive nerve impulses from other neurons; a cell body (soma), which controls the vital processes of the cell; and an axon, which conducts nerve impulses to adjacent neurons, muscles, and glands.
    b. Neural transmission is an electrochemical process. The nerve impulse, or action potential, is a brief reversal in the electrical potential of the cell membrane as sodium ions from the surrounding fluid flow into the cell through sodium ion channels, depolarizing the axon's membrane. Graded potentials are proportional to the amount of stimulation being received, whereas action potentials obey the all-or-none low, occurring at full intensity if the action potential threshold of stimulation is reached. The myelin sheath increases the speed of neural transmission.
    c. Passage of the impulse across the synapse is mediated by chemical transmitter substances. Neurons are selective in the neurotransmitters that can stimulate them. Some neurotransmitters excite neurons, whereas others inhibit firing of the postsynaptic neuron.
2. The Nervous System
    a. The nervous system is composed of sensory neurons, motor neurons, and interneurons (associative neurons). Its two major divisions are the central nervous system, consisting of the brain and spinal cord, and the peripheral nervous system, which has sensory and motor functions, and the autonomic nervous system, which detects the activity of the body's internal organs and glands.
    b. The spinal cord contains sensory neurons and motor neurons. Interneurons inside the spinal cord serve a connective function between the two. Simple stimulus-response connections can occur as spinal reflexes.
    c. The autonomic nervous system consists of sympathetic and parasympathetic division. The sympathetic system has an arousal function and tends to act as a unit. The parasympathetic system slows down body processes and is more specific in its actions. Together, the two divisions maintain a state of internal balance, or homeostasis.
    d. Discoveries about brain-behaviour relations are made by using techniques such as neuropsychological tests, electrical and chemical stimulation of the brain, electrical recording, and brain imaging techniques. Recently developed methods for producing computer-generated pictures of structures and processes within the living brain include CT and PET scans and MRI.
3. The Hierarchical Brain: Structures and Behavioural Functions
    a. The human brain consists of the hindbrain, the midbrain, and the forebrain, an organization that reflects the evolution of increasingly more complex brain structures related to behavioural capabilities.
    b. Major structures within the hindbrain include the medulla, which monitors and controls vital body functions; the pons, which contains important groups of sensory and motor neurons; and the cerebellum, which is concerned with motor coordination.
    c. The midbrain contains important sensory and motor neurons, as well as many sensory and motor tracts connecting higher and lower parts of the nervous system. The reticular formation plays a vital role in consciousness, attention, and sleep. Activity of the ascending reticular formation excites higher areas of the brain and prepares them to respond to stimulation. The descending reticular formation acts as a gate, determining which stimuli get through to enter into consciousness.
    d. The forebrain consists of two cerebral hemispheres and a number of subcortical structures. The cerebral hemispheres are connected by the corpus callosum.
    e. The thalamus acts as a relay and filter through which impulses originating in sense organs are touted to the appropriate sensory projection areas. The hypothalamus plays a major role in supporting many different biological drives. The limbic system seems to be involved in organizing the behaviours involved in motivation and emotion.
    f. The cerebral cortex is divided into frontal, parietal, occipital, and temporal lobes. Some areas of the cerebral cortex receive sensory input, some control motor functions, and others (the association cortex) are involved in such executive functions as planning, voluntary behaviour, and self-awareness.
    g. Although the two cerebral hemispheres ordinarily work in coordination with each other, they appear to have different functions and abilities. Studies of split-brain patients who have had the corpus callosum cut indicate that the left hemisphere commands language and mathematical abilities, whereas the right hemisphere has well-developed spatial abilities, but a generally limited ability to communicate through speech. However, recent findings indicate that language functions are less lateralized in women than in men. Positive emotions are believed to be linked to relatively greater left-hemisphere activation and

negative ones to relatively greater right-hemisphere involvement. Despite hemispheric localization, however, most behaviours involve interactions between both hemispheres; the brain operates as a system.

4. Plasticity in Brain
    a. Early experience has an especially profound effect on brain development, but neural plasticity can occur throughout life.
    b. Neural plasticity refers to the ability of neurons to change in structure and functions. Environmental factors, particularly early in life, have notable effects on brain development.
    c. A person's ability to recover from brain damage depends on several factors. Other things being equal, recovery is greatest early in life and declines with age.
    d. When neurons die, surviving neurons can sprout enlarged dendritic networks and extend axons to form new synapses. Neurons can also increase the amount of neurotransmitters substance they release so that they are more sensitive to stimulation.

Neurotransmitter	**Major Function**	**Disorders Associated with Malfunctioning**
Glutamate (glutamic acid)	Excitatory; found throughout the brain; involved in the control of all behaviours, especially important in learning and memory	
GABA (gamma-aminobutyric acid)	Inhibitory transmitter; found throughout the brain; involved in controlling all behaviours, especially important in anxiety and motor control	Destruction of GABA-producing neurons in Huntington's disease produces tremors and loss of motor control, as well as personality changes
Acetylcholine (ACh)	Excitatory at synapses involved in muscular movement and memory	Memory loss in Alzheimer's disease (undersupply); Muscle contractions, convulsions (oversupply)
Norepinephrine	Excitatory and inhibitory functions at various sites; involved in neural circuits controlling learning, memory, wakefulness, and eating	Depression (undersupply), stress and panic disorders (oversupply)
Serotonin	Inhibitory at most sites; involved in mood, sleep, eating, and arousal, and may be an important transmitter underlying pleasure and pain	Depression, sleeping, and eating disorders
Dopamine	Can be inhibitory or excitatory; involved in voluntary movement, emotional arousal, learning, motivation, experiencing pleasure	Parkinson's disease and depression (undersupply); Schizophrenia
Endorphin	Inhibits transmission of pain impulses	Insensitivity to pain (oversupply); Pain hypersensitivity, immune problems (undersupply)

Chapter 4 Genes, Evolution, and Behaviour

October 25, 2017 12:27 AM

1. Genetic Influences
    a. Chromosomes and Genes
        i. Introduction
            1) Gregor Mendel showed that heredity involves the passing on of specific organic factors, not a simple blending of the parents' characteristics.
                a) These specific factors might produce visible characteristics in the offspring, or they might simply be carried for possible transmission to another generation.
                b) In any case, the offspring of one set of parents do not all inherit the same traits, as is evident in the differences we see among brothers and sisters.
            2) Early in the 20th century, geneticists made the important distinction between **genotype**, the specific genetic makeup of an individual, and **phenotype**, the observable characteristics produced by that genetic endowment.
                a) Genotypes are present from conception and never change, but phenotypes can be affected by other genes and by the environment.
            3) A **chromosome** is a tightly coiled molecule of **deoxyribonucleic acid (DNA)** that is partly covered by protein.
                a) The DNA portion of the chromosome carries the hereditary blueprint in units called **genes**.
                b) The many genes carried on each chromosome are like a giant computer file of information about your characteristics, potentials, and limitations.
            4) In humans, every cell in the body except one type has 46 chromosomes.
                a) The exception is the sex cell (the egg or sperm), which has only 23.
                    i) At conception, the 23 chromosomes from the egg combine with the 23 from the sperm to form a new cell, the **zygote**, containing 46 chromosomes.
                    ii) The genes within each chromosome also occur in pairs, so that the offspring receives one of each gene pair from each parent.
                b) Every cell nucleus in your body contains the genetic code for your entire body.
                    i) Alternative forms of a gene that produce different characteristics are called **alleles**.
            5) Genes affect our body's development and functioning through one general mechanism: genes code for the production of proteins.
                a) The estimated 70,000 different types of proteins found in a human control the structure of individual cells and all the chemical reactions that go on within those cells, whether they are reactions necessary to sustain the life of the cell or are changes induced only periodically by experience or maturation.
                b) Each individual gene carries the code for a specific protein, and when that gene is activated, the cell produces the specified protein.
                c) As the protein levels within a neuron change, there is a corresponding change in the function of that neuron and the neural circuits in which it participates.
        ii. Dominant, Recessive, and Polygenic Effects
            1) If a gene in the pair received from the mother and father is **dominant**, the particular characteristic that it controls will be displayed.
                a) Brown eyes, dark hair

2) If the gene is **recessive**, the characteristic will not show up unless the partner gene inherited from the other parent is also recessive.
    a) Blue eyes, light hair
3) In a great many instances, a number of gene pairs combine their influences to create a single phenotypic trait.
    a) This action is known as **polygenic transmission**, and it complicates the straightforward picture what would occur if all characteristics were determined by one pair of genes.
    b) It also magnifies the number of possible variations in a trait that can occur.

iii. Epigenetics: Environmental Effects on Genes
1) The term **epigenetics** was first used in 1940 to refer to lasting changes in gene expression during development that were not due to genetic changes but to changes around the genes - epigenetic changes.
    a) Epigenetics concerns lasting changes in gene function caused by external or environmental factors without any change in the DNA sequence itself.
    b) The study of epigenetics has changed our understanding of environment-gene interactions.
    c) Specific patterns of maternal behaviour, use of drug of abuse, nutritional intake, and even physical exercise can all lead to lasting changes in how our genes operate.
2) The process of epigenetics work through a number of different chemical mechanisms that lead to lasting changes in how specific genes function without altering the DNA sequence.
    a) The mechanism involved in epigenetics involve activating or silencing specific genes, or altering how a gene is expressed thus changing the gene product.
    b) The change in gene function are long-lasting and some can even be passed to subsequent generations.
    c) Epigenetic studies are helping to explain how and why environmental factors such as stress are important risk factors for the development of a range of psychiatric disorders.

iv. The Human Genome
1) In 1990, genetics began the Human Genome Project, and in 2001, the genetic map was published, two years ahead of schedule.
2) The genetic structure in everyone of the 23 chromosome pairs has been mapped by using methods that allowed he researchers literally to disassemble the genes on each chromosome and study the specific sequence of substances that occur in each gene (A, T, G, and C).
3) The Human Genome Project, along with Celera Genomics, reported a number of surprises when their projects were complete.
    a) They discovered humans have fewer genes than expected; a human has approximately 25,000 genes and not the 100,000 originally estimated.
    b) Approximately 200 human genes may have arisen from genes that bacteria inserted into our early ancestors.

v. Genetic Engineering: The Edge of Creation
1) Recombinant DNA procedures
    a) In **Recombinant DNA procedures**, researchers use specific enzymes to cut the long threadlike molecules of genetic DNA into pieces, combine them with DNA from another organism, and insert the new strands into a host organism, such as a bacterium.
    b) Inside the host, the new DNA combination continues to divide and produce many copies of itself.
    c) Scientists have used this procedure to produce materials that are rare or difficult to obtain otherwise such as human growth hormone.

2) Knockout Procedure
    a) **Knockout procedure** is to alter a specific gene in a way that prevents it from carrying out its normal function.
    b) The effects on behaviour are then observed.
    c) Very little behaviour is controlled by a single gene.
        i) Thus, the disruption of a behaviour after a gene knockout may help to identify one of the genes involved in the behaviour, but this identification does not mean that one gene is wholly responsible for the behaviour.
        ii) Knocking out a single gene may disrupt a wide range of functions.

b. Behaviour Genetics Techniques
    i. The extent to which variation in a particular characteristic within a group can be attributed to genetic factor is estimated statistically by a **heritability coefficient**.
        1) Terms
            a) Heredity means the passage if characteristics from parents to offspring by way of genes.
            b) Heritability means how much the variation in a characteristic within a population can be attributed to a genetic differences.
        2) It is important to note that heritability refers to differences, or variance, in the trait across individuals and not to the trait itself.
        3) Heritability applies only to differences <u>within</u> a group, not <u>between</u> a groups.
    ii. Knowing the level of genetic similarity in family members and relatives provide a basis for estimating the relative contributions of heredity and environment to a physical or psychological characteristic.
        1) If a characteristic has higher **concordance**, or co-occurrence, in people who are more highly related to one another, then this points to a possible genetic contribution, particularly if the people have lived in different environments.
    iii. One research method based on this principle is the **adoption study**, in which a person who was adopted early in life is compared on some characteristic both with the biological parents, with whom the person shares genetic endowment, and with the adoptive parents, with whom no genes are shared.
    iv. **Twin studies** are one of the more powerful techniques used in behaviour genetics.
        1) Types of Twins
            a) **Monozygotic** (identical) twins develop from the same fertilized egg, so they share virtually all of their genes (there may be subtle differences such as variation in numbers of alleles and other copy variants). They occur once in 250 births.
            b) **Dizygotic** (fraternal) twins develop from two fertilized eggs, so they share 50 percent of their genetic endowment, like any other set of brothers and sisters. They occur once in 125 births.
        2) Same Family Environment
            a) Twins are usually raised in the same familial environment.
                i) Thus, we can compare concordance rates or behavioural similarity in samples of identical and fraternal twins, assuming that if the identical twins are far more similar to each other than are the fraternal twins, then a genetic factor is likely to be involved.
            b) However, it is always possible that because identical twins are more similar to each other in appearance than are fraternal twins, they might be treated more alike and therefore share a more similar environment.
                i) This environmental factor could partially account for greater behavioural similarity in identical twins.
        3) Different Environment

a) Sometimes they are able to find and compare sets of identical and fraternal twins who were separated very early in life and raised in different environment.
b) This design permits a better basis for evaluating the respective contributions of genes and environment.

v. Both adoption and twin studies have led behavioural genetics to conclude that many psychological characteristics, including intelligence, personality traits, and certain psychological disorders, have a notable genetic contribution.
vi. Genetic and environmental factors almost always interact with each other to influence behaviour.

2. Genetic Influences on Behaviour
   a. Heredity, Environment, and Intelligence
      i. Question is to what extent are differences in intelligence due to genetic factors, and to what extent does environment determine differences in intelligence?
      ii. From studying the correlation coefficients among people who differ in genetic similarity and who live together or apart, the strong evidence suggests that genes play a significant role in intelligence.
      iii. Although one's genotype seems to be an important factor in determining intelligence test scores, it probably accounts for only 50 to 70 percent of the IQ variation among people in the United States.
      iv. The real question should be as follows: how do heredity and environment interact to affect the intelligence.
   b. Biological Reaction Range, the Environment, Personality, and Intelligence
      i. Introduction
         1) The **reaction range** for a genetically influenced trait is the range of possibilities - the upper and lower limits - that the genetic code allows.
         2) Environmental effects will then determine where the person falls within these genetically determined boundaries.
         3) At present, genetic reaction ranges cannot be measured directly, and we do not know if their sizes differ from one person to another.
            a) But studies of IQ gains associated with environmental enrichment and adoption programs suggest that the range could be as large as 15 to 20 points on the IQ scale.
         4) Intellectual growth depends not only on genetic endowment and environmental advantage, but also on personal characteristics that affect how much we take advantage of our gifts and opportunities.
      ii. Behaviour Genetic and Personality
         1) Five Factor Model
            a) Extraversion-Introversion
            b) Agreeableness
            c) Conscientiousness
            d) Neuroticism
            e) Openness to experience
         2) We can divide the total variation among individuals on each personality trait into three components
            a) Variation attributable to genetic factors
            b) Variation due to a shared family environment
            c) Variation attributable to other factors, such as unique individual experiences.
         3) Results of Personality Study
            a) Genetic factor accounted for 39 to 58 percent of the variation among people in personality trait scores.
            b) The individuals' unique experience, such as school experiences, social interactions, and individual learning experiences, was an important factor and accounted for 36 to 56 percent of the variation in individual personality traits.
         4) Certain inherited factors (e.g., physical characteristics) may predispose

individuals to prefer certain activities.

3. Evolution and Behaviour
    a. Evolution of Adaptive Mechanisms
        i. Introduction
            1) The field of **evolutionary psychology** seek to understand how behavioural abilities and tendencies have evolved over the course of millions of years in response to environmental demands.
            2) No behaviour by any organism can occur in the absence of **biologically based mechanisms** that receive input from the environment, process the information, and respond to it.
            3) What evolves are genetically produced physical structures that interact with the demands of the environment to produce a behaviour.
        ii. Evolution
            1) **Evolution** is a change over time in the frequency with which particular genes - and the characteristics they produce - occur within an interbreeding population.
            2) Some genetic variations arise in a population through **mutation**, random events, and accidents on gene reproduction during the division of cells.
                a) If mutations occur in the cells that become sperm and egg cells, then the altered genes will be passed on to offspring.
                b) Mutations help to create variation within a population's physical characteristics, which makes evolution possible.
            3) Charles Darwin's landmark contribution was in specifying the process by which species change over time as they adapt to environmental demands.
        iii. Natural Selection
            1) According to Darwin's principle of **natural selection**, characteristics that increase the likelihood of survival and ability to reproduce within a particular environment will be more likely to be preserved in the population and therefore will become more common in the species over time.
            2) The filter, or natural selection, also allow neutral vitiations that neither facilitate nor impede fitness to pass through and be preserved in a population.
                a) These neutral variations, sometimes called **evolutionary noise**, could conceivably become important in meeting some future environmental demand.
        iv. Evolutionary Adaptations
            1) Adaptations
                a) The products of natural selection are called **adaptations**.
                b) **Adaptations** allow organism to meet recurring environmental challenges to their survival, thereby increasing their reproductive ability.
                c) In the final analysis, the name of the natural selection game is to pass on one's genes, either personally or through kin who share at least some of them.
            2) Evolution of Humans
                a) Bipedal Locomotion
                b) Australopithecus (4 million years ago)
                c) Homo erectus (1.6 million to 100,000 years ago)
                d) Neanderthal (75,000 years ago)
                e) Homo Sapiens
            3) Role of Culture
                a) In fact, the Neanderthal had a slightly larger brain.
                b) Yet the fact that we perform mental activities that could not have been imagined in those ancient times tells us that human capabilities are not solely determined by the brain.
                c) Cultural evolution is also important in the development of adaptations.

d) From an evolutionary perspective, culture provides important environmental input to evolutionary mechanisms.

4) Two Categories of Adaptations
   a) General
      i) Some evolved biological mechanisms allow broad adaptations, such as the ability to learn a language, repeat behaviours that are rewarded and suppress those that are punished, reason logically, and imagine future events.
   b) Domain-Specific Adaptation
      i) **Domain-specific adaptations** are designed to solve a particular problem, such as selecting a suitable mate, choosing safe foods to eat, and avoiding certain environmental hazards.
      ii) Domain-specific mechanisms suggest that the human mind is not a general, all-purpose problem solver but rather a collection of specialized and somewhat independent modules that evolved to handle specific adaptive problems.

b. Evolution and Human Nature
   i. Introduction
      1) Evolutionary psychologists suggest that the essence of human nature is the adaptations that have evolved through natural selection to solve problems specific to the human environment.
   ii. Examples
      1) Infants are born with an innate ability to acquire any language spoken in the world.
      2) Newborns are prewired to perceive specific stimuli.
      3) At one week of age, human infants show primitive mathematical skills, successfully discriminating between two and three objects. These abilities improve with age in the absence of any training.
      4) Humans seem to have a need to belong and strongly fear being ostracized from the group.
      5) Humans, like other social animals, tend to be altruistic and helpful to other members of their own group.
      6) There is much evidence for a set of basic emotions that are universally recognized.
      7) Our personal adaptations to life result from our interactions with immediate and past environments.

c. Evolutionary Psychology
   i. Personality
      1) An approach called **evolutionary personality theory** asks even more basic question: where did the traits come from in the first place.
      2) A current theory of personality, the Five Factor Model, argues that the human personality has a limited number of basic dimensions.
         a) Researchers have argued that these basic personality traits are found universally across all humans.
         b) They exist in human because they have helped us achieve two goals: physical survival and reproduction of the species.
      3) In different times, in different environments, within different social roles, the range of personality characteristics that we can display has allowed us to adapt and thrive.
   ii. Mating System and Parental Investment
      1) Introduction
         a) Humans and most other mammals invest a great deal in a small number of offspring to protect and sustain the next generation in an environment with limited resources and anger of predation.
         b) **Parental investment** refers to the time, effort, energy, and risk associated with caring successfully for each offspring.
         c) Although some components of parental investment can vary, there is,

at the core, a sex difference due to the biological differences between male and female roles in reproduction.

d) If parental investment is unequal, the parent who invests most in offspring will be more vigorously competed for and will be more discriminating when choosing a mate.

2) Polygyny
   a) **Polygyny** is a mating system in which one male may mate with many females, used by most mammals.
   b) Female investment is high, so females will competed for, and necessary male investment is low, so males can maximize their fitness by producing many offspring with many different females.
   c) Such a system should lead to larger and stronger males, since increased size and strength would confer an advantage in male-male competition.
3) Monogamous Mating System
   a) If both female and male investment is high, then Trivers' analysis would predict a **monogamous mating system**.
   b) Natural selection would favour genes that lead to parents staying together, at least until the young are self-sufficient.
   c) If parental investment is high among both females and males, then competition for a male is not limited to one sex and monogamous species should show few sex differences in size and strength.
4) Polyandry
   a) **Polyandry**, in which one female mates with many males, is rare among mammals but occurs in some species of fish and insects, as well as in a small number of bird species.
   b) Within polyandrous species, it is the females who compete with one another for access to males.
   c) Consistent with a parental investment analysis, the females of polyandrous species are larger, stronger, more active, and more aggressive than males of the species.
5) Polygynandry
   a) **Polygynandry**, or promiscuity, in which all members of the group mate with all other members of the group.
   b) Polygynandry is found among some primates, such as chimpanzees and is especially clear among bonobo chimps.
   c) For a highly social species such as bonobos, polygynandry is one possible way to reduce competition for a mate and may help bonobos be the most peaceful of all primates.

iii. Mate Preference
1) The theory of parental investment predicts that there will be a competition for the sex with the highest parental investment, and that the sex with the greater parental investment will be more discriminating when selecting a mate.
2) The results of a worldwide study of mate preferences found considerable overlap between what men and women look for in a mate, but also reported differences.
   a) Females
      i) Women prefer older men as potential mates.
         One. Averaged over all cultures, women preferred men who were about three and a half years older. The actual worldwide average age difference between brides and grooms is three years. That is, the actual marriage decisions of women match their expressed preferences.
         Two. Evolutionarily this preference makes sense: young adults males rarely have the respect, status, and access to resources that are achieved by older, more established

males.

ii) Women also show a preference for symmetrical faces and other signs of physical health.

One. A symmetrical face is a sign that the person is free of parasites or has a genetic resistance to parasites, and has had a healthy and normal physical development.

b) Males

i) Given the large parental investment by women, and the added advantage to their children conferred by a mate who contributes to the care and rearing of those children, one would expect that women would prefer a mate who has demonstrated a willingness to contribute to a child's well-being.

One. Male attractiveness was enhanced by signs of parental investment and decreased by indifference toward a child in distress.

Two. However, men's attractiveness rating for women were the same across all conditions.

ii) Male mate preference have also been explored within an evolutionary perspective.

One. Men tend to prefer women who display signs of youth and physical health, such as smooth skin, animated facial expressions, a high energy level, and a bouncy, youthful gait.

Two. The interpretation from an evolutionary perspective is clear: males have evolved to value those characteristics that are associated with youth - and hence future reproductive potential - and with health.

iii) Research has also found a surprising degree of cross-cultural consistency in male rating of female physical attractiveness.

3) For mate preferences to evolve, they must have had an impact on actual mating.

a) Furthermore, although women's preferences powerfully control actual mating, the mate preferences between the sexes should at least be compatible.

iv. Altruism

1) **Cooperation** refers to situations in which one individual helps another and in so doing also gains some advantage.

a) As a species developed the behavioural repertoire that supported cooperation, groups of individuals became capable of accomplishing more than any individual could accomplish alone.

2) **Altruism** occurs when one individual helps another, but in so doing he or she accrues some cost.

a) On the surface, altruism may not appear to make evolutionary sense: by engaging in altruism, individuals decrease the likelihood that they will survive.

3) **Kin selection theory** of altruism argues that altruism developed to increase the survival of relatives.

a) In showing altruism, one individual may perish, but if this increases the likelihood that genetically related individuals survive, the genes that support altruism will be selected for and spread through more and more members of the species across generations.

b) The kin selection theory predicts that we should direct more acts of altruism toward relatives than toward non-relatives.

4) **Theory of reciprocal altruism** argues that altruism is, in essence, long-term cooperation.

a) That is, one individual may help another, but that assistance will be reciprocated at some time in the future.

b) If this theory of reciprocal altruism is correct, then social animals should remember who has helped them in the past and should help those individuals, and they should not offer further assistance to individuals who have failed to reciprocate.
c) It also requires a relatively stable group; transient members are unlikely to be present to offer assistance at some later date.
d) Such reciprocal altruism between unrelated individuals has been observed in other social primates, such as bonobos.

5) These two theories of altruism, kin selection and reciprocity, are not incompatible.
6) However, altruism does not always occur.
a) One of the challenges in the study of altruism is to identify what environmental factors increase and decrease the likelihood that we will engage in acts of altruism.

v. Aggression
1) Evolutionarily aggression may have developed as a means to protect one's mate, young, territory, or food, to co-opt others' resources, or to gain access to unclaimed resources.
2) An important source of intraspecies aggression is competition for a mate.
a) Competition for a mate can be intense, and once a male and female have partnered, aggression may be used to protect one's mate from other suitors and the threat of sexual infidelity.
i) Among humans, one of the most common causes of homicide is sexual jealousy, most frequently two men fighting about a woman.
b) Less extreme forms of aggression also occur within the context of winning or protecting a mate, and aggression may be used to inflict some cost on rivals.
i) Both men and women belittle same-sex rivals, attempting to make their rivals appear less desirable.
3) As animals evolved larger, more complex brains and more sophisticated mental functions, an important change occurred in competition: animals acquired the ability to recognize others and to remember past encounters.
a) Instead of having to compete anew each time there were resources to allocate or protect, social animals developed dominance hierarchies.
b) Once a dominance hierarchy is established, and provided it is unchallenged, members of the group can determine access to resources without unnecessary, energy-expensive, and dangerous aggressive encounters.
c) Within a group of social animals, aggression may occur in forming dominance hierarchies and if an animal challenges another in an attempt to better its position in the hierarchy.
d) Apart from settling order of access to resources in a way that avoids unnecessarily repeated conflict, there may be deliberate quelling of aggression (leaders using their position to stop fighting among subordinates)
4) Aggression functions to divide limited resources among a group, and those who are most skilled in physical confrontation or in forming social alliances, depending on the situation and the species, gain the most.
5) There is also, however, a pattern of aggression that has been observed only among chimpanzees and humans.
a) Chimpanzees and humans form male coalitions to attack others as a group.
b) Of the 4000 species of mammals, and more than 10 million animal species in total, only two, humans and chimpanzees, have been shown to form coalitions that have the express purpose of engaging in acts of potentially lethal aggression against members of their own species.

c) Such acts of aggression are difficult to explain from any perspective, and traditional explanations, such as an aggression instinct or a drive to be aggressive, are clearly inadequate.
d) However, the point is that many species, including chimpanzees and humans, evolved mechanisms that supported aggressive behaviours.
    i) The immediate situation, the environmental cues confronting the individual or group, can activate those mechanisms.

4. How Not to Think About Behaviour Genetics and Evolutionary Psychology
    a. Standards of evidence for or against evolutionary psychology
        i. Evolutionary theorists are often forced to infer the forces to which our ancestors adapted, leading to after-the-fact speculation that is difficult to prove or disprove.
        ii. Early instinct theory fell victim to the logical fallacy of circular reasoning, although the arguments of modern evolutionary psychology are much more sophisticated and guard against these errors.
    b. Human Characteristic is not all because of Natural Selection
        i. In the distant past, as in the present, people created environments that help to shape behaviour and those behaviours can be passed down through cultural learning rather than through natural selection.
    c. Genetic Determinism
        i. **Genetic determinism** is the idea that gene shave invariant and unavoidable effects that cannot be altered - the idea that genes are destiny.
        ii. The expectation is that as our understanding of human genetics advance it will be possible to develop successful treatments for a range of diseases.
    d. Social Darwinism
        i. **Social Darwinism** refers to the idea that those at the top of the social ladder are somehow the "best" people.
        ii. The notion of the genetic superiority of those at the top of the social hierarchy has had destructive consequences, not the least of which was the eugenics movement of the early 20th century to prevent the "less biologically fit" (particularly immigrants) from breeding, and Nazi German's program of selective breeding designed to produce a "master race".
        iii. All behaviours are a function of both the person's biology and environment.
            1) We can regulate our own behaviours and exercise moral control, and this is often just as important to our survival as are our biological tendencies.
    e. Fallacy of Evolution as Purposive
        i. Another fallacy is the view that evolution is purposive, that there is a grand evolutionary scheme moving toward some end goal.
        ii. Although there are regularities in natural events that define certain "laws of nature", judgements of morality are most appropriately based on cultural standards and philosophical considerations, and not on biological imperatives.

Chapter 4 Summary

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1. Genetic Influences
    a. Heredity potential is carried within the DNA portion of the 23 pairs of chromosomes in units called genes. Genotype and phenotype are not identical because some genes are dominant while others are recessive. Many characteristics are polygenetic in origin; that is, influenced by interactions of multiple genes.
    b. Genes influence the development, structure, and function of our body, including our brain, by controlling the production of proteins.
    c. Genetic engineering allows scientists to duplicate and alter genetic material, or potentially, to repair dysfunctional genes.
    d. The field of behaviour genetics studies contribution of genetic and environmental factors in psychological traits and behaviours. The major research methods used in attempts to disentangle heredity and environmental factors are adoption and twin studies. The most useful research strategy is this area is the study of identical and fraternal twins who were separated in early life and raised in different environments.
    e. Behaviour genetics techniques allow a heritability coefficient to be determined for different characteristics. The heritability coefficient indicates the extend to which variation in a particular characteristic can be attributed to genetic factors.
2. Genetic Influences on Behaviour
    a. The more genetically similar two individuals, the higher the correlation between their IQ scores. The correlation between even genetically identical individuals, however, is not perfect, indicating an important role for the environment.
    b. Genetic factors contribute a reaction range for intelligence. Where within that range intelligence does develop depends on environmental factors.
    c. Identical twins are more alike than fraternal twins across a wide range of personality characteristics, indicating an important genetic component in personality traits. Together with genetic factors, an individual's unique experiences are important for personality; family environment has little impact.
    d. Genetic factors relevant for personality interact with the environment by predisposing an individual toward particular types of activities because of genetically influenced differences in brain activity, or other physical characteristics.
3. Evolution and Behaviour
    a. Evolutionary psychology focuses on biologically based mechanisms sculpted by evolutionary forces as solutions to the problems of adaptation faced by species. Some of these genetically based mechanisms are general, but many are domain-specific.
    b. Evolution involves a change over time in the frequency with which specific genes occur within an interbreeding population. Evolution represents an interaction between biological and environmental factors in both its original and later influences on behaviours.
    c. The cornerstone of Darwin's theory of evolution is the principle of natural selection, which posits that biologically based characteristics that contribute to survival and reproductive success increase in the population over time because those who lack the characteristic are less likely to pass on their genes.
    d. Parental investment refers to the time, effort, energy, and risk associated with caring successfully for each offspring. The sex that makes the greater parental investment will be more vigorously competed for and will be more discriminating when choosing a mate. Parental investment and the reproductive physiology of a species, together with environmental factors, have influenced the development of that species' mating system(s).
    e. Cross-culturally, women tend to prefer males who show signs of willingness to invest in children, physical health, earning potential, status, and ambitiousness. Consistent male preferences include physical attractiveness, good health, and younger women.

f. Social Species engage in acts of cooperation, in which all involved gain some benefit, and in acts of altruism, in which others benefit but the altruistic individual incurs some risk.
g. Animals, including humans, are more likely to show altruism toward genetically related individuals than toward non-kin, according to the kin selection theory of altruism. Altruism among non-kin may contribute to the fitness of the individual by making it more likely that others will act altruistically toward them in the future, according to the theory of reciprocal altruism.
h. Aggression may serve functions related to the protection of an allocation of resources, and the establishment of a position in a social dominance hierarchy. Among mammals, including all human cultures that have been studied, males, especially young males, are the most aggressive, since they are the group members that most actively compete.

Names to Remember

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1. P11: Wilhelm Wundt established the first experimental psychology laboratory at the University of Leipzig in Germany.
2. P12: William James, a leader in the functionalist movement, taught courses in physiology, psychology, and philosophy at Harvard University. James helped widen the scope of psychology to include the study of various biological and mental processes, and overt behaviour.
3. P12: Sigmund Freud developed the first and most influential psychodynamic theory. He used a method called free association, believed that an unconscious part of the mind profoundly influences behaviours, and developed a theory called psychoanalysis, leading to the study and treatment of psychological disorders.
4. P13: John Locke, an early empiricist, believed that at birth the human mind is a blank tablet upon which experiences are written.
5. P13: Ivan Pavolv, an Russian physiologist, revealed how learning occurs when events are associated with each other by conducting a research with dogs and giving their stimuli for food.
6. P13: Edward Thorndike proposed law of effect that responses followed by satisfying consequences become more likely to recur.
7. P14: John B. Watson argued that the proper subject matter of psychology was observable behaviour, not unobservable inner consciousness, and humans are products of their learning experiences.
8. P14: B.F. Skinner, a leading 20th century behaviourist believed that the real causes of behaviour reside in the outer world. And he believed through social engineering, society could harness the power of the environment to change behaviour in beneficial ways.
9. P15: Albert Bandura has played a key role in merging the cognitive and behavioural perspectives into cognitive behaviourism, the belief that learning experiences and the environment affect our behaviour by giving us the information we need to behave effectively.
10. P21: Karl Lashley, an early American pioneer of biological psychology, trained rats to run mazes and then measured how surgically produced lesions to various brain areas affected the rat's learning and memory.
11. P21: Donald O. Hebb, a Canadian pioneer in the field, proposed that changes in the connections between nerve cells in the brain provide the biological basis for learning, memory, and perception.
12. P39: Darley and Latane conducted a research over the diffusion of responsibility and Latane developed it further into the theory of social impact.
13. P71: Alan Hodgkin and Andrew Huxley found the action potential by stimulating the neuron's axon with a mild electrical stimulus.
14. P73: Otto Loewi won the Nobel Prize for his discovery of chemical neurotransmission.
15. P99: Roger Sperry won the Nobel Prize by studying the functions of the two cerebral hemispheres.
16. P108: Gregor Mendel, a monk, did research with garden peas in the 1860s, marking the beginning of modern genetic theory.

Chapter 5 Sensation and Perception

October 28, 2017 5:56 PM

1. Introduction
    a. **Synaesthesia** means "mixing of senses", people with which symptom may experience sounds as colours or tastes as touch sensations that have different shapes.
        1) Women are more likely to be synaesthetes than men (1 in 1150 versus 1 in 7150, respectively)
        2) In people with synaesthesia, there is some sort of cross-wiring, so that activity in one part of the brain evokes responses in another part of the brain dedicated to another sensory modality.
            a) One theory is that the pruning of neural connections that occurs in infancy has not occurred in people with synaethesia, so that brain regions retain connections that are absent in many people.
            b) Another theory is that with synaethesia, there is a deficit in neural inhibitory processes in the brain that ordinarily keep input from one sensory modality from "overflowing" into other sensory areas and stimulating them.
    b. Process of Sensation to Perception
        1) Stimulus is received by sensory receptors
        2) Receptors translate stimulus properties into nerve impulses (**transduction**)
        3) **Feature detectors** analyze stimulus features
        4) Stimulus features are reconstructed into neural representation
        5) Neural representation is compared with previously stored information in brain
        6) Matching process results in recognition and interpretation of stimuli
    c. **Binding Problem** refers to the question of how do we bind all our perceptions into one complete whole while keeping its sensory elements separate.
    d. **Sensation** is the stimulus-detection process by which our sense organs respond to and translate environmental stimuli into nerve impulses that are sent to the brain.
    e. **Perception** is the active process of organizing this stimulus input and giving it meaning.
2. Sensory Processes
    a. Introduction
        1) **Transduction** is the process whereby the characteristics of a stimulus are converted into nerve impulses.
        2) The particular to which different animals are sensitive vary considerably.
        3) Human senses
            a) Human sense include more than the five commonly thought senses (vision, audition - hearing, touch, gustation - taste, and olfaction - smell).
                a) The sense of touch can be subdivided into separate senses of pressure, pain, and temperature.
                b) Receptors within the brain monitor the chemical composition of our blood.
            b) Human sensory systems are designed to extract from other environment the information that we need to function and survive.
        4) The scientific area of **psychophysics**, which studies relations between the physical characteristics of stimuli and sensory capabilities, is concerned with two kinds of sensitivity.
            a) The first concerns the absolute limits of sensitivity.
            b) The second kind of sensitivity has to do with differences between stimuli.
    b. Stimulus Detection: The Absolute Threshold
        1) Because we are often unsure of whether we have actually sensed very faint stimuli, researchers designed the **absolute threshold** as the lowest intensity at which a stimulus can be detected 50 percent of the time.
            a) Thus, the lower the absolute threshold, the greater the sensitivity.
            b) From studies of absolute thresholds, the general limits of human sensitivity for the five major senses can be estimated.
        2) A **subliminal stimulus** is one that is so weak or brief that, although it is received by the senses, it cannot be perceived consciously - the stimulus is well below the absolute threshold.
    c. Signal Detection Theory

1) Psychologists concluded that the concept of a fixed absolute threshold is inaccurate because there is no single point on the intensity scale that separates non-detection from detection of a stimulus.
2) There is instead a range of uncertainty, and people set their own **decision criterion**, a standard of how certain they must be that a stimulus is present before they will say they detect it.
    a) The decision criterion can also change from time to time, depending on such factors as fatigue, expectation, and the potential significance of the stimulus.
    b) **Signal detection theory** is concerned with the factors that influence sensory judgements.

d. The Difference Threshold
1) The **difference threshold** is defined as the smallest difference between two stimuli that people can perceive 50 percent of the time.
    a) The difference threshold is sometimes called the **just noticeable difference (jnd)**.
2) **Weber's law** states that the difference threshold, or jnd, is directly proportional to the magnitude of the stimulus with which the comparison is being made, and can be expressed as **weber fraction**.
    a) Although Weber's law breaks down at extremely high and low intensities of stimulation, it holds up reasonably well within the most frequently encountered range, therefore providing a reasonable barometer of our abilities of discern differences in the various sensory modalities.
    b) The smaller the fraction, the greater the sensitivity to differences.

e. Sensory Adaptation
1) Sensory neurons are engineered to respond to a constant stimulus by decreasing their activity, and the diminishing sensitivity to an unchanging stimulus is called **sensory adaptation** (or **habituation**).
2) Adaptation occurs in all sensory modalities, including vision.
    a) Were it not for tiny involuntary eye movements that keep images moving about the retina, stationary objects would simply fade from sight if we stared at them.
3) Although sensory adaptation may reduce our overall sensitivity, it is adaptive because it frees our senses from the constant and the mundane to pick up informative changes in the environment.
    a) Sensitivity to such changes may turn out to be important to our well-being or survival.
    b) Sensory adaptation most mostly absent in animals while they were alert and engaged in a behavioural learning task, whereas after the task was learned and had become routine, levels of alertness lowered and sensory adaptation returned.

3. The Sensory Systems
a. Vision
1) Introduction
    a) The normal stimulus for vision is electromagnetic energy, or light waves, which are measured in nanometres (or one billionths of a metre).
    b) The order of the spectrum, from higher wavelengths to lower ones, is ROY G. BIV - red, orange, yellow, green, blue, indigo, and violet.
2) The Human Eye
    a) Structures
        a) Light waves enter the eye through the **cornea**, a transparent protective structure at the front of the eye.
        b) Behind the cornea is the **pupil**, an adjustable opening that can dilate or constrict to control the amount of light that enters the eye.
        c) The pupil's size is controlled by muscles in the coloured **iris** that surrounds the pupil.
        d) Behind the pupil is the **lens**, an elastic structure that becomes thinner to focus on distant objects and thicker to focus on nearby objects.
        e) The lends of the eye focuses the visual image on the light-sensitive **retina**, a multi-layered tissue at the rear of the fluid-filled eyeball.
            i) The lens reverses the image from right to left and top to bottom when it is projected on the retina, but the brain reconstructs the visual input into the image that we perceive.
    b) Abilities

a) The ability to see clearly depends on the lens's ability to focus the image directly onto the retina.
b) If you have good vision for nearby objects but have difficulty seeing faraway objects, then you probably suffer from **myopia** (nearsightedness).
    i) In nearsighted people, the lens focuses the visual image in front of the retina (too near to the lens), resulting in a blurred image for faraway objects.
    ii) This condition generally occurs because the eyeball is longer (front to back) than normal.
c) Some people have excellent distance vision but have difficulty seeing closeup objects clearly.
    i) **Hyperopia** (farsightedness) occurs when the lens does not thicken enough and the image is therefore focused on a point behind the retina (too far from lens).
    ii) The aging process typically causes the eyeball to become shorter over time, contributing to the development of hyperopia and the need for many middle-aged people to acquire reading glasses.
d) Eyeglasses and contact lenses are designed to correct for the natural lens's inability to focus the visual image directly onto the retina.
    i) Recent research suggests that playing action video games might also be effective in improving eyesight, even for older adults.

3) Photoreceptors: The Rods and Cones
a) The retina, a multi-layered screen that lines the back surface of the eyeball and contains specialized sensory neurons, is actually an extension of the brain.
    a) The retina contains two types of light-sensitive receptor cells called rods and cones because of their shapes.
    b) There are about 120 million rods and 6 million cones in the human eye.
b) The **rods**, which function best in dim light, are primarily black-and-white brightness receptors.
    a) They are about 500 times more sensitive to light than are the cones, but they do not give rise to colour sensations.
        i) The retinas of some night creatures, such as the owl, contain only rods, so they have exceptional vision in very dim light but no colour vision during the day.
c) The **cones**, which are colour receptors, function best in bright illumination.
    a) Some creatures that are active only during the day, such as the pigeon and the chipmunk, have only cones in their retinas, so they see the world in living colour but have very poor night vision.
d) Animals that are active during both day and night, as humans are, have a mixture of rods and cones.
    a) In humans, rods are found throughout the retina except in the **fovea**, a small area in the centre of the retina that contains only cones.
    b) Cones decrease in concentration as one moves away from the centre of the retina, and the periphery of the retina contains mainly rods.
e) Rods and cones send their messages to the brain via two additional layers of cells.
    a) **Bipolar cells** have synaptic connections with the rods and cones.
    b) The bipolar cells, in turn, synapse with a layer of about one million **ganglion cells**, whose axons are collected into a bundle to form the **optic nerve**.
f) Many rods are connected to the same bipolar cell, where the additive effect of the many signals may be enough to fire it.
    a) That is why we can more easily detect a faint stimulus, such as a dim star, if we look slightly to one side so that its image falls not on the fovea but on the peripheral portion of the retina, where the rods are packed most densely.
g) Like the rods, the cones that lie in the periphery of the retina also share bipolar cells. In the fovea, however the densely packed cones each have their own private line to a single bipolar cell.
    a) As a result, our **visual acuity**, or ability to see fine detail, is greatest when the visual image projects directly onto the fovea.

b) Some birds of prey, such as eagles and hawks, have two foveas in each eye, contributing to a visual acuity that allows them to see small prey on the ground as they soar high above the earth.

h) The optic nerve formed by the axons of the ganglion cells exits through the back of the eye not far away from the fovea, producing a **blind spot**, where there are no photoreceptors.

a) We are unware of the blind spot because our perceptual system fills in the missing part of the visual field.

4) Visual Transduction: From Light to Nerve Impulses

a) The process whereby the characteristics of a stimulus are converted into nerve impulses is called transduction.

b) Rods and cones translate light waves into nerve impulses through the action of protein molecules called **photopigments**.

a) The absorption of light by these molecules produces a chemical reaction that changes the rate of neurotransmitter release at the receptor's synapse with the bipolar cells.

b) The greater the change in transmitter release, the stronger the signal passed on to the bipolar cell and, in turn, to the ganglion cells whose axons form the optic nerve.

5) Brightness Vision and Dark Adaptation

a) Rods are far more sensitive than cones under conditions of low illumination.

a) Nonetheless, the brightness sensitivity of both the rods and the cones depends in part on the wavelength of the light.

b) Research has shown that rods have much greater brightness sensitivity than cones throughout the colour spectrum except at the red end, where rods are relatively insensitive.

c) Cones are most sensitive to low illumination in the greenish-yellow range of the spectrum.

b) **Dark adaptation** is the progressive improvement in brightness sensitivity that occurs over time under conditions of low illumination.

a) After absorbing light, a photoreceptor is depleted of its pigment molecules for a period of time.

b) If the eye has been exposed to conditions of high illumination, such as bright sunlight, a substantial amount of photopigment will be depleted.

c) During the process of dark adaptation, the photopigment molecules are regenerated, and the receptor's sensitivity increases greatly.

6) Colour Vision

a) The Trichromatic Theory

a) Any colour in the visible spectrum can be produced by some combination of the wavelengths that correspond to the colours blue, green, and red, which is known as **additive colour mixture**.

b) According to the Young-Helmholtz **trichromatic theory**, there are three types of colour receptors in the retina.

i) Although all cones can be stimulated by most wavelengths to varying degrees, individual cones are most sensitive to wavelengths that correspond to either blue, green, or red.

ii) Presumably, each of these receptor classes sends messages to the brain, based on the extent to which they are activated by the light energy's wavelength.

iii) The visual system then combines the signals to recreate the original hue.

c) Although the Young-Helmholtz theory al facts did not fit the theory.

i) First, certain people with red-green colour blindness are able to experience yellow, the combination of red and green.

ii) The second problem is the afterimage, in which a colour stimulus has been viewed steadily and then withdrawn, which can not be explained by trichromatic theory.

b) Opponent-Process Theory

a) Hering's **opponent-process theory** proposed that each of the three cone types

responds to two different wavelengths.
    i) One type responds to red or green, another to blue or yellow, and a third to black or white.
b) As you state at a certain colour, the neural processes that register that colour becomes fatigued.
    i) Then when you cast your gaze on the white surface, which reflects all wavelengths, a "rebound" opponent reaction occurs as each receptor responds with its opposing color reactions.

c) Dual Process in Colour Transduction
a) Today's **dual process theory** combines the trichromatic and opponent-process theories to account for the colour transduction process.
b) Trichromatic theorists were right about the cones.
    i) The cones do indeed contain one of three different protein photopigments that are most sensitive to wavelengths roughly corresponding to the colour blue, red, and green.
    ii) Different ratios of activity in the red-, blue-, and green-sensitive cones can produce a pattern of neural activity that corresponds to any hue in the spectrum.
c) Hering's opponent-process theory was also partly correct, but opponent process do not occur at the level of the cones, as he maintained.
    i) When researchers began to use microelectrodes to record rom single cells in the visual system, they discovered that certain ganglion cells in the retina, as well as the visual cortex, respond in an opponent-process fashion by altering their rate of firing.

d) Colour-Deficient Vision
a) People with normal colour vision are referred to as **trichromats**.
    i) They are sensitive to all three systems: red-green, yellow-blue, and black-white.
b) There are people who have a deficiency in the red-green system, the yellow-blue system, or both, which is caused by an absence of hue-sensitivity photopigment in certain cone types.
    i) A **dichromat** is a person who is colour-blind in only one of the systems (red-green or yellow-blue).
        One. Most colour-deficient people are dichromats and have their deficiency in the red-green system.
    ii) A **monochromat** is sensitive only to the black-white system and is totally colour-blind.

7) Analysis and Reconstruction of Visual Scenes
a) Process
a) From the retina, the optic nerve sends nerve impulses to a visual relay station in the thalamus, the brain's sensory switch board.
b) From there, the input is routed to various parts of the cortex, particularly the **primary visual cortex** in the occipital lobe at the rear of the brain.

b) Mapping
a) Microelectrode studies have shown that there is a point-to-point correspondence between tiny regions of the retina and groups of neurons in the visual cortex.
b) The fovea, where the one-to-one synapses of cones with bipolar cells produces high visual acuity, is represented by a disproportionately large area of the visual cortex.
c) There is more than one cortical map of the retina; there are at least 10 duplicate mappings.

c) Feature Detectors
a) Groups of neurons within the primary visual cortex are organized to receive and integrate sensory nerve impulses originating in specific regions of the retina.
b) Some of these cells are known as **feature detectors**.
    i) They fire selectively in response to stimuli that have specific characteristics.
c) These feature detector "modules" subdivide a visual scene into its component dimensions and process them simultaneously.

i) Separate but overlapping modules within the brain simultaneously analyze its colours, shape, distance, and movement by engaging in **parallel processing** of the information and constructing a unified image of its properties.

d) Recently, scientists have discovered that neurons in the brain respond selectively not only to basic stimulus characteristics such as corners and colours, but also to complex stimuli that have acquired special meaning through experience.

d) Visual Association Cortex

a) The final stages in the process of constructing a visual representation occur when the information analyzed and recombined by the primary visual cortex is routed to other cortical regions known as the **visual association cortex**.

b) Here successively more complex features of the visual scene are combined and interpreted in light of our memories and knowledge.

b. Audition

1) Introduction

a) The stimuli for our sense of hearing are sound waves, a form of mechanical energy.

b) **Frequency** is the number of sound waves, or cycles, per second.

a) The **hertz (Hz)** is the technical measure of cycles per second; 1 hertz equals 1 cycle per second.

b) The soundwave's frequency is related to the pitch that we perceive; the higher the frequency, the higher the perceived pitch.

c) Humans are capable of detecting sound frequencies from 20 hertz to 20,000 hertz.

c) **Amplitude** refers to the vertical size of the sound waves - that is , the amount of compression and expansion of the molecules in the conducting medium.

a) The soundwave's amplitude is the primary determinant of the sound's perceived loudness.

b) Differences in amplitudes are expressed as **decibels (db)**, a measure of the physical pressures that occur at the eardrum.

c) The absolute threshold for hearing is arbitrarily designated as 0 decibels, and each increase of 10 decibels represents a tenfold increase in loudness - it is a logarithmic scale.

2) Auditory Transduction

a) Structures

a) Sound waves first travel into an **external auditory canal** leading to the **eardrum (tympanic membrane)**, a movable membrane that vibrates in response to the sound waves.

b) Beyond the eardrum is the **middle ear**, a cavity housing three tiny bones.

c) The vibrating activity of these bones - the **hammer (malleus)**, **anvil (incus)**, and **stirrup (stapes)** - amplifies the sound waves more than 30 times.

i) The first bone, the hammer, is attached firmly to the eardrum, and the stirrup is attached to another membrane, the **oval window**, which forms the boundary between the middle ear and the inner ear.

d) The inner ear contains the **cochlea**, a coiled, snail-shaped tube about 3.5 centimeters in length that is filled with fluid and contains the **basilar membrane**, a sheet of tissue that runs its length.

e) Resting on the basilar membrane is the **organ of Corti**, which contains about 16,000 tiny hair cells that are attached to the **tectorial membrane** that overhangs the basilar membrane along the entire length of the cochlea.

i) The hair cells synapse with the neurons of the auditory nerve which, in turn, sends impulses via an auditory relay station in the thalamus to the auditory cortex, which is located in the temporal lobe.

b) Processes

a) When sound waves strike the eardrum, pressure created at the oval window by the hammer, anvil, and stirrup of the middle ear sets the fluid inside the cochlea into motion.

b) The fluid waves that result vibrate the basilar membrane and the membrane above it, causing a bending of the hair cells in the organ of Corti.

c) This bending of the hair cells triggers a release of neurotransmitter substance into

the synaptic space between the hair cells and the neurons of the auditory nerve, resulting in nerve impulses that are sent to the brain.
                d) Within the auditory cortex, located in the temporal lobe, are feature detectors neurons that respond to specific kinds of auditory input.
        3) Coding of Pitch and Loudness
            a) Loudness
                a) High-amplitude sound waves cause the hair cells to bend more and release more neurotransmitter substance at the point where they synapse with auditory nerve cells, resulting in a higher rate of firing within the auditory nerve.
                b) In addition, certain receptor neurons have higher thresholds than others, so that they will fire only when considerable bending of the hair cells occurs in response to an intense sound.
                c) Thus, loudness is coded in terms of both the rate of firing in a axons of the auditory nerve and in terms of which specific hair cells are sending messages.
            b) Pitch
                a) The coding of pitch also involves two different processes, one for frequencies below about 1000 hertz and another for higher frequencies.
                b) According to the **frequency theory** of pitch perception, nerve impulses sent to the brain match the frequency of the sound wave.
                    i) Because neurons are limited in their rate of firing, individual impulses or volleys of impulses fired by group of neurons can not produce higher enough frequencies of firing to match sound wave frequencies above 1000 hertz.
                c) Bekesy's observations supported a **place theory of pitch perception**, suggesting that the specific point in the cochlea where the fluid wave peaks and most strongly bends the hair cells serve as a frequency coding cue.
                    i) The auditory has a tonal frequency map that corresponds to specific areas of the cochlea.
                d) At low frequencies, frequency theory holds true; at higher frequencies, place theory provides the mechanism for coding the pitch of a sound.
        4) Sound Localization
            a) The two ears play a crucial role in **sound localization**.
            b) The nervous system uses information concerning the time and intensity differences of sounds arriving at the two ears to locate the source of sounds in space.
        5) Hearing Loss
            a) **Conduction deafness** is caused by problems involving the mechanical system that transmits sound waves to the cochlea.
                a) Use of a hearing aid, which amplifies the sounds entering the ear, may correct many cases of conduction deafness.
            b) **Nerve deafness** is caused by damaged receptors within the inner ear or damage to the auditory nerve itself, and it cannot be helped by a hearing aid.
                a) Although aging and disease can produce nerve deafness, exposure to loud sounds is a leading cause of nerve deafness.
    c. Taste and Smell: The Chemical Senses
        1) Introduction
            a) **Gustation** (taste) and **olfaction** (smell) are chemical senses because their receptors are sensitive to chemical molecules rather than to some form of energy.
            b) These senses are so intertwined that some scientists refer to a **common chemical sense**.
        2) Gustation: the Sense of Taste
            a) There are only four basic qualities of taste: sweet, sour, salty, and bitter.
            b) **Taste buds** are chemical receptors concentrated along the edges and back surface of the tongue.
                a) Each taste bud is most responsive to one or two of the basic taste qualities, but responds weakly to the others as well.
            c) An additional taste sensation called **umami** increases the sensitivity of other taste qualities.
                a) This sensory response is activated by certain proteins, as well as by monosodium glutamate, a substance used by some of for flavour enhancement.

d) Humans have about 9,000 taste buds, each consisting of several receptors cells arranged like the segments of an orange.
    a) Hair-like structures project from the top of each cell into the taste pore.
    b) When a substance is taken into the mouth, it interacts with saliva to form a chemical solution that flows into the taste pore and stimulates the receptor cell.
    c) A "taste" results from complex patterns of neural activity produced by the four types of taste receptors.
    d) A small number of receptors also are found in the roof and back of the mouth.

3) Olfaction: the Sense of Smell
    a) The receptors for smell are long cells that project through the lining of the upper part of the nasal cavity and into the mucous membrane.
    b) The most popular current theory is that olfactory receptors recognize diverse odours individually rather than by mixing the activity of a smaller number of basic receptors, as occurs in taste.
        a) Olfactory receptors have receptor structures that resemble neurotransmitter binding sites on neurons.
        b) Any of the thousands of potential odour molecules can lock into sites that are tailored to fit them.
        c) The receptors that fire send their input to the **olfactory bulb**, a forebrain structure immediately above the nasal cavity.
        d) Each odorous chemical excites only a limited portion of the olfactory bulb, and odours are apparently coded in terms of the specific area of the olfactory bulb that is excited.
    c) The social and sexual behaviour of animals is more strongly regulated by olfaction than is human behaviour.
        a) Some researchers believe that **pheromones**, chemical signals found in natural body scents, may affect human behaviour in subtle ways.
        b) One interesting but puzzling observation, known as **menstrual synchrony**, is the tendency of women who live together or are close friends to become more similar in their menstrual cycles.

d. The Skin and Body Senses
1) Introduction
    a) The skin and body senses include the sense of touch, kinesthesis (muscle movement), and equilibrium.
    b) The last two are called **body senses** because they inform us of the body's position and movement.
2) The Tactile Senses
    a) Touch is important to us in many ways.
        a) Sensitivity to extreme temperatures and pain enables us to avoid external danger and alerts to disorders within our bodies.
        b) Tactile sensations are also a source of many of life's pleasures, including sexual orgasm.
    b) Humans are sensitive to at least four tactile sensations: pressure (touch), pain, warmth, and cold.
        a) These sensations are conveyed by receptors in the skin and in our external organs.
        b) Mixtures of these four sensations form the basis for all other common skin sensations.
    c) Little is known about how our skin senses work.
        a) Primary receptors for pain and temperature are **free nerve endings**, simple nerve cells beneath the skin's surface that resemble the bare branches of a tree in winter.
        b) Nerve fibres situated in the base of hair follicles are receptors for touch and light pressure.
    d) The brain can locate sensations because skin receptors send their messages to the point in the area of the body where the receptor is located.
        a) **Phantom limb** is the situation in which amputees experience vivid sensations coming from the missing limb.
3) Pain

a) Process
    a) Pain receptors are found in all body tissues with the exception of the brain, bones, hair, nails, and non-living parts of the teeth.
    b) Free nerve endings in the skin and internal organs respond to intense mechanical, thermal, or chemical stimulation and then send nerve impulses into the spinal cord, where sensory tracts carry pain information to the brain.
    c) Once in the brain, the sensory information about pain intensity and location is relayed by the thalamus to the somatosensory and frontal area of the cortex.
b) Emotion
    a) Pain has both a sensory and an emotional component.
        i) Other tracts from the thalamus direct nerve impulses to the limbic system, which is involved in motivation and emotion.
        ii) These tracts seem to control the emotional component of pain.

4) Spinal and Brain Mechanisms
    a) **Gate control theory** proposes that the experience of pain results from the opening and closing of gating mechanisms in the nervous system.
        a) Events in the spinal cord can open a system of spinal cord "gates" and allow the nerve impulses to travel toward the brain.
        b) However, other sensory input can partially or completely close the gates and blunt our experience of pain.
    b) Nerve impulses in fibers descending from the brain can also influence the experience of pain and helps to explain why pain is a psychological phenomenon as well as a physical one.
    c) The immune system also plays a role in pain.
        a) Glial cells, which structurally support and service neurons within the spinal cord, are involved in the creation and maintenance of pathological pain.
        b) These glial cells become activated by immune challenges and by substances released by neurons within the pain pathway.
        c) They then amplify pain by releasing **cytokines** (messenger molecules) that promote inflammation.
5) The endorphins
    a) **Endorphins** exert some of their painkilling effects by inhibiting the release of neurotransmitters involved in the synaptic transmission of pain impulses from the spinal cord to the brain.
    b) Study suggests that acupuncture normally release endorphins to blunt pain sensations.
6) The Body Senses
    a) **Kinesthesis** provides us with feedback about our muscle's and joints' positions and movement.
        a) The receptors are nerve endings in the muscles, tendons, and joints.
        b) The information this gives us is the basis for making coordinated movements.
    b) Cooperating with kinesthesis is the **vestibular sense**, the sense of body orientation or equilibrium.
        a) The vestibular receptors are located in the **vestibular apparatus** of the inner ear.
            i) One part of the equilibrium system consists of three **semicircular canals**, which contains the receptors for head movement.
            ii) Each canal lies in a different plane: left/right, backward/forward, or up/down.
            iii) These canals are filled with fluid and lined with hair-like cells that function as receptors.
            iv) When the head moves, the fluid in the appropriate canal shifts, stimulating the hair cell and sending messages to the brain.
            v) The semicircular canals respond only to acceleration and deacceleration; when a constant speed is reached, the fluid and the hair cell return to their normal resting state.
        b) Located at the base of the semicircular canals, the **vestibular sacs** also contain hair cells that respond to the position of the body and tell us whether we are upright or tilted at an angle.

4. Perception: The Creation of Experience

a. Introduction
    1) In **bottom-up processing**, the systems takes in individual elements of the stimulus and then combines them into a unified perception.
    2) In **top-down processing**, sensory information is interpreted in the light of existing knowledge, concepts, ideas, and expectations.
        a) Top-down processing accounts for many psychological influences on perception, such as the roles played by our motives, expectations, previous experiences, and cultural learning.
b. Perception is Selective: The Role of Attention
    1) Introduction
        a) Attention involves two processes of selection: 1) focusing on certain stimuli, and 2) filtering out other incoming information.
        b) These processes have been studied experimentally through a technique called **shadowing**.
            a) Participants wear earphones and listen simultaneously to two messages, one sent through each earphone. And They are asked to repeat ("shadow") one of the messages word for word as they listen.
            b) Most participants can do this quite successfully, but only at the cost of not remembering what the other message was about.
            c) Shadowing experiments demonstrate that we cannot attend completely to more than one thing at a time, but we can shift our attention rapidly back and forth between the two messages, drawing on our general knowledge to fill in the gaps.
    2) Inattentional Blindness
        a) Electrical recording and brain-imaging studies have shown that unattended stimuli register in the nervous system but do not enter immediate experience.
        b) In the visual realm, scientists have coined the term **inattentional blindness** to refer to the failure of unattended stimuli to register in consciousness.
    3) Environmental and Personal Factors in Attention
        a) Attention is strongly affected both by the nature of the stimulus and by personal factors.
        b) Stimulus characteristics that attract our attention include intensity, novelty, movement, contrast and repetition.
        c) Internal factors, such as our motives and interests, act as powerful filters and influence which stimuli in our environment we will notice.
            a) People are especially attentive to stimuli that have relevance to their well-being, a tendency that clearly has biological survival value.
            b) Humans' ability to perceive and recognize objects in their peripheral visual field is greater for naturalistic stimuli like animals than for artificial stimuli like letters or numbers.
c. Perceptions Have Organization and Structure
    1) Gestalt Principles of Perceptual Organization
        a) Gestalt theorists were early champions of top-down processing, arguing that the wholes we perceive are often more than (and frequently different from) the sum of their parts.
        b) The Gestalt theorists emphasized the importance of **figure-ground relations**.
            a) We tend to organize stimuli into a central or foreground figure and a background.
            b) Separating figure from ground can be a challenging task, yet our perceptual systems usually are equal to the task. At times, however, what's figure and what's ground is not completely obvious, and the same stimulus may give rise to two different perceptions.
        c) In addition to figure-ground relations, the Gestalt psychologists were interested in how separate stimuli come to be perceived as parts of larger wholes.
            a) They suggested that people group and interpret stimuli in accordance with four **Gestalt laws** of perceptual organization: similarity, proximity, closure, and continuity.
d. Perception Involves Hypothesis Testing
    1) Recognizing a stimulus implies that we have a **perceptual schema** - a mental representation or images - to compare it with.
        a) Our schemas contain the critical features of objects, events, and other perceptual

phenomena.
b) They allow us to classify and identify sensory input in a top-down fashion.
2) Perception is, in this sense, an attempt to make sense of stimulus input, to search for the "best" interpretation of sensory information we can arrive at, based on our knowledge and experience.
a) In some instances, sensory information fits two different internal representations, and there is not enough information to permanently rule out one of them in favour of the other.

e. Perception Is Influenced By Expectations: Perceptual Sets
1) **Perceptual set** is a readiness to perceive stimuli in a particular way.
2) Sometimes believing is seeing.

f. Stimuli Are Recognizable under Changing Conditions: Perceptual Constancies
1) Were it not for **perceptual constancies** that allow us to recognize familiar stimuli under varying conditions, we would have literally to rediscover what something is each time it appeared under different conditions.
2) In vision, several constancies are important.
a) **Shape constancy** allows us to recognize people and other objects from many different angles.
b) Because of **brightness constancy**, the relative brightness of objects remains the same under different conditions of illumination, such as full sunlight and shade.
a) Brightness constancy occurs because the ratio of light intensity between an object and its surroundings usually is constant.
c) **Size constancy** is the perception that the size of objects remains relatively constant even though images on our retina change in size with variations in distance.

5. Perception of Depth, Distance, and Movement
a. Depth and Distance Perception
1) Introduction
a) The retina receives information in only two dimensions (length and width), but the brain translates these cues into three-dimensional perceptions.
b) It does this by using both **monocular cues** (which requires only one eye), and **binocular cues** (which requires both eyes).
2) Monocular Depth Cues
a) One cue is patterns of **light and shadow**.
b) Another cue, **linear perspective**, refers to the perception that parallel lines converge or angle toward each other as they recede into the distance.
c) **Interposition**, in which objects closer to us may cut off part of our view of more distant objects, provides another cue for distance and depth.
d) An object's **height in the horizontal plane** provides another source of information.
e) **Texture** is a fifth cue, because the texture or grain of an object appears finer as distance increases.
f) **Clarity** can be an important cue for judging distance.
g) **Relative size** is yet another basis for distance judgements.
h) A final monocular cue is **motion parallax**, which tells us that if we are moving, nearby objects appear to move faster in the opposite direction than do faraway ones.
3) Binocular Disparity
a) The most dramatic perceptions of depth arise with binocular depth cues, which require the use of both eyes.
b) **Binocular disparity** refer to the fact that each eye sees a slightly different image.
a) Within the brain, the visual input from the two eyes is analyzed by feature detectors that are attuned to depth.
b) Some of the feature detectors respond only to stimuli that are either in front of or behind the point we are fixing our gaze upon.
c) The responses of these depth-sensitive neurons are integrated to produce our perception of depth.
c) A second binocular distance cue, **convergence**, is produced by feedback from the muscles that turn your eyes inward to view a near object.

b. Perception of Movement

1) The perception of movement is a complex process that requires the brain to integrate information from several different senses.
2) The primary cue for perceiving motion is the movement of the stimulus across the retina.
    a) Under optimal conditions, a retinal image need move only about one-fifth the diameter of a single cone for us to detect movement.
3) The relative movement of an object against a structured background is also a movement cue.
4) The illusion of smooth motion can be produced if we arrange for the sequential appearance of two or more stimuli.
    a) Gestalt psychologist Max Wertheimer demonstrated this in his studies of **stroboscopic movement**, illusory movement produced when a light is briefly flashed in darkness and then, a few milliseconds later, another light is flashed nearby.

6. Illusions: False Perceptual Hypotheses
    a. Our knowledge of perceptual schemas, hypotheses, sets, and constancies allow us to understand some interesting perceptual experiences known as **illusions**.
    b. **Illusions** are compelling but incorrect perceptions.
        1) Ironically, most visual illusions can be attributed to perceptual constancies that ordinarily help us to perceive more accurately.
        2) Our perceptual hypotheses are strongly influenced by the **context**, or surroundings, in which a stimulus occurs.
7. Experience, Critical Periods, and Perceptual Development
    a. Introduction
        1) Development of sensory and perceptual systems results from the interplay of biological and experiential factors.
        2) Genes program biological development, but this development is also influenced by environmental experiences.
    b. Cross-Cultural Research on Perception
        1) As far as we know, humans normally come into the world with the same perceptual abilities; However, from that point, the culture one grows in helps to determine the kinds of perceptual learning experiences people have.
        2) Cross cultural research can help to identify which aspects of perception occurs in all people, regardless of their cultures, as well as perceptual differences that result from cultural experiences.
    c. Restored Sensory Capacity
        1) For some aspects of perception, there are also **critical periods** during which certain kinds of experiences must occur if perceptual abilities and the brain mechanisms that underlie them are to develop normally.
            1) If the critical period passes without the experience occurring, it is to late to undo the deficit that results.
            2) We can use the methodology of a **deprivation experiment** to study this.
        2) Biological and experiential factors interact in complex ways.
            1) Some of our perceptual abilities are at least partially present at birth, but experience plays an important role in their normal development.

Chapter 5 Summary

October 31, 2017 10:18 AM

1. Introduction
    a. The senses may be classified in terms of the energy to which they respond. Through the process of transduction, these energy forms are transformed into the common language of nerve impulses.
2. Vision
    a. The normal stimulus for vision is electromagnetic energy, or light waves. Light-sensitive visual receptor cells are located in the retina. The rods are brightness receptors, and the less numerous cones are colour receptors. Light energy striking the retina is converted into nerve impulses by chemical reactions in the photopigments of the rods and cones. Dark adaptation involves the gradual regeneration of photopigments that have been depleted by brighter illumination.
    b. Visual stimuli are analyzed by feature detectors in the primary visual cortex, and the stimulus elements are reconstructed and interpreted in light of input from the visual association cortex.
3. Audition
    a. Sound waves, the stimuli for audition, have two characteristics: frequency, measured in terms of cycles per second of hertz (Hz), and amplitude, measured in terms of decibels (db). Frequency is related to the pitch, amplitude to loudness. The receptors for hearing are hair cells in the organ of Corti of the inner ear.
    b. Loudness is coded in terms of the number of types of auditory nerve fibres that fire. Pitch is coded in two ways. Low-frequency tones are coded in terms of corresponding numbers of nerve impulses in individual receptors or by volleys of impulses from a number of receptors. Frequencies above 1000 hertz are coded according to the region of the basilar membrane that is displaced most by the fluid wave in the cochlear canal.
    c. Hearing loss may result from conduction deafness, produced by problems involving the structures of the inner ear that transmit vibrations to the cochlea, or from nerve deafness, in which the receptors of the inner ear or the auditory nerve are damaged.
4. Chemical Sense - Taste and Smell
    a. The receptors for taste and smell respond to chemical molecules. Taste buds are responsive to four basic qualities: sweet, sour, salty, and bitter. The receptors for smell (olfaction) are long cells in the upper nasal cavity. Natural body odours produced by pheromones appear to account for a menstrual synchrony that some times occurs among women who are in frequent contact.
5. The Skin and Body Senses
    a. Pain is a complex perception influenced by biological and psychological factors. At the biological level, the major pain receptors appear to be free nerve endings. Gate control theory attributes pain to the opening and closing of gates in the spinal cord and to influences from the brain. The nervous system contains endorphins, which play a major role in pain reduction.
    b. The skin and body senses include touch, kinesthesis, and equilibrium. Receptors in the skin and body tissues are sensitive to touch, pain, warmth, and cold. Kinesthesis functions by means of nerve endings in the muscles, tendons, and joints. The sense organs for equilibrium are in the vestibular apparatus of the inner ear.
    c. Principles derived from the study of sensory processes have been applied in developing sensory prosthetics for the blind and the hearing impaired. Examples include the Sonicguide, a device that provides visual information through tactile stimulation of the tongue, direct electrical stimulation of the visual cortex, and cochlear implants.
6. Perception
    a. Perception involves both bottom-up processing, in which individual stimulus fragments are combined into a perception, and top-down processing, in which existing knowledge and perceptual schemas are applied to interpret stimuli.

b. Attention is an active process in which we focus on certain stimuli while blocking out other stimuli. We cannot attend completely to more than one thing at a time, but we are capable of rapid attentional shifts. Attentional processes are affected by the nature of the stimulus and by personal factors such as motives and interests. The perceptual system appears to be especially vigilant to stimuli that denote threat or danger.
c. The Gestalt psychologists identified a number of principles of perceptual organization, including figure-ground relations and the laws of similarity, proximity, closure, and continuity. R. L. Gregory suggested that perception is essentially a hypothesis about what a stimulus is, based on previous experience and the nature of the stimulus.
d. Perceptual sets involve a readiness to perceive stimuli in certain ways, based on our expectations, assumptions, motivations, and current emotional state.
e. Perceptual constancies allow us to recognize familiar stimuli under changing conditions. In the visual realm, there are three constancies: shape, brightness, and size.

7. Depth and Distance
   a. Monocular cues to judge distance include linear perspective, relative size, height in the horizontal plane, texture, and clarity. These distance cues also help us judge depth. Depth perception also occurs through the monocular cues of light and shadow patterns, interposition, and motion parallax.
   b. Binocular disparity occurs as slightly different images are viewed by each eye and acted on by feature detectors for depth. Convergence of the eyes provides a second binocular cue.
   c. The basis for perception of movement is absolute movement of a stimulus across the retina or relative movement of an object in relation to its background. Stroboscopic movement is illusory.
   d. Illusions are erroneous perceptions. They may be regarded as incorrect perceptual hypotheses. Perceptual constancies help to produce a variety of context-produced illusions.
8. Perceptual Development
   a. Perceptual development involves both physical maturation and learning. Some perceptual abilities are innate or develop shortly after birth, whereas others require particular experiences early in life to develop.
   b. Cultural factors can influence certain aspects of perception, including picture perception and susceptibility to illusions. However, many aspects of perception seem constant across cultures.
   c. Visual deprivation studies, manipulation of visual input, and studies of restored vision have shown that the normal biological development of the perceptual system depends on certain sensory experiences at early periods of development.

Chapter 6 State of Consciousness

November 1, 2017 3:27 PM

1. The Puzzle of Consciousness
    a. Introduction
        i. **State of consciousness** is a pattern of subjective experience, a way of experiencing internal and external events.
        ii. **Altered state of consciousness** refers to variations from our normal waking state.
        iii. **Consciousness** is defined as our moment-to-moment awareness of ourselves and our environment.
            1) Among its characteristics, consciousness is subjective and private, dynamic (ever-changing), self-reflective and central to our sense of self, and intimately connected with the process of selective attention.
    b. Measuring State of Consciousness
        i. Self-report is used for people to describe their inner experiences.
            1) Self-reports offer the most direct insight into a person's subjective experience, but they are not always verifiable.
        ii. Physiological measures establish the correspondence between bodily states and mental processes.
            1) Physiological measures are objective but cannot tell us what a person is experiencing subjectively.
        iii. Behavioural measures also are used, including performance on special tasks, such as the **rouge test**.
            1) Behavioural measures are objective, but we still must infer the person' (or chimp's) state of mind.
    c. Levels of Consciousness: Psychodynamic and Cognitive Perspective
        i. Introduction
            1) The **conscious** mind contains thoughts, perceptions, and other mental events of which we are currently aware.
            2) **Preconscious** mental events are outside current awareness, but can easily be recalled under certain conditions.
            3) **Unconscious** events cannot be brought into conscious awareness under ordinary circumstances.
        ii. The Cognitive Viewpoint
            1) Cognitive psychologists reject the notion of an unconscious mind driven by instinctive urges and repressed conflicts. Rather, they view conscious and unconscious mental life as complementary forms of information processing.
            2) Controlled versus automatic processing
                a) Many activities, such as planning a vacation or studying, involve **controlled (effortful) processing**, the voluntary use of attention and conscious effort.
                b) Other activities involve **automatic processing** and can be performed with little or no conscious effort.
                    i) Automatic processing occurs most often when we carry out routine actions or well-learned tasks.
                    ii) However, automatic processing reduces our chances of finding new ways to approach problems.
                    iii) Still, automatic processing offers speed and economy of effort, and in everyday life most actions may be processed this way.

3) Divided attention
    a) Automatic processing also facilitates **divided attention**, the ability to perform more than one activity at the same time.
    b) Although divided attention can be adaptive, it can have serious negative consequences in certain situations.

iii. The Emotional Unconscious
1) Emotional and motivational processes can also operate unconsciously and influence behaviour.

d. The Neural Basis of Consciousness
i. Windows to the Brain
1) Visual Agnosia
    a) **Visual agnosia** is an inability to visually recognize objects.
    b) People with visual agnosia are not blind; they can see and are aware of seeing, but they cannot identify objects by sight.
2) Blindsight
    a) Patients with **blindsight** will report that they cannot see.
    b) As with visual agnosia, cases of blindsight demonstrate that visual information can be processed and influence behaviour outside of conscious awareness.

ii. Consciousness and the Modular Mind
1) Many neuroscientists view the mind as a collection of largely separate but interacting information-processing modules that perform tasks related to sensation, perception, memory, movement, planning, problem solving, emotion, and so on.
    a) The modules process information in parallel - that is, simultaneously and largely independently.
    b) However, there is also cross-talk between them, as when the output from one module is carried by neural circuits to provide input for another module, or a module receives input from two independently functioning modules.
2) According to one view, consciousness is a **global workspace** that represents the unified activity of multiple modules in different areas of the brain.
    a) In essence, of the many brain modules and connecting circuits that are active at any instant, a particular subset becomes joined in unified activity that is strong enough to become a conscious perception of thought.
    b) The specific modules and circuits that make up this dominant subset can vary as our brain responds to changing stimuli - sights, sounds, smells, and so on - that compete for conscious attention.

2. Circadian Rhythms: Our Daily Biological Clocks
a. Keeping Time: Bain and Environment
i. Biological Basis
1) The daily biological cycles in our body are called **circadian rhythms**.
2) Most circadian rhythms are regulated by the brain's **superchiasmatic nucleus (SCN)**, which is located in the hypothalamus.
    a) The SCN synchronizes daily rhythms in physiology and behaviour.
    b) There is recent evidence that the SCN also regulates seasonal rhythms, such as seasonal rhythms in breeding and hibernation..

3) The SCN helps to control the **pineal gland**, which secrets **melatonin**, a hormone that has a relaxing effect on the body.
    a) SCN neurons become active during daytime and reduce the pineal gland's secretion of melatonin, raising your body temperature and heightening alertness.
    b) At night SCN neurons are inactive, allowing melatonin levels to increase and promoting relaxation and sleepiness.
4) Our circadian clock is biological, but environmental factors such as the day-night cycle to help SCN neurons on a 24-hour schedule.
    a) Your eyes have neural connections to the SCN. After a night's sleep, the light of day increases SCN activity and helps to reset your 24-hour biological clock.
    b) If people were lived in dark, most of them would drift into a longer natural cycle of about 24.2 to 24.8 hours, called a **free-running circadian rhythm**.

ii. Early Birds and Night Owls
1) Circadian rhythms influence our tendency to be a "morning person" or a "night person".
    a) Compared to night people, morning people go to bed and rise earlier, and their body temperature, blood pressure, and alertness peak earlier in the day.
2) Studies around the globe indicate that morningness is more common among older adults, whereas more night people are found among 18- to 39-year-olds.
3) Cultures also differ in their overall tendency toward morningness.
    a) People from warmer annual climates exhibited greater morningness than people from other places.

b. Environmental Disruption of Circadian Rhythms
i. Seasonal Affective Disorders
1) **Seasonal affective disorders (SAD)** is a cyclic tendency to become psychologically depressed during certain months of the year.
2) Symptoms typically begin in fall or winter, which usher in shorter periods of daylight, and then lift in spring.
3) Many experts belie that the circadian rhythms of SAD sufferers may be particularly sensitive to light, to as sunrises occur later in winter, the daily "onset" time of their circadian clocks may be pushed back to an unusual degree.

ii. Jet Lag
1) **Jet lag** is a sudden circadian disruption caused by flying across several time zones in one day.
2) Jet lag often causes insomnia, decreased alertness, and poorer performance until the body readjusts.
3) Typically, people adjust faster when flying west, presumably because lengthening the travel day is more compatible with our natural free-running circadian cycle.

iii. Nightshift Work
1) The most problematic circadian disruption for society is caused by **night shiftwork**.
    a) Overtime, fatigue, stress, and the likelihood of an accident increases.
2) When work shifts change, it is easier to extend the waking day than to compress it.
    a) A forward rotating work schedule that takes advantage

of this is called **rotating shiftwork**.

iv. Early-Morning Sleepiness
1) Our biological clocks promote sleepiness in the early-morning hours.

3. Sleep and Dreaming
a. Stages of Sleep
i. Sleep Research
1) Approximately through every 90 minutes while asleep, we cycle through different stages in which our brain activity and other physiological responses change in a generally predictable way.
2) Sleep research often is carried in specially equipped laboratories in which sleepers' physiological responses are recorded.
ii. Two Pre-Sleep Waves
1) EEG recordings of your brain's electrical activity show a pattern of **beta waves** when you are awake and alert.
a) Beta waves have a high frequency but a low amplitude or height.
2) As you close your eyes, feeling relaxed and drowsy, your brain waves slow down and **alpha waves** occur at about 9 to 12 cycles per second.
iii. 4 Stages of Sleep
1) Stage 1
a) Stage 1 is with **theta waves**, with which your brain-wave pattern becomes more irregular, and slower.
b) **Stage 1** is a form of light sleep from which one can easily be awakened.
c) One would probably spend just a few minutes in stage 1, during which time some people experience images and sudden body jerks.
2) Stage 2
a) **Sleep spindles** - period one- to two-second bursts of rapid brain wave activity (12 to 15 cycles per second) - indicate stage 2.
b) For people sleeping in **stage 2**, muscles are more relaxed, breathing and heart rate are slower, and are harder to awaken.
3) Stage 3
a) Sleep deepens as one moves into **stage 3**, marked by the regular appearance of very slow (0.5 to 2 cycles per second) and large **delta waves**.
4) Stage 4
a) As time passes, delta waves occur more often, and when delta waves dominate the EEG pattern, one have reached **stage 4**.
b) Together, stage 3 and stage 4 are often referred to as **slow-wave sleep**.
i) Your body is relaxed, activity in various parts of your brain has decreased, and you are hard to awaken.
5) General
a) After 20 to 30 minutes of stage 4 sleep, your EEG pattern changes as you go back through stages 3 and 2, spending a little time in each.
b) Overall, within 60 to 90 minutes of going to sleep, one will have completed a cycle of stages 123432, and at this

point, REM sleep ensues.

iv. REM Sleep
    1) **REM sleep** is indicated by the **rapid eye movements (REMs)**: every half minute or so, bursts of muscular activity caused the sleepers' eyeballs to vigorously move back and forth beneath their closed eyelid.
    2) During REM sleep, physiological arousal may increase to daytime levels.
        a) Heart rate quickens, breathing becomes more rapid and irregular, and brain-wave activity resembles that of active wakefulness.
        b) Men have penile erections and women experience vaginal lubrication; because most dreams do not have sexual content, this REM-induced genital arousal is not a response to sexual imagery.
    3) The brain also sends signals, making it more difficult for voluntary muscles to contract.
        a) As a result, muscles in the arms, legs, and torso lose tone and become relaxed. These muscles may twitch, but in effect you are paralyzed and unable to move.
        b) This stage is called **REM sleep paralysis**, and because of it, REM sleep is sometimes called **paradoxical sleep**: your body is highly aroused, and yet it looks like you are sleeping peacefully because you move so little.
    4) REM sleep is often though to be the only sleep in stage in which we dream or even experience mental activity, but this is not correct.
        a) The non-REM dream is shorter than REM dream and is often fixed and unmoving.
        b) Apart from non-REM dreams, mental activity that occurs during non-REM sleep also may resemble daytime thoughts, although in comparison to waking thoughts they are simple and jumbled.
        c) Some of the mental activity that occurs during non-REM sleep has even been referred to as **sleep thoughts** because of the closer resemblance to daytime thinking than to REM dreams.
    5) Each cycle through the sleep stages takes about 90 minutes, and as the hour pass, stage 4 and stage 3 drop out and REM periods become longer.

b. Getting a Night's Sleep: Brain and Environment
    i. Different aspects of the sleep cycle, such as falling asleep, REM sleep, and slow-wave sleep, are controlled by different brain mechanisms.
    ii. Separate systems turn on and actively promote sleep.
        1) **Basal forebrain**, areas at the base of the forebrain, and within the brain stem are particularly important in regulating our falling asleep.
        2) A different brain stem area - where the reticular formation passes through the pons - plays a key role in initiating REM sleep.
            a) This region contains "REM-sleep On" neurons that periodically activate other brain systems, each of which controls a different aspect of REM sleep.
    iii. Sleep is biologically regulated, but the environment plays a role as well: change of seasons, shiftwork, jet lag, stress at work and school, and nighttime noise.

c. How Much Do We Sleep?

i. Newborn infants average 16 hours of sleep a day, and almost half of their sleep time is in REM.
ii. But as we age, three important changes occur:
    1) We sleep less.
    2) REM sleep decreases dramatically during infancy and early childhood, but remains relatively stable thereafter.
    3) Time spent in stage 3 and 4 declines.

d. Sleep Deprivation
    i. Sleep deprivation influences mood, cognitive and physical performance.
    ii. Sleep deprivation is associated with a range of health complaints including type II diabetes and insulin resistance, high blood pressure, headache, stomach-ache, increased allergic reactions, and lowered health-related quality of life.

e. How to Promote Healthy Sleep
    i. Have a regular schedule
    ii. Have a bedtime ritual
    iii. Do not nap
    iv. Exercise regularly
    v. Your bedroom
    vi. Avoid heavy meals in the evening
    vii. Avoid caffeine, alcohol, and nicotine in the evening
    viii. Relax
    ix. If you are not sleeping, get up.

f. Why Do We Sleep
    i. Restoration Model
        1) According to the **restoration model**, sleep recharges our rundown bodies and allows us to recover from physical and mental fatigue.
        2) We do not know precisely, but some researchers believe that as a cellular waste product called **adenosine** accumulates, it influences brain systems that decrease alertness and promote sleep, signalling the body to slow down because too much cellular fuel has been burned.
    ii. Evolutionary/Circadian Sleep Model
        1) **Evolutionary/circadian sleep models** emphasize that sleep's main purpose is to increase a species' chances of survival in relation to its environmental demands.
        2) Over the course of evolution, each species developed a circadian sleep-wage pattern that was adaptive in terms of whether is was predator or prey, its food requirements, and its methods of defence from attach.
            a) For small prey animals, spending a lot time is adaptive, and for large prey animals, spending a lot of time asleep would be hazardous.
        3) Sleeping may have evolved also as a mechanism for conserving energy.
    iii. Function of REM Sleep
        1) The high level pf brain activity during REM sleep may help to strengthen the neural circuits involved in remembering important information from the preceding day.
            a) REM sleep and learning are related, although exactly how REM sleep, memory, and learning are related is an ongoing area of research.
        2) **REM-rebound effect** is a tendency to increase the amount of REM sleep after being deprived of it, and it occurs in many species, including humans.

g. Sleep Disorders
    i. Insomnia
        1) **Insomnia** refers to chronic difficulty in falling asleep, staying asleep, or experiencing restful sleep.
            a) Trouble falling asleep is most common among young adults, and difficulty staying asleep is most common among older adults.
            b) True insomniacs' sleep troubles are frequent and persistent.
            c) Certain people, called **pseudoinsomniacs**, complain of insomnia, but sleep normally when examined in the laboratory.
        2) Insomnia is the most common sleep disorder, experienced by approximately 10 to 40 percent of the population of various countries.
        3) Insomnia has biological, psychological, and environmental causes.
            a) Some people are genetically predisposed to insomnia.
            b) Medical conditions, mental disorders, such as anxiety and depression, and many drugs can disrupt sleep.
    ii. Narcolepsy
        1) **Narcolepsy** involves sudden, uncontrollable sleep attacks that may last from less than a minute to an hour, and no matter how much narcoleptics rest at night, sleep attacks can occur at any time.
        2) Narcolepsy is often associated with insomnia and REM sleep behaviour disorder.
            a) When sleep attack occurs, narcoleptic may experience a sudden loss of motor control (**cataplexy**) and go directly into a REM sleep.
        3) Causes of Narcolepsy
            a) There is a genetic predisposition for narcolepsy.
            b) Narcolepsy is often associated with an insensitivity to **hypocretin**, a peptide hormone produced in the hypothalamus that helps to regulate arousal, wakefulness, and appetite, and in cases of narcolepsy with cataplexy even a complete lack of the hypocretin producing neurons in the hypothalamus.
    iii. REM-Sleep Behaviour Disorder
        1) **REM-sleep behaviour disorder (RBD)** refers to the loss of muscle tone that causes normal REM paralysis is absent.
        2) Some researchers propose that brain abnormalities may prevent signals that normally inhibit movement during REM from being sent, but at present the causes of RBD are unknown.
    iv. Sleepwalking
        1) Sleepwalking typically occurs during a stage 3 or 4 period of slow wave sleep.
            a) Sleepwalkers often have blank stares and are unresponsive to other people, but they seem vaguely conscious of the environment as they navigate around furniture, go to the bathroom, or find something to eat.
            b) Sleep walkers often return to bed and awaken in the morning with no memory of the event.
        2) A tendency of sleepwalk may be inherited, and daytime stress, alcohol, and certain illnesses and medications also increase sleepwalking.

3) Various treatments may be used, including psychotherapy, drugs, and routinely awakening children before the time they typically sleepwalk. But the most common way simply is to wait for children to outgrow it while creating a safe home environment so that the sleepwalker does not get injured.
4) Awakening sleepwalkers is not harmful, although they may be confused for a few minutes.

v. Nightmares and Night Terrors
1) **Nightmares** are frightening dreams, and virtually everyone has them.
a) They occur most often during REM sleep and in the hours before we arise.
b) Physiological arousal during nightmares is similar to levels experienced during pleasant dreams.
2) **Night terrors** (also called **sleep terrors**) are more intense than nightmares: the sleeper, usually a child, suddenly sits up and seems to awaken, terrified and aroused to a near-panic state, and might trash about in bed or flee to another room, but has no memory of the episode.
a) Night terrors are most common during deep sleep (stages 3 and 4) and involve greatly elevated physiological arousal.

h. The Nature of Dreams
i. When Do We Dream
1) Mental activity occurs throughout the sleep cycle.
2) Research shows that we dream most when the brain is most active.
a) Brain activity is higher during REM sleep than non-REM sleep.
b) Brain activity is also higher in the final hours of sleep than it is during the earlier hours, thanks to our circadian sleep-wake cycle preparing us to rise for a new day.

ii. What Do We Dream About
1) With the coding system developed by Calvin Hall and Robert Van de Castle, researchers found that dreams are not nearly as strange as they are stereotyped to be, and most take place in familiar settings and often involve people we know.
a) Certainly, some dreams are bizarre, but they often leave a lasting impression that biases our perception of what most dreams are like.
2) Most dreams contain some negative content: 80 percent of the content involved negative emotions, and almost half contained aggressive acts, and a third involved some type of misfortune.
3) Women dreamt almost equally about male and female characters, whereas about two-thirds of men's dream characters were male.
4) Our experience, and current concerns can shape dream content.
5) Other recent research has considered dreams as part of a continuum on which consciousness can shift from alert wakefulness to daydreams to dreams.

iii. Why Do We Dream
1) Freud's Psychoanalytic Theory
a) Sigmund Freud believed that the main purpose of dreaming is **wish fulfillment**, the gratification of our unconscious desires and needs.
i) These desires include sexual and aggressive urges

that are too unacceptable to be consciously acknowledged and fulfilled in real life.

b) Freud distinguished between a dream's **manifest content** - the surface story that the dreamer reports - and its **latent content**, which is its disguised psychological meaning.

c) Dream analysis has been criticized as highly subjective: the same dream can be interpreted differently to fit the particular analyst's point of view.

2) Activation-Synthesis Theory

a) According to the **activation-synthesis theory**, during REM sleep the brain stem bombards our higher brain centres with random neural activity (the **activation** component), and because we are asleep, this neural activity does not match any external sensory events, but our cerebral cortex continues to interpret it by creating a dream that provide the best fit to the particular pattern of activation (the **synthesis** component).

b) It poses that dreaming does not serve any particular function, and it is merely a by-product of REM neural activity.

c) This does not explain the dreaming and mental imagery that occurs during non-REM sleep.

3) Cognitive Approaches

a) According to **problem-solving dream models**, dreams can help us find creative solutions to our problems and conflicts because they are not constrained by reality.

i) But critics point out that, just because a problem shows up in a dream, this does not mean that the dream involved an attempt to solve it.

b) **Cognitive-process dream theories** focus on the process of how we dream.

i) Based on the modular model of consciousness, these theories propose that dreaming and waking thought are produced by the same mental systems in the brain.

ii) As children's mental abilities develop with age, so does their ability to dream.

iii) Rapid shifting of attention is a process common to dreaming and waking mental activity.

4) Toward Integration

a) Although there currently is no agreed-upon model of dreaming, some theorists have begun to integrate concepts from cognitive, biological, and modern psychodynamic perspectives.

4. Drugs and Altered Consciousness

a. Drugs and the Brain

i. Introduction

1) Drugs enter the bloodstream and are carried throughout the brain by small blood vessels, called **capillaries**.

a) These capillaries contain a blood-brain barrier, a special lining of tightly packed cells that lets vital nutrients pass through so that neurons can function.

b) The blood-brain barrier screens out many foreign substances, but some, including a variety of drugs, manage to pass through.

c) Once inside, they alter consciousness by facilitating or

inhibiting synaptic transmission.

2) Psychoactive drugs act by influencing one or more of steps in synaptic transmission.
    a) First, neurotransmitters are synthesized inside the presynaptic (sending) neuron and stored in vesicles.
    b) Next, neurotransmitters are released into the synapse, where they bind with and stimulate receptor sites on the postsynaptic (receiving) neuron.
    c) Finally, neurotransmitter molecules are deactivated by enzymes or reuptake.

ii. How Drugs Facilitate Synaptic Transmission
1) An **agonist** is a drug that increases the activity of a neurotransmitter.
    a) Agonist may enhance the production, storage, or release of a neurotransmitter; activate the postsynaptic receptor (or make it easier for the neurotransmitter to stimulate their receptors); or prevent the neurotransmitter from being deactivated.
2) **Opiates** (such as morphine, codeine, or fentanyl) are effective pain relievers because it binds to and activates receptors that normally receive endorphins, a neurotransmitter that plays a major role in pain relief.
3) **Amphetamines** are powerful stimulants by amplifying the actions of the neurotransmitters dopamine and norepinephrine.
    a) Amphetamines cause neurons to release dopamine and norepinephrine, even if the neurons are not firing.
    b) Amphetamines also block the reuptake of these neurotransmitters, which allows dopamine and norepinephrine to remain in the synapse and to keep stimulating the postsynaptic neuron.

iii. How Drugs Inhibit Synaptic Transmission
1) A drug that inhibits or decreases the actions of a neurotransmitter is called an **antagonist**.
    a) An antagonist may reduce the synthesis, storage, or release of a neurotransmitter, or prevent a neurotransmitter from binding to its receptors on the postsynaptic neuron.
2) Many antagonists act on the postsynaptic receptors.
    a) The antipsychotics are used to treat schizophrenia by binding to dopamine receptors, and once bound they have no effect on the postsynaptic neuron.
    b) Instead, by occupying the receptor, they prevent the neurotransmitter dopamine from binding and acting on the postsynaptic neuron.

b. Tolerance and Withdrawal
i. Tolerance
1) The decreasing responsivity to a drug is called **tolerance**.
    a) As tolerance develops, the person must take increasingly larger doses to achieve the same physical and psychological effects..
2) Tolerance stems from the body's attempt to maintain a state of optimal physiological balance, called **homeostasis**.
3) If a drug changes bodily functioning in a certain, say by increasing heart rate, the brain will try to adjust for this imbalance by producing **compensatory responses**, which are reactions opposite to that of the drug.

4) The occurrence of compensatory responses after discontinued drug use is known as **withdrawal**.

ii. Learning, Drug Tolerance, and Overdose
   1) As drug use continues, the physical setting triggers progressively stronger compensatory responses, increasing the user's tolerance.
      a) This helps to explain why addicts often experience increased cravings when they enter a setting associated with drug use.
      b) The environmental stimuli trigger compensatory responses, which, without drugs to mask their effect, cause the user to feel withdrawal symptoms.
   2) There is a hidden danger in this process, particularly for experienced drug users.
      a) Compensatory responses serve a protective function by physiologically countering part of the drug's effects.
      b) If a user takes his or her usual high dose in a familiar environment, the body's compensatory responses will be at full strength - a combination of compensatory reactions directly to the drug and also to the conditioned environmental stimuli.
      c) But in an unfamiliar environment, the conditioned compensatory responses are weaker, and the drug has a stronger physiological net effect than usual.
   3) Process of Conditioned Drug Responses and Consequences
      a) Stage 1: Take drug => Body produces compensatory responses.
      b) Stage 2: Repeatedly take drug in a particular setting => compensatory responses
      c) Stage 3: Setting along => now produces conditioned compensatory responses.
      d) Stage 4: Take same dose of drug in unfamiliar setting => compensatory responses not at full strength. Drug produces stronger reaction. "Overdose" more likely.

iii. Misconceptions about Drug Addiction and Dependence
   1) Drug addiction, which is formally called **substance dependence**, represents a maladaptive pattern of substance use that causes a person significant distress or substantially impairs that person's life.
      a) Substance dependence is diagnosed as occurring with **physiological dependence** if drug tolerance or withdrawal symptoms have developed.
      b) **Psychological dependence** is used to describe situations in which people strongly crave a drug because of its pleasurable effects, even though they are not physiologically dependent.
         i) However, this is not a diagnostic term, and many drug experts feel it is misleading.
   2) Several misconceptions surround the issue of substance dependence:
      a) Drug tolerance always leads to significant withdrawal. It often does, but not always. Tolerance develops to marijuana and hallucinogens, such as LSD, yet at typical doses withdrawal symptoms are mild.
      b) Psychological dependence is the major cause of drug addiction. Usual conception is that motivation to avoid or end withdrawal symptoms is the primary cause of

addiction. Certainly the withdrawal symptoms contribute to drug dependence, but consider these points:

i) People become highly dependent on some drugs, such as cocaine, that produce only mild withdrawal. The pleasurable effects of these drugs - often produced by boosting dopamine activity - play a powerful role in drug dependence.
ii) Many drug users who quit and make it through withdrawal eventually start using again, even though they are no longer physiologically dependent.
iii) Drug dependence is influenced by many factors beyond a drug's chemical effects, including genetic predisposition, personality traits, religious beliefs, peer influence, and cultural norms.

c. Depressants
    i. Introduction
        1) **Depressants** decrease nervous system activity.
        2) In moderate doses, they reduce feelings of tension and anxiety, and produce a state of relaxed euphoria.
        3) In extremely high doses, depressants can slow down vital life processes to the point of death.
    ii. Alcohol
        1) Alcohol is the most widely used recreational drug in numerous countries.
        2) Tolerance to alcohol develops gradually but powerfully and leads to physiological dependence and a dangerous withdrawal syndrome.
            a) Alcohol withdrawal is one of the very few withdrawal syndromes that carry a risk of death.
        3) How Alcohol Functions
            a) Alcohol increases the activity of GABA, the main inhibitory neurotransmitter in the brain. By increasing the action of an inhibitory neurotransmitter, alcohol decreases brain activity.
            b) Alcohol also decreases the activity of glutamate, a major excitatory neurotransmitter, further decreasing brain activity.
        4) Why People Get "High" from Alcohol
            a) The neural slowdown first depresses the action of inhibitory control centers in the cerebral cortex, so the person literally becomes "less inhibited" and feels euphoric.
            b) At higher doses, the brain's control centres become increasingly disrupted, thinking and physical coordination become disorganized, and fatigue and psychological depression may occur.
        5) The **blood-alcohol level (BAL)** is a measure of alcohol concentration in the body.
            a) Elevated BAL is linked to risky and harmful behaviours, such as having unprotected sex and traffic accidents.
            b) As BAL increases, reaction time, eye-hand coordination, and decision making are impaired.
        6) Alcohol reduces cognitive capacity so people often act in risky ways that they wouldn't when sober.
            a) Intoxicated people display **alcohol myopia**, a "short-sightedness" in thinking caused by the inability to pay

attention to as much information as sober people.
b) Drinkers start to concentrate only on those aspects of the situation (called **cues**) that stand out.
c) As a result, in the absence of strong cautionary curs (such as warning) to inhibit risky behaviour, drinkers do not think about the long-term consequences of their actions as carefully as when they are sober.

iii. Barbiturates and Tranquilizers
1) Physicians frequently prescribe barbiturates and tranquilizers as sedatives and relaxants.
a) The vast majority of these drugs depress the nervous system by increasing the activity of the inhibitory neurotransmitter GABA.
2) Barbiturates and tranquilizers are widely overused and powerful tolerance and physiological dependence can occur.
a) At high doses, barbiturates trigger initial excitation, followed by slurred speech, loss of coordination, depression, and severe memory impairment.
b) Overdose, particularly when taken with alcohol, may cause unconsciousness, coma, and death.
c) Sudden withdrawal after heavy use can cause death, so several months of gradual withdrawal may be needed before addicts lose their physiological dependence.
d) Users don't recognize that they have become dependent until they try to stop and experience serious withdrawal symptoms, such as anxiety, insomnia, and possibly seizures.

d. Stimulants
i. Introduction
1) **Stimulants** increase neural firing and arouse the nervous system.
2) They increase blood pressure, respiration, heart rate, and overall alertness.
3) They also can boost mood, produce euphoria, and heighten irritability.

ii. Amphetamines
1) Amphetamines are powerful stimulants are prescribed to reduce appetite and fatigue, to decrease the need for sleep, and sometimes, to reduce depression.
a) Unfortunately, they are widely overused to boost energy and mood.
2) Amphetamines increase dopamine and norepinephrine activity.
3) Symptoms
a) Tolerance develops and many heavy users start injecting large quantities, producing a sudden surge of energy and a rush of intense pleasure.
i) With frequent injections, they may remain awake continuously for as long as a week, they bodily systems racing at breakneck speed.
ii) Injecting amphetamines greatly increases blood pressure and can lead to heart failure and cerebral hemorrhage; repeated high doses may cause brain damage.
b) When the brain's dopamine activity is boosted beyond normal levels by continuous or frequent amphetamine use, it causes schizophrenia-like hallucinations and paranoid delusions, a reaction called **amphetamine**

psychosis.

c) When heavy users top taking amphetamines, they may sleep for one or two days, waking up depressed, exhausted, and irritable.
    i) This crash occurs because neurons' norepinephrine and dopamine supplies have been depleted.
    ii) Amphetamines tax the body heavily, and addicts have a short life expectancy.

4) Example of Amphetamine
    a) **Crystal meth**, **crystal methamphetamine**, or "ice", is inhaled or smoked and is a particularly potent form of amphetamine.
        i) Abuse of crystal methamphetamine has become widespread because of its long-lasting effects, its potency, and because it is relatively easy to make from commonly available ingredients.
        ii) Crystal methamphetamine causes irritability, insomnia, loss of REM sleep, hyperactivity, confusion, hallucinations, anxiety, paranoia, and increased aggression.
        iii) It has a powerful impact on the cardiovascular system, increases heart rate and blood pressure, and greatly increases the risk of stroke and heart attack.
        iv) In high doses, methamphetamine also leads to **hypothermia** (a drop in core body temperature) and convulsions and can be fatal.
        v) Methamphetamine users often show pronounced tooth decay and lose their teeth abnormally quickly, a condition known as **meth mouth**.
    b) **MDMA**, commonly called **ecstasy**, is a derivative of amphetamine.
        i) Ecstasy acts on several neurotransmitters, including dopamine, but primarily alerts serotonin functioning by causing the release of serotonin and blocking its reuptake.
        ii) MDMA can cause cognitive deficits, sleep disturbances, sexual dysfunction, and impaired immune responses.
        iii) After the drug wears off, users often feel sluggish and depressed - a rebound effect partly due to depletion of serotonin within the brain.
        iv) Depletion of brain serotonin associated with long-term MDMA use, can persist long after drug use is stopped.

iii. Cocaine
1) **Cocaine** is a powder derived from the coca plant, which grows mainly in western South America.
    a) Usually inhaled or injected, it produces excitation, a sense of increased muscular strength, and euphoria.
    b) Like amphetamines, cocaine increases the activity of norepinephrine and dopamine, but it does so in only one major way: it blocks their reuptake.
2) Moderate Use of Cocaine
    a) Cocaine was once widely used as a local anaesthetic in eye, nose, and throat surgery.
        i) Novocaine, a synthetic form of cocaine, is still used

in dentistry as an anaesthetic.
    b) Because of its stimulating effects, cocaine found its way into health potions and tonics sold to the public to enhance health and emotional well-being, like Coca Cola in 1885.
  3) Overuse of Cocaine
    a) In large doses, cocaine can produce fever, vomiting, convulsions, hallucinations, and paranoid delusions.
    b) A severe depressive crash may occur after a cocaine high, particularly with repeated doses.
    c) **Crack** is a chemically converted form of cocaine that can be smoked, and its effects are faster, more intense, and more dangerous.
      i) Overdose of crack can cause sudden death from cardiorespiratory arrest.
    d) Tolerance develops to many of cocaine's effects, but withdrawal symptoms are mild and the potential for physiological dependence is low.
      i) However, cocaine users often develop strong cravings for the drug and the abuse potential is very high.

e. Opiates
  i. Drugs derived from opium, such as morphine, codeine, and heroin, are called **opiates**.
  ii. Effects
    1) Opiates have two major effects.
      a) First, they provide pain relief.
      b) Second, they cause mood changes, which may include intense euphoria.
    2) Opiates bind to and stimulate receptors normally activated by endorphins, thereby producing pain relief.
    3) Opiates also increase dopamine activity, which may be one reason that induce euphoria.
    4) Endorphin receptors are found in many brain areas, which accounts for opiate effects on many brain functions, such as body temperature and hormone levels, and other functions, such as the control of the cough reflex.
  iii. Forms of Opiates
    1) Fentanyl
      a) **Fentanyl** is an especially powerful synthetic opiate, even more potent than oxycodone.
      b) Fentanyl is used to treat patients with severe pain or to manage pain after surgery, especially among patients who have developed tolerance to other opiates.
      c) It is often administered as a skin patch, designed to slowly release the drug over 72 hours.
        i) Illicit use of fentanyl usually involves consuming the drug rapidly by smoking, injection, or chewing.
      d) Fentanyl is often mixed with other drugs such as heroin or cocaine and is used to make fake OxyCotin Pills.
    2) Heroin
      a) Experienced heroin users feel an intense, pleasurable "rush" within several minutes of an injection.
      b) High doses can greatly reduce a person's breathing rate and may lead to coma.
      c) Overdoses can cause death.

f. Hallucinogens

i. **Hallucinogens** are powerful mind-altering drugs that produce hallucinations.
    1) Some are derived from natural sources: Mescaline comes from the peyote cactus and psilocybin from mushrooms.
        a) Natural hallucinogens have been considered sacred in many tribal cultures because of their ability to produce "unearthly" states of consciousness and contact with spiritual forces.
    2) Other hallucinogens, such as LSD and phencyclidine ("angel dust") are synthetic.
ii. Hallucinogens usually distort or intensify sensory experience and can blur the boundaries between reality and fantasy.
    1) Users may speak of seeing sounds and hearing colours, of mystical experiences and insights, and of feeling exhilarated.
    2) They also may have violent outbursts, experience paranoia and panic, and have flashbacks after the "trip" has ended.
    3) The mental effects of hallucinogens are unpredictable.
        a) This unpredictability constitutes their greatest danger.

g. Marijuana
    i. **Marijuana** is a product of the hemp plant, **Cannabis sativa**.
        1) Some experts classify it as a hallucinogen, others as a sedative, and some feel it belongs in its own category.
        2) Marijuana is the most widely used illicit drug in Canada.
    ii. **THC (tetrahydrocannabinol)** is marijuana's major active ingredient, and it binds to receptors on neurons throughout the brain.
        1) This is because the brain produces its own THC-like substances called **cannabinoids**.
        2) With chronic use, THC may increase GABA activity, which slows down neural activity and produces relaxing effects.
        3) THC also increases dopamine activity, which may account for some of its pleasurable subjective effects.
    iii. Certain misconceptions exist about marijuana.
        1) One unsupported statement is that chronic use causes people to become unmotivated and apathetic toward everything, a condition called **amotivational syndrome**.
        2) Another unsupported misconception is that marijuana causes people to start using more dangerous drugs.
        3) A third misconception is that using marijuana has no significant dangers.
            a) This is untrue because marijuana smoke contains more cancer-causing substances than does tobacco smoke.
            b) At high doses, users may experience negative changes in mood, sensory distortions, and feelings of panic and anxiety.
            c) Marijuana can impair reaction time, thinking, memory, and learning, and can amplify the impact of other risk factors for psychiatric illness.
    iv. Reported marijuana use produces tolerance.
        1) At typical doses, some chronic users may experience mild withdrawal symptoms, such as restlessness.
        2) But users of chronically high doses who suddenly stop may experience nausea and vomiting, sleep disruptions, and irritability.

h. From Genes to Culture: Determinants of Drug Effects
    i. A user's reaction depends on more than the drug's chemical structure, and other biological, psychological, and environmental factors can influence the drug experience.

ii. Biological Level
    1) At the biological level, animal research indicates that genetic factors influence sensitivity and tolerance to drug effects.
        a) Rats and mice can be genetically bred to inherit a strong preference for drinking alcohol instead of water, and even in their first exposure to alcohol, these rats show greater tolerance than normal rats.
    2) Among humans, identical twins have a higher concordance rate for alcoholism than do fraternal twins.
    3) People who grow up with alcoholic versus non-alcoholic parents respond differently to drinking alcohol under laboratory conditions.
        a) Growing up with alcoholic parents includes both genetic and social learning components.
        b) Animals, including humans, learn what to eat and drink, in part, by cues provided by the parents. Thus the children of alcoholic parents could be at an increased risk of abusing alcohol for two reasons: genetic factors and exposure to a parent who abuses alcohol.
    4) Twin and adoptions studies have found that alcohol abuse in among adoptees is correlated with alcohol abuse in their biological parents but not their adoptive parents.
iii. Environmental Level
    1) At the environmental level, the setting in which a drug is taken can influence a user's reactions.
        a) Compensatory physiological responses to a drug can become associated with, and ultimately triggered by, environmental stimuli in the drug setting.
        b) The behaviour of other people who are sharing the drug experience provides important cues about how to respond, and a hostile environment may increase the chances of a "bad trip" with drugs such as LSD.
    2) Cultural learning also affects how people respond to a drug.
        a) In many Western cultures, increased aggressiveness and sexual promiscuity are commonly associated with drunken excess.
    3) Cultural factors also affect drug consumption.
iv. Psychological Level
    1) Experiments show that people may behave as if "drunk" if they think they have consumed alcohol even if they have not.
    2) If a person's fellow drinkers are happy and gregarious, he or she may expect to respond in the same way.
    3) Expectations powerfully influence the effects of a psychoactive drug.
    4) Personality factors also influence drug reactions and usage.

5. Hypnosis
    a. The Scientific Study of Hypnosis
        i. **Hypnosis** is a therapeutic technique in which clinicians make suggestions to individuals who have undergone a procedure designed to relax them and focus their minds.
        ii. **Hypnotic induction** is a process that creates a context for hypnosis.
            1) A hypnotist may ask the subject to sit down, relax, gaze at an object on the wall, and then in a quiet voice suggest that the subject's eyes are becoming heavy and tired.
            2) The goal is to relax the subject and increase her or his concentration.
        iii. **Hypnotic susceptibility scales** contain a standard series of pass/fail

suggestions that are read to a subject after a hypnotic induction and the subject's score is based on the number of "passes".
    1) People cannot be hypnotized against their will, and even when people want to be hypnotized, they differ in how "susceptible" they are to hypnotic suggestion.

b. Hypnotic Behaviours and Experiences
    i. Involuntary Control and Behaving Against One's Will
        1) Hypnotized people subjectively experience their actions to be involuntary.
        2) Hypnosis does not involve any unique power to get people to behave against their will.
        3) An authority figure can induce people to commit highly out of character and even dangerous acts, whether or not they are hypnotized.
    ii. Pain Tolerance
        1) Experiments confirm that hypnosis can increase pain tolerance and that this is not due to a placebo effect.
        2) Brain-imaging studies have found that hypnosis modifies activity in brain areas involved in processing painful stimuli.
        3) Nonhypnotic techniques, such as painful visual imagery and distractions, can, however, also alter activity in these brain areas and reduce the felling of pain.
    iii. Hypnosis and Memory
        1) Hypnosis and Amnesia
            a) Hypnotized people are given a suggestion that they will not remember something, either during the session itself **(hypnotic amnesia)**, or after the hypnotic trance has ended **(posthypnotic amnesia)**.
            b) If a reversal cue is also given, such as a phrase "you will remember everything", it will end the amnesia once the person hears it.
            c) Research indicates that about 25 percent of hypnotized university students can be led to experience amnesia.
        2) Hypnosis Does not Improve Memory
            a) The results of controlled experiments have revealed that, overall, hypnosis does not reliably improve memory.
            b) Hypnotized people do report more information, but much of that extra information is inaccurate.
            c) Memory is not more accurate under hypnosis, but people believe it is.
        3) Pseudo-memories under Hypnosis
            a) Some memories recalled under hypnosis may be **pseudomemories**, false memories created during hypnosis by statements or leading suggestions made by the examiner.
            b) The increased suggestibility of hypnotized people make them particularly susceptible to memory distortion.

c. Theories of Hypnosis
    i. Dissociation Theories: Hypnosis as Divided Consciousness
        1) **Dissociation theories** view hypnosis as an altered state involving a division (dissociation) of consciousness.
        2) That is, hypnosis creates a **division of awareness** in which the person simultaneously experiences two streams of consciousness that are cut off from each other.
            a) One stream responds to the hypnotist's suggestions, while the second stream - the part of consciousness that monitors behaviour - remains in the background but is

aware of everything that goes on.
    b) Hilgard refers to this second part of consciousness as the **hidden observer**.
3) This dissociation explains why behaviours that occur under hypnosis seem involuntary or automatic.
    a) Given the suggestion to raise arms, the subject intentionally raises the arm, but only the hidden observer is aware of this.
    b) The main stream of consciousness that responds to the command is blocked from this awareness, and thus perceive that the arm is rising all by itself.

ii. Social Cognitive Theories: Roles and Expectations
1) In general, **social cognitive theories** propose that hypnotic experiences result from expectations of people who take on the role of being "hypnotized".
    a) Most people believe that hypnosis involves a trancelike appearance, responsiveness to suggestion, and a loss of self-consciousness.
    b) People who accept the role of hypnotized participant conform to this role and develop a perceptual set - a readiness to respond to the hypnotist's suggestions and to perceive hypnotic experiences as real and involuntary.
2) Role theorists emphasize that people are not faking or play-acting when they are hypnotized and when people immerse themselves in a social role, their responses are completely real.
    a) Perceptual sets strongly influence how the brain organizes sensory information.
    b) According to social cognitive theory, many of the effects of hypnosis represent an extension of this basic principle.
    c) The hypnotized subject perceives their behaviour as involuntary because this is what they expect, and because attention is focused externally on the hypnotist and the hypnotic suggestion.
3) Some psychologists believe the dissociation and social cognitive viewpoint can be integrated into a comprehensive theory, while others disagree, saying it is time to discard some ideas of dissociation theory.

iii. The Hypnotized Brain
1) Cognitive neuroscience provides insights into the hypnotized brain, but it will take more research to resolve the debate about hypnosis.
2) Presenting pain-reducing suggestions to hypnotized subjects decreases both subjective reports of pain and activity in brain areas that processes pain information.
    a) Activity in brain areas linked to sensation and perception, memory and motor control have all been studied under hypnosis.
    b) These studies tend to support the conclusion that altered brain activity matches verbal reports while hypnotized.
    c) Social cognitive theorists argue that these findings do not resolve the issue and note that hypnotic experiences are subjectively real, and if hypnosis alters brain activity this does not contradict the position that people's expectations are what lead them to become hypnotized in the first place.

Chapter 6 Summary

November 2, 2017 12:05 PM

1. The Puzzle of Consciousness
    a. Consciousness refers to our moment-to-moment awareness of ourselves and the environment. It is subjective, dynamic, self-reflective, and central to our sense of identity. Selective attention focuses conscious awareness on some stimuli to the exclusion of others.
    b. Scientists use self-report, physiological, and behavioural measures to operationally define states of consciousness.
    c. Freud believed that the mind has conscious, preconscious, and unconscious levels. He viewed the unconscious as a reservoir of unacceptable desires and repressed experiences. Cognitive psychologists view the unconscious as an information-processing system.
    d. Controlled processing typically is required for learning new tasks. Automatic processing makes divided attention possible, enabling us to perform several tasks at once. Research on subliminal perception and other topics suggests that emotional and motivational processes also can operate nonconsciously and influence behaviour.
    e. Many theorists propose that the mind consists of separate but interacting information-processing modules. Our subjective experience of "unitary" consciousness arises from the integrated output of these modules.
2. Circadian Rhythms: Our Daily Biological Clocks
    a. Circadian rhythms are 24-hour biological cycles that help to regulate many bodily processes. The suprachiasmic nuclei (SCN) are the brain's master circadian clock. Environmental factors, such as the day-night cycle, help to reset our daily clock to a 24-hour schedule.
    b. Circadian rhythms influence whether we are a morning person or a night person.
    c. Seasonal affective disorder (SAD), jet lag, and night shiftwork involve environmental disruptions of circadian rhythms. Treatments for circadian disruption include controlling exposure to light, oral melatonin, and regulating daily activity schedules.
3. Sleep and Dreaming
    a. EEG measurements of brain activity indicate five main stages of sleep. Stage 1 and 2 are lighter sleep, and stages 3 and 4 are deeper, slow-wave sleep. High physiological arousal and periods of rapid eye movements characterize the fifth stage, REM sleep. Several brain regions, including the brain stem, regulate sleep.
    b. The amount we sleep nightly change as we age. Genetic, psychological, and environmental factors affect our sleep patterns and sleep length.
    c. Sleep deprivation negatively affects mood, mental performance, and physical performance. The restoration model proposes that we sleep to recover from accumulated physical and mental fatigue. Evolutionary/circadian models state that species evolved unique waking-sleeping cycles that maximized their chances of survival.
    d. Insomnia is the most common sleep disorder but less common disorders such as narcolepsy and REM-sleep behaviour disorder can have extremely serious consequences. Sleepwalking typically occurs during slow-wave sleep, whereas nightmares occur most often during REM sleep. Night terrors create a near-panic state of arousal, typically occur in slow-wave sleep, and are most common among children.
    e. Dreams occur throughout sleep but are most common during REM periods. Unpleasant dreams are common, and there are gender differences in dream content. Our cultural background, current concerns, and recent events influence what we dream about.
    f. Freud proposed that dreams fulfill unconscious wishes that show up in disguised form within our dreams. Activation-synesis theory regards dreaming as the brain's attempt to fit a story to random neural activity. Cognitive-process theories emphasize that dreaming and waking thought are produced by the same mental systems.
4. Drugs and Altered Consciousness

a. Drugs alter consciousness by modifying neurotransmitter activity. Agonist increase such activity, whereas antagonists decrease it.
b. Tolerance develops when the body produces compensatory responses to counteract a drug's effects. When drug use is stopped, compensatory responses continue and produce withdrawal symptoms. Substance dependence represents a maladaptive pattern of substance use that causes a person significant distress or substantially impairs that person's life. It can occur with or without physiological dependence.
c. Depressants decrease neural activity. The subjective "high" and liveliness associated with low alcohol doses occur because alcohol depresses the activity of inhibitory brain centres. Drinking contributes to poor decision making.
d. Stimulants increase arousal and boost mood by enhancing dopamine and norepinephrine activity. Repeated use depletes these neurotransmitters and can cause a severe depressive "crash" after the drug wears off.
e. Opiates increase endorphin activity, producing pain relief and mood changes that may include euphoria. Opiates are important in medicine but are highly addictive.
f. Hallucinogens, such as LSD, powerfully distort sensory experience and can blur the line between reality and fantasy. The effects of hallucinogens are always unpredictable.
g. THC, the main active ingredients in marijuana, produces relaxation and a sense of well-being at low doses but can cause anxiety and sensory distortion at higher doses. Marijuana can impair thinking and reflexes, and its smoke contains carcinogens.
h. A drug's effect depends on its chemical actions, the physical and social setting, cultural norms, learning, and the user's predispositions, expectations, and personality.

5. Hypnosis
   a. Hypnosis involves an increased receptiveness to suggestion. Hypnotic susceptibility scales measure people's responsiveness to hypnosis.
   b. Hypnotized people subjectively experience their actions to be involuntary, but hypnosis has no unique power to make people behave against their will. In experiments, hypnotized and unhypnotized people are equally likely to show striking physiological reactions and perform "amazing" physical feats. Hypnosis increases pain tolerance, but other psychological techniques also can reduce pain.
   c. Some people can be led to experience hypnotic and posthypnotic amnesia. Hypnosis, however, does not reliably improve memory or lead to the recall or forgotten information.
   d. Dissociation theories view hypnosis as an altered state of divided consciousness. Hilgard propose that one stream of consciousness responds to the hypnotist's suggestions, while another stream (the hidden observer) stays in the background and is fully aware of everything going on. Social cognitive role theories state that hypnotic experiences occur because people have strong beliefs and expectations about hypnosis and are highly motivated to enter a hypnotized role. People's actions are sincere but not the result of divided consciousness.

Class	**Typical Effects**	**Overdose Effects**
Depressants		
Alcohol	Relaxation, lowered inhibition, depressed/impaired physical and psychological functioning.	Disorientation, unconsciousness, possible death at extreme doses.

Barbiturates/Tranquilizers	Tension reduction, depressed reflexes and impaired motor functioning, induced sleep	Shallow breathing, clammy skin, weak and rapid pulse, coma, possible death
Stimulants		
Amphetamines, Cocaine, Ecstasy	Increased alertness, pulse, and blood pressure; elevated mood; suppressed appetite; sleeplessness	Agitation, hallucinations, paranoid delusions, convulsions, heart failure, possible death
Opiates		
Opium, Morphine, Heroin, Oxycodone, Fentanyl	Euphoria, pain relief, drowsiness, impaired motor and psychological functioning	Shallow breathing, convulsions, coma, possible death
Hallucinogens		
LSD, Mescaline, Psilocybin	Hallucinations and "visions", distorted time perception, loss of reality contact, nausea, restlessness, risk of panic	Psychotic reactions (delusions, paranoia), panic that may lead to behaviour causing injury.
Marijuana	Mild euphoria, relaxation, enhanced sensory experience, increased appetite, impaired memory and reaction time	Fatigue, anxiety, disorientation, sensory distortions, and possible psychotic reactions

Chapter 7 Learning and Adaptation: The Role of Experience

November 13, 2017 4:23 PM

1. Adapting to the Environment
    a. How Do we Learn? The Search for Mechanism
        i. **Learning** is a process by which experience produces a relatively enduring change in an organism's behaviour or capabilities.
            1) The term **capabilities** highlights a distinction made by many theorists: "knowing how", or learning, versus "doing", or performance.
            2) For example, experience may provide us with immediate knowledge, by in science we must measure learning by actual changes in performance.
            3) We can view learning as a process of **personal adaptation** to the ever-changing circumstances of our lives.
        ii. Within psychology, behaviourists focus on <u>how</u> organisms learn, examining the processes by which experience influences behaviour.
            1) Behaviourists assumed that there are laws of learning that apply to virtually all organisms and each species they studied responded in predictable ways to patterns of reward or punishment.
            2) Behaviourists treated the organism as a **tabula rasa**, or blank tablet, upon which learning experiences were inscribed.
            3) Most of their research was conducted with nonhuman species in controlled laboratory settings.
            4) Behaviourists explained learning solely in terms of directly observable events and avoided speculating about an organisms' unobservable "mental state".
            5) The concept of learning calls to the importance of adapting to the environment, and where as evolution focuses on species' adaptation across many generations, learning represents a process of personal adaptation.
        iii. The resurgence of the **cognitive perspective**, an interest in **biological factors**, and the emergence of **cross-cultural psychology** also have expanded our understanding of learning.
            1) Cognitive and biological factors play important roles in learning.
            2) Cross-cultural research highlights the important impact that culture has on what we learn - from social customs (norms) and beliefs, to our most basic perceptions of the world and our selves.
            3) Culture's impact is not surprising, given that learning represents adaptation to the environment and culture is the human-made part of our environment.
            4) And yet, the learning mechanisms that foster this adaptation are universal among humans and, in some cases, occur across countless species.
    b. Habituation and Sensitization
        i. **Habituation** is a decrease in the strength of response to a repeated stimulus.
            1) It may be simplest form of learning and occurs across species, ranging from humans to dragonflies and sea snails.
            2) If an organism responded to every stimulus in its environment, it would rapidly become overwhelmed and exhausted. By learning not to respond to uneventful familiar stimuli, organisms conserve energy and can attend to other stimuli that are important.
            3) Habituation also plays an important role in enabling scientists to study behaviour.
                a) Whether observing animals in the wild or schoolchildren, a researcher's mere presence may initially disrupt participants' natural responses.

b) Thus, before collecting data, observers often allow people and animals to habituate to their presence.

4) Habituation is different from sensory adaptation.
   a) Sensory adaptation refers to a decreased sensory response to a continuously present stimulus.
   b) Habituation, on the other hand, is a simple form of learning that occurs within the central nervous system.
   c) You may habituate to a stimulus, but that sensory information is still available if it becomes relevant.

ii. **Sensitization** is an increase in the strength of response to a repeated stimulus.
   1) Like habituation, sensitization is found across a wide range of species, even among animals with very simple nervous systems.
   2) Sensitization tends to occur to strong or noxious stimuli, and its purpose is to increase responses to a potentially dangerous stimulus.

2. Classical Conditioning: Associating One Stimulus With Another
   a. Classical Conditioning
      i. **Classical conditioning** is a learning process in which an organism learns to associate two stimuli (e.g., a song an a pleasant event), such that one stimulus (the song) comes to produce a response (feeling happy) that originally was produced only by the other stimulus (the pleasurable event).
      ii. Like habituation and sensitization, classical conditioning is a basic form of learning that occurs in mammals, birds, reptiles, fish, sea snails, and even insects.
      iii. Classical conditioning involves **learning an association** between stimuli.
   b. Pavlov's Pioneering Research
      i. To study digestion, Pavlov presented various types of food to dogs and measured their natural salivary response.
         1) He noticed that with repeated testing, the dos began to salivate before the food was presented, such as when they heard the footsteps of the approaching experimenter.
         2) Further study confirmed Pavlov's observation: dogs have a natural reflex to salivate to food but not to tones. Yet when a tone or other stimulus that ordinarily did not cause salivation was presented just before food powder as squirted directly into a dog's mouth, the sound of the tone alone soon made the dog salivate.
      ii. Pavlov's research team rigorously studied this process for decades, and this type of learning by association came to be called **classical conditioning**, or **Pavlovian conditioning**.
         1) Classical conditioning performs a key adaptive function; classical conditioning alerts organisms to stimuli that signal the impending arrival of an important event.
   c. Basic Principles
      i. Acquisition
         1) **Acquisition** refers to the period during which a response is being learned.
         2) Terms Analysed in the Experiment
            a) Neutral Stimulus
               i) Sounding the tone initially may cause the dog to perk up its ears and stare at us oddly, but not to salivate, and at this time, the tone is a **neutral stimulus** because it does not elicit the salivation response.
            b) Unconditioned Stimulus and Unconditioned Response
               i) If we place food in the dog's mouth, the dog will salivate. And this salivation response to food is reflexive - it's what dogs do by nature.
               ii) Because no learning is required for this food to produce salivation, the food is called an **unconditioned stimulus (UCS)** and salivation is an **unconditioned response (UCR)**.
            c) Learning Trial

i) Next the tone and the food are paired - each pairing is called a **learning trial**.
ii) After several learning trials, when the tone is presented by itself, the dog salivates even though there is no food.

d) Conditioned Stimulus (CS) and Conditioned Response (CR)
i) Through associations, the tone has become a **conditioned stimulus (CS)** and salivation has become a **conditioned response (CR)**.

e) Comparison of Two Kinds of Salivation
i) When the dogs salivates to food, this UCR is a **natural, unlearned (unconditioned) reflex**.
ii) But when it salivates to a tone, this Cr represents a **learned (conditioned) response**.

3) What Affects the CS-UCS Conditioning
a) Intensity
i) During acquisition, a CS typically must be paired multiple times with a UCS to establish a strong CR.
ii) Pavlov also found that a tone became a CS more rapidly when it was followed by greater amounts of food.
iii) When the UCS is intense and aversive conditioning may require only one CS-UCS pairing.

b) Sequence and Time Interval
i) Learning usually occurs most quickly with **forward short-delay pairing**: the CS (tone) appears first and is still present when the UCS (food) appears.
ii) In **forward tracing pairing**, the tone would come on and off, and afterward the food would be presented.
One. In forward pairing, it is often optimal for the CS to appear no more than two or three seconds before the UCS.
Two. Forward pairing has adaptive value because the CS signals the impending arrival of the UCS.
iii) Typically, presenting the CS and UCS at the same time **(simultaneous pairing)** produces same less rapid conditioning, and learning is slowest, or does not occur at all, when the CS is presented after the UCS **(backward pairing)**.
iv) To summarize, classical conditioning usually is strongest when there are repeated CS-UCS pairing, the UCS is more intense, the sequence involves forward pairing, and the time interval between the CS and UCS is short.

ii. Extinction and Spontaneous Recovery
1) Why There Is Extinction
a) IF the function of classical conditioning is to help organism adapt to their environment, then there must be a way of eliminating the CR when it is no longer appropriate.

2) Definition of Extinction
a) If the CS is presented repeated in the absence of the UCS, the CR weakens and eventually disappears.
b) This process is called **extinction**, and each presentation of the CS without the UCS is called an **extinction trial**.
c) Occasional re-pairings of the CS and the UCS usually are required to maintain a CR.

3) Definition of Spontaneous Recovery
a) **Spontaneous recovery** is the reappearance of a previously extinguished CR after a rest period and without new learning trials.
i) The spontaneously recovered CR usually is weaker than the initial CR and extinguishes more rapidly in the absence of the UCS.

b) The phenomenon of spontaneous recovery is why practical applications of extinction, such as treatment of phobias or other anxiety disorders, require multiple sessions.
i) With each set of extinction trials, the CR is progressively weakened, and with sufficient extinction training, spontaneous recovery is weak enough that it is not a problem.

iii. Generalization and Discrimination
1) **Stimulus generalization** refers to the fact that stimuli similar to the initial CS elicit a CR.
a) The greater the stimulus similarity, the greater the chance that a CR will occur.
2) In classical conditioning, **discrimination** is demonstrated when a CR (such as an alarm reaction) occurs to one stimulus (a sound) but not to others.
3) Organisms can be taught, through conditioning, to behaviourally discriminate two stimuli that were initially treated the same way.
a) Pairing the CS with the UCS combined with paring similar stimuli with no consequence leads to a narrowing of response to the specific CS and a loss of generalized responses to other similar stimuli.

iv. Higher-Order conditioning
1) **Higher-order conditioning** refers to the fact that a neutral stimulus becomes a CS after being paired with an already established CS.
2) Typically, a higher-order CS produces a CR that is weaker and extinguishes more rapidly than the original CR.
3) Higher-order conditioning greatly expands the influence of conditioned stimuli and can affect what we come to value, like, fear, or dislike.
a) For example, a child may value a gold star because that gold star was previously paired by social recognition and praise from the teacher.

d. Applications of Classical Conditioning
i. Acquiring and Overcoming Fear
1) Pavlov's discoveries enabled early American behaviourists to challenge Freud's psychoanalytic view of the causes of anxiety disorders, such as phobias.
2) Behaviourist John B. Watson and his assistant Rosalie Rayner set out to obtain evidence that fear could be conditioned by studying a number of infants, including, most famously, an 11-month-old infant named Albert.
a) Initially, when Watson and Rayner showed him a white rat, Albert displayed no sign of fear.
b) Later, knowing that Albert was afraid of loud noises, they hit a steel bar with a hammer, making a loud noise as they showed Albert the rat.
c) The noise scared Albert and made him cry.
d) After several rat-noise pairings, the sight of the white rat along made Albert Cry.
3) To examine stimulus discrimination and generalization, Watson and Rayner exposed Albert to other test stimuli.
a) Albert displayed no fear when shown coloured blocks, but furry white or grey objects made him cry.
4) Learning theory dominates our current understanding of specific phobias.
a) The implication is clear: if a specific phobia was acquired through classical conditioning then exposure to the feared stimulus under neutral or positive circumstances should be an effective form of treatment.
b) **Exposure therapies** refers to exposing the phobic patient to the feared stimulus without any UCS, allowing extinction to occur.
c) Although psychologists still debate the contribution of other factors such as genetic influences, exposure therapy is effective in most cases.

ii. Conditioned Attraction and Aversion

1) Much of what attracts and pleasurably arouses us is influenced by classical conditioning.
    a) People become sexually aroused to stimuli after those stimuli have been paired with sexually arousing UCSs.
2) Classical conditioning also can decrease our arousal and attraction to stimuli.
    a) This principle is used in **aversion therapy**, which attempts to condition an aversion (a repulsion) to a stimulus that triggers unwanted behaviour by pairing it with a noxious UCS.
    b) To reduce an alcoholic's attraction to alcohol, the patient is given a drug that induces severe nausea when alcohol is consumed.
    c) Aversion therapies yield mixed results, often producing short-term changes that do not last or do not generalize outside of the environment where the learning occurred.
3) Conditioned attraction and aversion also play a role in attitude formation.
    a) Neutral stimuli can become attractive or unattractive by being paired with stimuli that already elicit positive or negative attitudes.
    b) Advertising executives are keenly aware of classical conditioning's power and they carefully link products and company logos to pleasurable items or especially with pleasurable interactions with the opposite sex.
4) Behaviourists originally argued that an emotional reaction, whether it is fear or attraction, could be classically conditioned to any stimulus. However, there are some constraints on learning.
    a) For example, it is easier to condition fear to some stimuli than others: we seem to be biologically prepared to easily learn to fear stimuli such as heights, snakes, spiders, and bats.
    b) Similarly, it is relative easy to condition an aversion to a taste by pairing a taste and an illness, but it is very difficult to condition a similar aversion to a visual stimulus by pairing a visual cue and an illness.
5) Beyond influencing fear, attraction, and aversion, classical conditioning also can affect our physical health.
    a) Allergic responses occur when the immune system overacts and releases too many antibodies to combat pollen, dust, or other foreign substance (called **allergens**).
    b) When a neutral stimulus (such as a distinct odour) is repeated paired with a natural allergen (the UCS), it may become a CS that triggers an allergic CR.
    c) Classical conditioning can even increase immune system functioning.

3. Operant Conditioning: Learning Through Consequences
    a. Definition
        i. **Elicited responses** are automatically triggered by some stimulus, like dogs salivating to a tone.
        ii. **Emitted (voluntary) responses** are learned through consequences, like driving.
    b. Thorndike's Law of Effect
        i. Experiment
            1) Thorndike placed a hungry animal, such as a cat, inside a box. Food was put outside, and to get it the animal had to learn how to open the box.
            2) By chance, the animal eventually stepped on the lever, opening the door.
            3) Performance slowly improved with repeated trials, and over time the cat learned to press the lever soon after the door was shut.
        ii. Theory
            1) Because performance improved slowly, Thorndike concluded that, with trial-and-error, the animals gradually eliminated responses that failed to open the door, and became more likely to perform actions that worked.
            2) Thorndike called this process **instrumental learning** because an organism's

behaviour is instrumental in bringing about certain outcomes.
3) He also proposed **the law of effect**, which stated that in a given situation, a response followed by a "satisfying" consequence will become more likely to occur, and a response followed by an unsatisfying outcome will become less likely to occur.
4) The law of effect became the foundation of the school of behaviourism.

c. Skinner's Analysis of Operant Conditioning
   i. Definition
      1) **Operant behaviour** means that an organism operates on its environment in some way, and it emits responses that produce certain consequences.
      2) **Operant conditioning** is a type of learning in which behaviour is influenced by its consequences.
         a) Responses that produce favourable consequences tend to be repeated, whereas responses that produce unfavourable consequences become less likely to occur.
         b) Through operant conditioning, organisms learn to increase behaviours that benefit them and reduce behaviours that harm them.
   ii. Experiment
      1) Skinner deigned a special chamber, called a **Skinner box**, to study operant conditioning experimentally.
         a) A lever on one wall is positioned above a small cup, and a food pellet automatically drops into the cup whenever a rat presses the lever.
         b) A hungry rat is put into the chamber and, as it moves about, it accidentally presses the lever and the food drops.
      2) Skinner identified several important types of consequences.
         a) With **reinforcement**, a response is strengthened by an outcome that follows it.
            i) Typically, "strengthen" is operationally defined as an increase in the frequency of a response.
            ii) The outcome (a stimulus or event) that increases the frequency of a response is called a **reinforcer**.
         b) **Punishment** occurs when a response is weakened by outcomes that follow it.
            i) **Punisher** refers to a consequence that weakens the behaviour.
         c) Notice that reinforcer and punishers are defined in terms of their observable effects on behaviour.
            i) If the food doesn't increase lever pressing, then for this particular rat it is not a reinforcer.
   iii. ABCs of Operant Conditioning
      1) Skinner's analysis of operant behaviour involves three kinds of events:
         a) **Antecedents** are stimuli that are present before a behaviour occurs;
         b) **Behaviours** are the responses that the organism emits;
         c) **Consequences** are what follow the behaviours.
         d) The relationships between antecedents and behaviours, and between behaviours and consequences, are called **contingencies**.
            i) The consequence of receiving food is contingent of the dog's response of sitting.
      2) Key Differences Between Classical and Operant Conditioning
         a) In classical conditioning, the organism learns an association between two stimuli - the CS and UCS - that occurs before the behaviour;
            i) In operant conditioning, the organism learns an association between behaviour and its consequences, and behaviours change because of the events that occur after it.
         b) Classical conditioning focuses on elicited behaviours, and the conditioned response is triggered involuntarily, almost like a reflex, by a stimulus that precedes it.
            i) Operant conditioning focuses on emitted behaviours: in a given

situation, the organism generates responses that are under its physical control.

3) Involvement of Both Classical and Operant Conditioning in Learning Situations
    a) One stimulus can have classical as well as operant functions, which appear to be processed through different neural pathways in the brain.
    b) When your dog hears the can opener, he will run to you, wagging his tail and salivating.
        i) The sound of diner being prepared is a CS that automatically triggers a CR of salivation.
        ii) It also is a signal to your dog that if he comes to you (an operant response) he will be reinforced by the desirable consequence of being fed.

d. Antecedent Conditions: Identifying When to Respond
    i. In operant conditioning, the **antecedent** may be a general situation or specific stimulus.
        1) At present, simply being in the Skinner box is the antecedent condition.
        2) Suppose we place a light on the wall above the lever. When the light is on, pressing the lever dispenses food, but when the light is off, no food is given.
            a) The rat will soon learn to press the lever only when the light is on.
            b) The light becomes a **discriminative stimulus**, a signal that a particular response will now produce certain consequences.
    ii. Discriminative stimulus guides much of our everyday behaviour.
        1) If you are hungry, food on your plate is a discriminative stimulus.
e. Consequences: Determining How to Respond
    i. Introduction
        1) Behaviour is governed by its consequences.
            a) Two major types of reinforcement strengthen responses, and two major types of punishment weaken them.
        2) Reinforcement and punishment refer to whether the response is strengthened (reinforcement) or weakened (punishment), and they do not refer to he emotional value of the event.
        3) When discussing the consequences of behaviour the use of the terms "positive" and "negative" refer to something being added or something being taken away, and they do not refer to whether something is good or pleasurable or aversive.
        4) Operant behaviour is also weakened by extinction.
    ii. Positive Reinforcement
        1) **Positive reinforcement** refers to the process: a response is strengthened by the subsequent <u>presentation</u> of a stimulus.
        2) The stimulus that follows and strengthens the response is called a **positive reinforcer**.
            a) Food, drinks, comforting physical contact, attention, praise, and money are common positive reinforcers.
        3) The term reward, in many instances, reward does not function as a positive reinforcement.
            a) Parents may "reward" a child with a new toy for cleaning her room.
            b) But if the child does not clean her room again, then the toy was not a positive reinforcement for the behaviour.
    iii. Negative Reinforcement
        1) **Negative reinforcement** refers to the process: a response is strengthened by the subsequent <u>removal or avoidance</u> of a stimulus.
        2) The stimulus that is removed or avoided is called a **negative reinforcer**.
    iv. Operant Extinction
        1) **Operant extinction** is the weakening and eventual disappearance of a response because it is no longer reinforced.

2) The degree to which non-reinforced responses persist is called **resistance to extinction**.
    a) Resistance to extinction is strongly influenced by the pattern of reinforcement that has previously maintained the behaviour.
    b) If you can identify the reinforcers that are maintaining an undesirable behaviour, operant extinction can provide a good alternative to punishment as a method for reducing that behaviour.

v. Positive Punishment
1) **Positive punishment**, also called **aversive punishment**, refers to the process of weakening a response by the subsequent presentation of a stimulus, such as painful slaps, electric shock, and verbal reprimands.
2) Positive punishment always is subtle.
    a) If a teenager wears a new blouse, and her close friends showed a little bit dislike from their facial expressions, then the teenager would stop wearing the shirts.
3) Positive punishment often produces rapid results, an important consideration when it is necessary to stop a particularly dangerous behaviour, such as an animal or a person attacking someone.
4) Though positive punishment works, it has important limitations.
    a) Punishment suppresses behaviour but does not cause the organism to forget how to make the response or provide a different more appropriate response.
    b) This suppression may not generalize to other situations, as when scolded children refrain from using "bad language" only when their parents are present.
    c) Unlike reinforcement, punishment arouses negative emotions, such as fear and anger, which can produce dislike and avoidance of the person delivering the punishment.
    d) Positive physical punishment can also send a message to the recipient that such aggression is appropriate and effective.

vi. Negative Punishment
1) In **negative punishment**, **or response cost**, a response is weakened by the subsequent removal of a stimulus.
    a) Monetary fines, loss of privileges, and being grounded represent attempts to punish behaviour by taking away something that an organism desires or finds satisfying.
2) Though both negative punishment and operant extinction weaken behaviour by depriving the individual of something, there is a key difference.
    a) In operant extinction the stimulus or event that is reinforcing the behaviour is removed.
    b) Negative punishment involves removal of other desirable stimuli.
3) Negative punishment has two distinct advantages.
    a) First, although it may arouse temporary frustration or anger, it is less likely to create strong fear or even hatred of the punishing agent.
    b) Second, physical aggression is not being modelled, so there is less opportunity for learning of aggression through observational learning.
4) When adults use negative punishment to punish children's behaviour, the withheld reinforcer should be some prized object or activity, rather than love or attention.
    a) Communicate dislike for the behaviour, not for the child.
5) Punishment teaches us what not to do but does not guarantee that a desirable behaviour will appear.
    a) Desirable alternative responses should be strengthened directly through positive reinforcement.

vii. Primary and Secondary Consequences
1) **Primary reinforcers** are stimuli, such as food and water or attention and praise, that an organism naturally finds reinforcing because they satisfy

biological needs.
2) Through their association with primary reinforcers, other stimuli can become **secondary**, or **conditioned**, **reinforcers**, like money.
    a) Secondary reinforcers illustrate how behaviour often depends on a combination of classical and operant conditioning.
3) The terms primary and secondary do not apply only to positive reinforcement.
    a) Whether it is positive or negative reinforcement or positive or negative punishment, the distinction is that a primary consequence has its value because of biological importance.
    b) A secondary consequence has its importance because of learning.

viii. Immediate versus Delayed Consequences
1) In general, reinforcement or punishment that occurs immediately after a behaviour has a stronger effect than when it is delayed.
    a) Training animals typically requires very quick reinforcement so that they associate the correct response - rather than some subsequent behaviour - with the satisfying outcome.
2) The timing of consequences may have less influence on human behaviour because we are able to imagine future consequences and weigh them against more immediately ones.
    a) **Delay of gratification** refers to the ability to forego an immediate smaller reward for a delayed but more satisfying outcome.
    b) Individuals vary in their ability to delay gratification, a capacity that typically develops in the preschool years.
    c) Young children who display less ability of delay gratification show poorer adjustment and have more difficulty coping with stress and frustration when they become adolescents.
    d) The inability to delay gratification also may play a role in behaviours such as chronic drinking, smoking, and even criminal acts.

f. Shaping and Chaining: Taking One Step at One Time
i. **Shaping**, also called **method of successive approximations**, involves reinforcing successive approximations toward a final response.
1) Even when behaviours might reasonably be learned through trial and error - such as rat learning to press a lever for food - shaping speeds up the process.
2) By reinforcing successive approximations, acquisition time is drastically reduced.

ii. **Chaining** is used to develop a sequence (chain) of responses by reinforcing each response with the opportunity to perform the next response.
1) Chaining usually begins with the final response in the sequence and works back-wards toward the first response.

g. Generalization and Discrimination
i. In **operant generalization**, an operant response occurs to a new antecedent stimulus or situation that is similar to the original one.
ii. **Operant discrimination** means that an operant response will occur to one antecedent stimulus but not to another.
1) These antecedent stimuli are called **discriminative stimuli**. And when discriminative stimuli influence a behaviour, that behaviour is said to be under **stimulus control**.
2) The concept of operant discrimination gives science a powerful tool for examining the perceptual and cognitive abilities of infants and non human species.
    a) We cannot ask infants and animals to tell us if they can distinguish between different colours, sounds, shapes, faces, and so on, but by using a procedure called **operant discrimination training**, we can teach an organism that making a response when a discriminative stimulus is present produces food or some other positive

consequence.

h. Schedules of Reinforcement
    i. **Schedules of Reinforcement** refers to the different patterns and frequencies that reinforcement comes in, and they have strong and predictable effects on behaviour.
    ii. Classification Criteria
        1) On a **continuous reinforcement schedule**, every response of a particular type is reinforced.
        2) With **partial reinforcement**, also called **intermittent reinforcement**, only some responses are reinforced.
            a) If you are going to reinforce behaviour intermittently, you have a choice of delivering your reinforcement based on the amount of behaviour that has been produced or the time.
                i) On **ratio schedules**, a certain percentage of response is reinforced. And the key factor is that ratio schedules are based on the number of correct responses.
                One. In the workplace, this reinforcement method is called **pay for performance**, and an example is being paid on a quota system - when you meet your quota you get paid.
                ii) On **interval schedules**, a certain amount of time must elapse between reinforcement, and the key factor is that interval schedules are based on the passage of time.
                One. An example would be receiving hourly wage.
            b) Schedules of reinforcement can also vary as fixed versus variable schedules.
                i) With a **fixed schedule**, reinforcement always occurs after a specific - that is, fixed - number of responses or time interval.
                ii) With a **variable schedule**, the required number of responses or the time interval varies at random around an average.
    iii. Four Types of Partial Reinforcement Schedules
        1) Fixed-Ratio Schedule
            a) On a **fixed-ratio schedule**, reinforcement is given after a fixed number of responses.
                i) FR-3 means that reinforcement occurs after every third response, regardless of how long it takes for those responses to occur.
            b) FR schedules result in greater work output than hourly wages.
                i) If the ratio is gradually increased over time, many responses can be obtained with relatively few reinforcements.
                ii) However, the organism often pauses briefly after each reinforcement, perhaps because the next response (or responses) is never reinforced.
        2) Variable-Ratio Schedule
            a) On a **variable-ratio schedule**, reinforcement is given after a variable number of correct responses, based on an average.
                i) A VR-3 schedule means that, on average, three responses are required for reinforcement, but the number of responses required will vary from trial to trial.
            b) VR schedules, like FR schedules, produce a high rate of responding, but because the occurrence of reinforcement is less predictable on a VR schedule, there is less pausing after reinforcement, and this leads to high, steady rate of responding.
                i) VR schedules also are highly resistant to extinction, because the organism learns that periods of no payoff eventually are followed by reinforcement.
        3) Fixed-Interval Schedule
            a) On a **fixed-interval schedule**, the first correct response that occurs

after a fixed time interval is reinforced.
        b) After each reinforcement, there is a pause, followed by increased responding as the time interval passes and the next reinforcement nears.
    4) Variable-Interval Schedule
        a) On a **variable-interval schedule**, reinforcement is given for the first response that occurs after a variable time interval.
        b) Because the availability of reinforcement is less predictable than with an FI schedule, the VI schedule produces a steadier response rate.
iv. Partial Reinforcement, Learning, and Extinction
    1) Continuous reinforcement produces more rapid learning than partial reinforcement.
        a) However, continuously reinforced responses also extinguish more rapidly because the shift to no reinforcement is sudden and obvious.
    2) Partial reinforcement produces behaviour that is learned more slowly but is more resistant to extinction, especially if the behaviour is reinforced on a variable schedule.
        a) If reinforcement has been unpredictable in the past, it takes longer to learn that it is gone forever.
    3) The best way to promote fast learning and high resistance to extinction is to begin reinforcing the desired behaviour on a continuous schedule until the behaviour is well established.
        a) Then shift to a partial (preferably variable) schedule that is gradually made more demanding.

i. Escape and Avoidance Conditioning
    i. Escape and avoidance conditioning are both forms of negative reinforcement, an instance where the removal of an event or stimulus leads to an increase in behaviour.
        1) In **escape conditioning**, organisms learn a response to terminate an aversive stimulus.
        2) In **avoidance conditioning**, the organism learns a response to complete avoid an aversive stimulus.
            a) That is, in avoidance conditioning, we learn to respond before the aversive stimulus even begins.
    ii. According to one model, the **two-factor theory of avoidance learning**, classical and operant conditioning are involved in avoidance.
        1) Two-factor theory helps us understand how many avoidance behaviours develop.
            a) For our rat, the warning light initially is a neutral stimulus paired with shock (UCS), and through classical conditioning, the light becomes a CS that elicits fear.
            b) Now operant conditioning takes over: fleeing from the light is negatively reinforced by the termination of fear, and this strengthens and maintains the avoidance response.
        2) However, it has trouble explaining some aspects of avoidance, such as why people and other animals develop phobia avoidance to some stimuli (e.g., snakes) much more easily than to others (e.g., squirrels).

j. Applications of Operant Conditioning
    i. Training Animals
        1) Through shaping and chaining, animals can learn to perform some truly remarkable behaviours.
        2) Some applications push the boundaries of ingenuity, such as using pigeons to assist in-air rescue.
    ii. Human Application: Education, the Workplace, and Beyond
        1) Skinner's Beliefs
            a) Skinner set forth his utopian vision of how positive reinforcement could put an end to war, improve education, and solve a range of

social problems.
    b) Social influence is a natural part of human existence.
    c) Individual and societal problems are created by the haphazard use of reinforcement and overreliance on punishment.
2) The effectiveness of computerized instruction, or **computer-assisted** learning, rests on two key principles championed by Skinner: **immediate performance feedback** and **self-paced learning**.
3) A key behaviourist assumption is that poor performance occurs when the environment is not providing the proper consequences to reinforce the desired behaviour.
    a) **Token economies**, in which desirable behaviours are quickly reinforced with tokens that are later turned in for other reinforcers, have been used to enhance academic performance, increase work performance, and aid treatment in group homes.
4) Skinner's work gave rise to a field called **applied behaviour analysis** (also known as **behaviour modification**), which combines a behavioural approach with the scientific method to solve individual and societal problems.
    a) Essentially, a program (usually based on positive reinforcement) is designed and implemented to change behaviour, and its effectiveness is objectively measured by gathering data before and after the program is in place.

4. Biology and Learning
    a. Introduction
        i. Behaviour is influenced by an organism's evolutionary history.
        ii. **Preparedness** means that, through evolution, animals are biologically "prewired" to easily learn behaviours related to their survival as a species.
            1) Behaviours contrary to an organism's natural tendencies are learned slowly, if at all.
    b. Constraints on Classical Conditioning: Learned Taste Aversion
        i. Pairing the smell and taste of food (CS) with a toxin or some illness-producing agent (UCS) toxin can produce a CR called **conditioned taste aversion**: the taste and smell of the food now disgusts and repulses us, and we learn to avoid it.
            1) Pairing food with nausea creates an aversion involuntarily.
        ii. Psychologist John Garcia pioneered numerous taste aversion experiments that challenged two basic assumptions of classical conditioning.
            1) First, behaviourists had assumed that the CS-UCS time interval had to be relatively short, usually within a few seconds.
                a) Garcia showed that animals learned taste aversion even though exposure to the taste (CS) was up to several hours or even a day before they became ill (UCR).
            2) Second, in a classic experiment, Garcia illustrated how biological preparedness influences learned aversions.
                a) Rats are biologically primed, or prepared, to form taste-illness associations, which means that in nature they most easily identify poisonous or "bad" food by its taste (or smell).
                    i) Sounds and lights in nature don't make rats sick.
                b) In nature, sights and sounds - but not how food and drink taste - signal fear-provoking situations.
                    i) Seeing the food may repulse us, but it would not make us afraid.
        iii. Conditioned aversion can be applied to save animals' lives or help children patients avoid aversion to their normal diets.
    c. Are We Biologically Prepared to Fear Certain Things?
        i. Seligman and others proposed that humans, like other animals, are biologically prepared to acquire certain fears more readily than others.
        ii. Humans develop phobias to many stimuli, but most often we fear things that seem to have evolutionary significance: snakes, spiders, other animals, and dangerous places.

1) Although there are cases of it occurring, people rarely develop phobias to the things that really do injure, main, and kill people in today's world, like phobias to cars, cigarettes, knives, and guns.
2) Through cultural transmission of knowledge, perhaps we come to expect that some stimuli can be dangerous, making us "cognitively" rather than "biologically" prepared to acquire certain fears.

d. Constraints on Operant Conditioning: Animals That "Won't Shape Up"
   i. Training with operant conditioning was usually successful but not always, and sometimes the animals simply refused to behave according to the laws of operant conditioning.
   ii. **Instinctive drift** refers to a conditioned response "drifts" back toward instinctive behaviour.
      1) Once a particular stimulus came to represent food, animals began to act as if it were food: the chicken pecked at the ball as if it were something to eat.
   iii. Experiments confirm that operant learning is constrained by biology.
      1) It is relatively easy to train a pigeon to peck a novel object (such as a disc or on a wall) for food reinforcers, because pigeons come into the world biologically primed to peck for food.
      2) Training a pigeon to peck an object to escape from electric shock is more difficult because in their natural environment pigeons do not escape from danger by pecking - they fly away.

e. Learning and the Brain
   i. Neuroscientists have found that certain brain regions, such as the nucleus accumbens and certain neurotransmitters, such as dopamine, play a key role in regulating the ability to predict and experience reward.
   ii. No single part of the brain controls learning.
      1) The cerebellum plays an important role in acquiring classically conditioned movements - such as conditioned eyeblink responses - whereas the amygdala is centrally involved in acquiring classically conditioned fears.
   iii. Biology affects learning, but experience and learning environments also influence our biological functioning.
      1) Compared with their littermates who grow up in standard cages, young animals who are exposed to enriched environments - with toys and greater opportunities to learn - develop heavier brains with more dendrites and synapses, and with greater concentration of various neurotransmitters.
      2) In late adulthood, continued exposure to stimulating environments seems to slow down the decline in human brain functioning, as measured by better performance on intellectual and perceptual tasks.

5. Cognition and Learning
   a. SR and SOR Psychology
      i. Behaviourism guided much learning research from early 1900s through the 1960s, and it remains influential.
         1) Early behaviourists believed that learning involves the relatively automatic formation of bonds between stimuli and responses.
            a) In classical conditioning, the CS elicits the CR.
            b) In operant conditioning, a discriminative stimulus leads to an emitted response.
         2) This behaviourist orientation came to be known as **SR (stimulus-response) psychology**.
         3) They did not deny that people had thoughts and feelings, but argued that behaviour could be explained without referring to such mentalistic concepts.
      ii. But even in psychology's early days, some learning theorists argued that between the stimulus (S) and the response (R), there was something else - the organism's (O) mental representation of the world.
         1) This model came to be known as the **SOR**, or **cognitive model of learning**.
   b. Insight and Cognitive Maps

i. Insight
    1) German psychologist Wolfgang Kohler challenged Thorndike's behaviourist assumption that animals learn to perform tasks only by trial-and-error learning.
    2) Kohler exposed chimpanzees to novel learning tasks and concluded that they were able to learn by **insight**, the sudden perception of a useful relationship that helps to solve a problem, like how apes solved the problem of how to reach bananas that were dangling beyond reach with a few boxes.
    3) Kohler emphasized that the aps often spent time staring at the bananas and available tools, and then responded correctly, as if the solution suddenly appeared.
ii. Cognitive Maps
    1) The rats in Tolman's experiment had developed a mental representation of the maze layout - a **cognitive map**.
        a) The concept of cognitive maps supported Tolman's belief that learning does not merely stamp in stimulus-response connections.
        b) Rather, learning provides **knowledge**, and, based on their knowledge, organisms develop an **expectancy**, a cognitive representation of "what leads to what".
    2) A **place cell** is a type of neuron in the hippocampus that becomes active when an animal is in a specific location in the environment.
        a) A specific place cell will have one or a few locations where it becomes active.
        b) Different cells represent different parts of the environment, and the firing patterns of these groups of place cell is thought to represent a cognitive map that supports recognition of different locations and enables the animals to successfully navigate in its environment.
        c) The place cells preserved the sequence of locations visited along the track even when the geometry of the track changed.

c. Cognition in Classical Conditioning
    i. Early American behaviourists belief that classical conditioning created a direct reflex-like connection between the CS (tone) and CR (salivation).
    ii. Cognitive learning theorists also argue that classical conditioning forms a CS-UCS link.
        1) In cognitive terminology, the link is an expectation that the CS will be followed by the UCS.
        2) This **expectancy model** states that the most important factor in classical conditioning is not how often the CS and the UCS are paired, but how well the CS predicts (i.e., signals) the appearance of the UCS.
        3) It is important to note that the expectancy model does not refer to the conscious expectation of the UCS.
        4) The development of a CR is not the result of an individual's conscious inferences about the relationship between the CS and the UCS.
    iii. CS-UCS inconsistency also explains why we don't become conditioned to all the neutral stimuli that are present just before a UCS appears.
        1) From a cognitive viewpoint, these neutral stimuli do not consistently predict the arrival of the UCS, and that dramatically reduces the chance that they will become a CS.
d. Cognition in Operant Conditioning
    i. The Role of Awareness
        1) Cognitive theorists emphasize that organisms develop an expectancy of the relations between their responses and probable consequences.
            a) Many of Tolman's rats acted as if they were aware that running through one alternate path or the other would produce the best consequence, once they learned that their primary route was blocked.
        2) From a cognitive perspective, the concept of "awareness" implies that the best predictor of behaviour is the <u>perceived</u> contingency, not the actual one.

a) In many instances the two are identical, but sometimes people perceive contingencies that do not actually exist.
b) One example is superstitious behaviour.

ii. Latent Learning
1) **Latent learning** refers to learning that occurs but is not demonstrated until there is an incentive to perform.
a) In short, we may learn how to do something (gain knowledge) but not display that knowledge outwardly (performance) until some future time.
2) Latent learning supports that cognitive maps could be learned without reinforcement, posing an even greater challenge to the behaviourist viewpoint.

6. Observational Learning: When Others Pave the Way
a. Social-Cognitive Theory
i. Bandura's **social-cognitive theory**, also known by its former name **social learning theory**, emphasizes that people learn by observing the behaviour of models and acquiring the belief that they can produce behaviours to influence events in their lives.
b. The Modelling Process and Self-Efficacy
i. Bandura view modelling as a four-step process that includes several cognitive factors.
1) **Attention**: first, we must pay attention to the model's behaviour.
2) **Retention**: second, we must retain that information in memory so that it can be recalled when needed.
3) **Reproduction**: third, we must be physically capable of reproducing the model's behaviour or something similar to it.
4) **Motivation**: fourth, we must be motivated to display the behaviour.
ii. Initially we defined learning as a change in an organism's behaviour or capabilities based on experience.
1) According to Bandura, the knowledge or capability to perform a behaviour may be acquired at one time but not displayed until a later time when the motivational conditions are favourable.
iii. A classic experiment by Bandura on modelling demonstrated both observational learning and the learning-versus-performance distinction.
1) Children watched a film in which a model acted aggressively toward a Bobo doll. One group say the model rewarded, a second group saw the model reprimanded for aggression, and the third model saw no consequences, and after the film, each child was placed in a room with various toys, including a Bodo doll.
2) Children who saw the model punished performed fewer aggressive actions toward the Bobo doll than did children in the other two groups.
3) If the experimenter later offered the children attractive prizes if they could do what the model had done, all of the children quickly reproduced the model's aggressive responses.
4) Bandura demonstrated that regardless of whether the model was reinforced or punished, children had indeed learned the model's behaviour.
iv. Models, of course, differ in many ways, and we are more likely to imitate those who we consider to be successful and respected, or that we see as similar to ourselves.
c. Imitation of Aggression and Prosocial Behaviour
i. Research suggests that viewing media violence:
1) Decreases viewers' concerns about the suffering of victims;
2) Habituates us to the sight of violence; and
3) Provides aggressive models that increase some viewers' tendency to act aggressively.
ii. Many studies indicate that exposure to prosocial models enhances people's helping behaviour.

iii. Exposure to violent media is currently not considered to be the cause of aggressive and violent behaviour but research indicates that it is an important risk factor.

d. Applications of Observational Learning
   i. In everyday life, we learn many skills from observing models.
   ii. Psychologists have also used observational learning to enhance prosocial behaviour.
   iii. More ambitiously, observational learning has been used to address global social problems.
      1) Mass media programs incorporating social cognitive learning principles have since tackled social problems in South America, Africa, India, and Asia.

Chapter 7 Summary

December 2, 2017 1:46 PM

1. Adapting to the Environment
    a. Learning is a process by which experience produces a relatively enduring change in an organism's behaviour or capabilities. Learning is measured by changes in performance.
    b. Learning involves adapting to the environment. Historically, behaviourists focused on the processes by which organisms learn, and ethologists focused on the adaptive significance of learning. Today, these two perspectives have crossed paths, and more attention is paid also to how mental processes and cultural environments influence learning.
    c. Habituation is a decrease in the strength of a response to a repeated stimulus. It may be the simplest form of learning.
    d. Sensitization is an increase in the strength of a response to a repeated stimulus. Sensitization increases an organism's response to potentially dangerous stimuli.
2. Classical Conditioning: Associating One Stimulus with Another
    a. Classical conditioning involves pairing a neutral stimulus with an unconditioned stimulus (UCS) that elicits and unconditioned response (UCR). Through repeated pairing, the neutral stimulus becomes a conditioned stimulus (CS) that evokes a conditioned response (CR) similar to the original UCR.
    b. The acquisition phase involves pairing the CS with the UCS. Extinction, the disappearance of the CR, occurs when the CS is presented repeatedly in the absence of the UCS. Sometimes, spontaneous recovery occurs after a rest period and the CS temporarily will evoke a response even after extinction has taken place.
    c. Stimulus generalization occurs when a CR is evoked by a stimulus similar to the original CS. Discrimination occurs when a CR occurs to one stimulus but not another.
    d. Once a stimulus (e.g., a tone) becomes a CS, it can now be used in place of the original UCS (food) to condition other neutral stimuli. This is called higher-order conditioning.
    e. A wide range of bodily and psychological responses can be classically conditioned, including fears, sexual attraction, and positive and negative attitudes. Techniques based on classical conditioning are highly successful in treating fears and phobias.
3. Operant Conditioning: Learning Through Consequences
    a. Thorndike's law of effect states that responses followed by satisfying consequences will be strengthened, whereas those followed by unsatisfying consequences will be weakened.
    b. B.F. Skinner analyzed operant conditioning in terms of relations between antecedents, behaviours, and consequences. Antecedents that signal the likely consequences of particular behaviours in a given situation are called discriminative stimuli.
    c. Operant behaviours are emitted (under voluntary control), whereas classically conditioned responses are elicited (reflexive). Classically conditioned responses are influenced by what happens before the behaviour (i.e., by the CS-UCS pairing), whereas operant behaviours are influenced by consequences that occur after the behaviour.
    d. Reinforcement occurs when a response is strengthened by an outcome (a reinforcer) that follows it. With positive reinforcement, a response is followed by the presentation of a positive stimulus, so the response becomes stronger. With negative reinforcement, a response is followed by the removal of an aversive stimulus, so again, the response becomes stronger.
    e. Operant extinction is the weakening and eventual disappearance of a response because it no longer is reinforced.
    f. Punishment occurs when a response is weakened by an outcome (a punisher) that follows it. With positive punishment, a behaviour is followed by the presentation of a positive stimulus, and the behaviour becomes weaker.
    g. Shaping, which uses the method of successive approximations, involves the reinforcement of behaviours that increasingly resemble the final desired behaviour.

h. When behaviour changes in one situation because of reinforcement or punishment, and then this new response carries over to similar situations, this is called operant generalization. In contrast, when an operant response is made to one discriminative stimulus but not to another, this is called operant discrimination.
i. On a continuous reinforcement schedule, every response is reinforced. Partial reinforcement may occur on a ratio schedule, in which a certain percentage of responses are reinforced, or on an interval schedule, in which a certain amount of time must pass before a response gets reinforced. In general, ratio schedules produce higher rates of performance than interval schedules.
j. On fixed-ratio and fixed-interval schedules, reinforcement always occurs after a fixed number of correct responses or a fixed time interval. On variable schedules, the required number of responses or interval of time varies around some average.
k. Learning occurs most rapidly under continuous reinforcement, but partial schedules produce behaviours that are more resistant to extinction.
l. Escape and avoidance conditioning result from negative reinforcement. According to the two-factor theory, fear is created through classical conditioning. This fear motivates escape and avoidance, which is then negatively reinforced by fear reduction.
m. Animals are operantly trained to perform in entertainment industries and to assist disabled people, the police, and the military. Human applications include teaching machines, computerized instructions, token economies, and applied behaviour analysis.

4. Biology and Learning
    a. An animal's evolutionary history prepares it to learn certain associations more easily than others. This principle is called biological preparedness, and it illustrates that there are biological constraints on learning.
    b. Humans show faster fear conditioning to CSs that have evolutionary significance, suggesting that we are biologically prepared to acquire specific kinds of phobias.
    c. Cancer patients may develop anticipated nausea or vomiting to stimuli that are paired with their chemotherapy. This anticipatory nausea is a classically conditioned response.
    d. It is difficult to operantly condition animals to perform behaviours that are contrary to their evolved natural tendencies. Such conditioned behaviours often are abandoned in favour of a more natural response, a concept called instinctive drift.
    e. Various brain regions and chemicals regulate learning. Environmental experiences affect brain development and functioning, which in turn influence our future ability to learn.
5. Cognition and Learning
    a. Kohler's early research on animal insight and Tolman's pioneering research on cognitive maps indicated that cognitive factors play a role in learning. Tolman emphasized that learning is based on knowledge and an expectation of what leads to what.
    b. Cognitive interpretations of classical conditioning propose that what is learned is an expectancy that the CS will be followed by the UCS.
    c. Cognitive theorists view operant conditioning as the development of an expectancy that certain behaviours will produce certain consequences under certain conditions. Tolman's research on latent learning indicates that knowledge and performance are conceptually distinct, and that learning can occur without reinforcement.
6. Observational Learning: When Others Pave the Way
    a. Many behaviours are learned through observation. The behaviour may not be displayed immediately but instead may appear later when incentive conditions change.
    b. Observing successful models can increase people's self-efficacy and motivate them to perform the modelled behaviour.
    c. Children can learn aggressive and prosocial behaviours by watching models, and modelling is an instructional technique in skill-learning situations.

Chapter 8 Memory

November 20, 2017 3:52 PM

1. Memory as Information Processing
    a. Introduction
        i. **Memory** refers to the processes that allow us to record and later retrieve experiences and information.
        ii. **Encoding** refers to getting information into the system by translating it into a neural code that your brain processes.
        iii. **Storage** involves retaining information over time.
        iv. **Retrieval** refers to the process of pulling information out of storage when we want to use.
        v. Human memory is highly dynamic, and its complexity cannot be fully captured by any existing information-processing model.
    b. A Three-Component Model
        i. Introduction
            1) The **three-component model** proposes that memory has three major components: sensory memory, short-term or "working" memory, and long-term memory.
            2) The model does not assume that each component corresponds to a specific unit within the brain.
            3) Rather, the components may involve interrelated neural sites, and memory researchers use these terms in a more abstract sense.
        ii. Sensory Memory
            1) **Sensory memory** holds incoming sensory information just long enough for it to be recognized.
            2) It is composed of different subsystems, called **sensory registers**, which are the initial information processors.
            3) Out visual sensory register is called the **iconic store**.
                a) The time course for visual sensory memory is very brief and it is difficult or even impossible to retain complete information in purely visual form for more than a fraction of a second.
            4) The auditory sensory register, called the **echoic store**, is studied by asking participants to recall different sets of numbers or letters that are simultaneously presented to their left and right ears via headphones.
                a) Echoic memory lasts longer than iconic memory and a nearly complete echoic trace may last about two seconds and a partial trace may linger for several more.
        iii. Short-Term/Working Memory
            1) Definitions
                a) Though selective attention, a small portion of the information in sensory memory enters **short-term memory**, which holds the information that we are conscious of at any given time.
                b) Short-term memory also is referred to as **working memory**, because it consciously processes, codes, and works on information.
            2) Memory Codes
                a) Once information leaves sensory memory, it must be represented by some type of code if it is to be retained in short-term and eventually long-term memory.
                b) Such mental representations, or **memory codes**, can take various forms.
                    i) Mental image - visual encoding
                    ii) Code something by sound - phonological encoding
                    iii) Focus on the meaning of a stimulus - semantic encoding

iv) Patterns of movement - motor encoding

c) Study of memory codes and their underlying neural mechanisms may provide a key to understanding how the brain represents and makes sense of information received through the senses.

d) Note that the form of a memory code often does not correspond to the form of the original stimulus.

i) When you read these words you are probably forming phonological codes.

3) Capacity and Duration

a) Memory Capacity

i) Short-term memory can only hold a limited amount of information at a time.

ii) Depending on the stimulus, such as numbers, letters, or words, it is believed that most people can hold no more than five to nine meaningful items in short-term memory.

iii) Others suggest that the number may in fact be as few as four.

iv) However, the number of items in visual working memory may be up to 30 or more.

b) Chunking

i) The limit on short-term memory capacity concerns the number of meaningful units that can be recalled.

ii) Combining individual items into larger units of meaning is called **chunking**, and it can greatly aid recall.

c) Rehearsing

i) By rehearsing information, we can extend its duration in short-term memory indefinitely.

ii) The simple repetition of information is called **maintenance rehearsal**.

iii) In contrast, **elaborative rehearsal** involves focusing on the meaning of information or relating it to other things we already know.

iv) Both types of rehearsal keep information active in the short-term memory, but elaborative rehearsal is more effective in transferring information into long-term, which is our more permanent memory store.

4) Putting short-term memory to work

a) The original three-stage model of memory focused on short-term memory primarily as a loading platform or holding station for information along the route from sensory to long-term memory.

b) Many cognitive scientists now reject this view of short-term memory as too passive and too sequential.

i) Instead, they view short-term memory as a **working memory** - a mental workspace that actively and simultaneously processes different types of information and supports other cognitive functions, such as problem solving and planning, and interacts with long-term memory.

c) One model, proposed by Alan Baddeley, divides working memory into four components.

i) First, we maintain some information in an **auditory working memory** (the "phonological loop"), such as when you repeat a phone number, name, or new vocabulary terms to yourself mentally.

ii) A second component, **visual-spatial working memory** (the "visuospatial sketchpad"), allows us to temporarily store and manipulate mental maps of the route to some destination.

iii) A third component, the **episodic buffer**, provides temporary storage space where information from long-term memory and

from the phonological loop and/or visuospatial subsystems can be integrated, manipulated, and made available for conscious awareness.

One. The episodic buffer also comes into play when you chunk information.

iv) Finally, a control process, called the **central executive**, directs the action.

One. It decides how much attention to allocate to mental imagery and auditory rehearsal, calls up information from long-term memory, and integrates the inputs.

Two. Many authors support this account of working memory, and research suggests that the prefrontal cortex, the seat of "executive functions" is heavily involved in directing the processing of information in working memory.

iv. Long-Term Memory

1) **Long-term memory** is our vast library of more durable stored memories.
   a) The long-term storage capacity essentially is unlimited.
   b) Once formed, a long-term memory can endure for up to a lifetime.
2) Serial Position Effect
   a) Most experiments find that words at the end and beginning of the list are the easiest for participants to recall, and this U-shaped pattern is called the **serial position effect**, meaning that recall is influenced by a word's position in a series of items.
   b) The serial position effect has two components, a **primacy effect**, reflecting the superior recall or early words, and a **recency effect**, representing the superior recall of the most recent words.
      i) According to the three-stage model, the primacy effect is due to the transfer of early words into long-term memory because of rehearsing, whereas the recency effect is due to short-term memory.

2. Encoding: Entering Information

a. Effortful and Automatic Processing

i. **Effortful processing** refers to the encoding that is initiated intentionally and requires conscious attention.
   1) Rehearsing, making lists, and taking class notes illustrate effortful processing.

ii. **Automatic processing** refers to the encoding that occurs without intention and requires minimal attention.
   1) Information about the frequency, spatial location, sequence, and timing of events often is encoded automatically.
   2) Some processes (e.g., reading) are so automatic that we have difficulty switching to a more effortful stage.

b. Levels of Processing: When Deeper is Better

i. Three Kinds of Encoding
   1) When you have to notice how the word looks, you are using **structural encoding**.
   2) When you sound out the word to yourself and then judging whether it matches the sound of another word, you are using **phonological encoding** (also called **phonemic encoding**).
   3) When you must pay attention to what the word means, you are using **sematic encoding**.

ii. According to the **levels of processing** concept, the more deeply we process information, the better it will be remembered.
   1) Semantic encoding involves the deepest processing because it requires us to focus on the meaning of information.
   2) Merely perceiving the structural properties of the words involves shallow processing, and phonemically encoding words is intermediate.

c. Exposure and Rehearsal
    i. To learn factual and conceptual information presented in most academic or job settings, we need to employ effortful, deep processing.
    ii. Simple repeated exposure to a stimulus without stopping to think about it represents shallow processing.
    iii. Rehearsal goes beyond mere exposure because we are thinking about the information.
        1) Maintenance rehearsal involves simple repetition, and is most useful for keeping information active in short-term, working memory.
            a) It may help to transfer some information into long-term memory. However, it is an inefficient method for bringing about long-term transfer.
        2) Elaborative rehearsal focuses on the meaning of information - we elaborate on the material in some way.
            a) Organizing information, thinking about how it applies to our own lives, and relating it to concepts or examples we already know illustrate such elaboration.
            b) Elaborative rehearsal involves deeper processing than maintenance rehearsal and should be more effective in transferring information into long-term memory.
d. Organization and Imagery
    i. Introduction
        1) Imposing organization on a set of stimuli is an excellent way to enhance memory.
        2) An organizational scheme can enhance the meaningfulness of information and also serve as a cue that helps to trigger our memory for the information it represents.
    ii. Hierarchies and Chunking
        1) Organizing material in a **hierarchy** takes advantage of the principle that memory is enhanced by associations between concepts.
            a) A logical hierarchy enhances our **understanding** of how these diverse elements are related, and as we proceed from top to bottom, each category can serve as a cur that triggers our memory for the associated items below it.
            b) Hierarchy has a visual organization, there also is a greater possibility of using imagery as a supplemental memory code.
        2) **Chunking** refers to combining individual items into a larger unit of meaning, and it widens the information-processing bottleneck caused by the limited capacity of short-term memory.
    iii. Mnemonic Devices
        1) A **mnemonic device** is any type of memory aid.
            a) Hierarchies and chunking represent two types of mnemonic devices.
            b) So do **acronyms**, which combine one or more letters from each piece of information you wish to remember, and acronyms are one of the most popular mnemonic techniques among university students.
        2) When you are learning new material, mnemonic devices do not reduce the amount of raw information you have to encode into memory.
            a) Rather, they reorganize information into more meaningful units and provide extra cues to help you retrieve information from long-term memory.
            b) Thus, some researchers argue that acronyms don't aid memory, or at least do so only when you are already familiar with the material.
    iv. Visual Imagery
        1) Information is stored in long-term memory in two forms: verbal codes and non-verbal (typically visual) codes.
            a) According to Allan Paivio's **dual coding theory**, encoding information using both codes enhances memory, because the odds improve that

at least one of the codes will be available later to support recall.
b) In short, two codes are better than one of, though dual coding is harder to use with some types of stimuli than others.
c) Abstract concepts are easier to encode semantically than visually.
2) The ancient Greeks developed an effective and well-known imagery technique called the **method of loci**.
a) To use this technique, imagine a physical environment with a sequence of distinct landmarks, such a the rooms in a house or places on your campus.
b) To remember a list of items or concepts, take an imaginary stroll through this environment and form an image linking each place with an item or a concept.
c) Many studies support the effectiveness of method of loci.

e. How Prior Knowledge Shapes Encoding
i. Schemas: Our Mental Organizers
1) The themes that we extract from events are stored in memory are often organized around schemas, and a **schema** (plural: schemas, or schemata) is a mental framework - an organized pattern of thought about some aspect of the world, such as a class of people, events, situations, or objects.
2) We form schemas through experience, and they can strongly influence the way we encode material in memory.
3) Essentially, schemas create a perceptual set, which is a readiness to perceive - to **organize and interpret** - information in a certain way.
ii. Schemas, Encoding, and Expertise
1) In music as in other fields, acquiring **expert knowledge** can be viewed as a process of developing schemas - mental frameworks - that help to encode information into meaningful patterns.
a) From a neurological perspective, the active area involved in creating and using schema information is the medial prefrontal lobe.
2) When the chess pieces were arranged in meaningful positions, the expert could apply well-developed schemas to recognize patterns and group pieces together.
a) However, if the pieces were not in positions that would occur in a real game, they were no more meaningful to the experts than to the other players.
b) In this case, the experts lost the advantage of schemas and had to approach the task on a piece-by-piece basis just as the other players did.
3) One area that we are all expert in is survival.
a) From a functional perspective, we should be extremely good at processing and remembering words and concepts related to survival.
b) Apparently, it is very adaptive for us to encode and remember items related to survival.

3. Storage: Retaining Information
a. Memory as a Network
i. Associative Networks
1) One group of theories proposes that memory can be represented as an **associative network**, a massive network of associated concepts and ideas.
a) In this network, each concept or unit of information is represented by a **node** somewhat akin to each knot in a huge fishing net.
b) The lines in this network represent associations between concepts, with shorter lines indicating stronger associations.
c) Items within the same category generally have the strongest associations and therefore tend to be clustered closer together.
2) When people think about a concept, there is a **spreading activation** of related concepts throughout the network.
a) The term **priming** refers to the activation of one concept (or one unit

of information) by another.
    b) Thus, the "fire engine" primes the node for "red", making it more likely that our memory for this colour will be accessed.
3) The notion that memory stores information in an associative network provides one possible explanation for why hints and mnemonic devices help to stimulate our recall.

ii. Neural Networks
1) A **neural network** has nodes that are linked to one another, but these nodes are physical in nature and do not contain individual units of information.
    a) There is no single node for "red", and instead each node is more like a small information-processing unit.
    b) In a **neural network**, each concept is represented by a particular pattern or set of nodes that becomes activated simultaneously.
2) Looking across the entire network, as multitude of nodes distributed throughout the brain fire in parallel at each instant and spread their activation to other nodes, concepts and information are retrieved and thoughts arise.
    a) For this reason, neural network models are often called **parallel distributed processing models** (PDP).
3) Researchers in many fields are using the neural network approach to model learning, memory, language disorders, and other cognitive processes.

b. Types of Long-Term Memory

i. Declarative and Procedural Memory
1) **Declarative memory** involves factual knowledge and includes two subcategories: personally experienced events (episodic memory) and facts-general knowledge (semantic memory).
    a) **Episodic memory** is our store of factual knowledge concerning personal experiences: when, where, and what happened in the episodes of our lives.
    b) **Semantic memory** represents general factual knowledge about the world and language, including memory for words and concepts.
    c) Episodic and semantic memories are called declarative because, to demonstrate our knowledge, we typically have to declare it - we tell other people what we know.
2) In contrast to declarative memory, whose contents are verbalized, **procedural memory** (nondeclarative memory) is reflected in skills and actions.
    a) One component of procedural memory consists of **skills** that are expressed by "doing things" in particular situations, such as typing, riding a bicycle, or playing a musical instrument.
    b) **Classically conditioned responses** also reflect procedural memory.

ii. Explicit and Implicit Memory
1) **Explicit memory** involves conscious or intentional memory retrieval, as when you consciously recognize or recall something.
    a) **Recognition** requires us to decide whether a stimulus is familiar, as when an eyewitness is asked to pick out a suspect from a police lineup or when students take multiple-choice tests.
        i) In recognition tasks, the target stimuli are provided for you.
    b) **Recall** involves spontaneous memory retrieval, in the sense that you must retrieve the target stimuli or information on your own.
        i) With **cued recall**, hints are given to stimulate memory.
2) **Implicit memory** occurs when memory influences our behaviour without conscious awareness.
    a) **Priming tasks** provide another example.
    b) If given a list of words that haven't been explicitly remembered, one can still more possibly write down those exact words in filling-the-blank questions.

c) The word stems have activated or primed your stored mental representations of these words - the information is still in your memory - even though you may be unable to consciously recall the original words.

4. Retrieval: Accessing Information
    a. Introduction
        i. A **retrieval cue** is any stimulus, whether internal or external, that stimulates the activation of information stored in long-term memory.
        ii. **Priming** is a good example of how a retrieval cue can trigger associated elements in memory, presumably via a process of spreading activation.
    b. The Value of Multiple and Self-Generated Cues
        i. Having multiple, self-generated retrieval cues was the most effective approach to maximizing recall.
        ii. Reasons
            1) On the encoding side of the equation, generating our own associations involves deeper, more elaborative rehearsal than does being presented with associations generated by someone else.
                a) Similarly, generating three associations involves deeper processing than thinking of only one.
            2) On the retrieval side, these self-generated associations become cues that have personal meaning.
                a) And with multiple cues, if one fails, another may activate the memory.
    c. The Value of Distinctiveness
        i. In general, distinctive stimuli are better remembered than non-distinctive ones.
        ii. This principle also applies to the events of our lives, and distinctive events such as weddings, romantic encounters, births and deaths, vacations, and accidents were among the most frequently recalled.
        iii. We can enhance the memorability of non-distinctive stimuli by associating them with other stimuli that help to make them distinctive.
            1) This is the key reason why students who generated their own three-words associations were able to remember almost all the 500 words.
    d. Flashbulb Memory: Fogging Up the Picture
        i. **Flashbulb memories** are recollections that seem so vivid, so clear, that we can picture them as if they were a snapshot of a moment in time.
            1) They are most likely to occur for distinctive, positive or negative events that evoke strong emotional reactions.
        ii. Memory researchers have studied the relation between confidence and accuracy with children and adults, inside and outside the laboratory, and for many types of events.
            1) Overall, confidence and accuracy are weakly related.
    e. Context, State, and Mood Effects on Memory
        i. Context-Dependent Memory: Returning to the Scene
            1) The **encoding specificity principle** states that memory is enhanced when conditions present during retrieval match those that were present during encoding.
                1) This enhancement occurs because stimuli associated with an event may become encoded as part of the memory and later serve as retrieval cues.
            2) Applying the encoding specificity principle to external cues leads us to **context-dependent memory**: it typically is easier to remember something in the same environment in which it was acquired.
            3) The context or environment in which learning occurs may even influence the nature of the memory itself.
                1) When new learning occurs in the same environment as prior learning, the context reactivates the earlier memory and as a result the new information modifies and updates the memory.
                2) When new learning occurs in a novel environment, on the other hand,

the information is consolidated into a new episodic memory instead of modifying an existing memory.

ii. State-Dependent Memory: Arousal, Drugs, and Mood
    1) Moving from external to internal cues, the concept of **state-dependent memory** proposes that our ability to retrieve information is greater when out internal state at the time of retrieval matches our original state during learning.
    2) Many drug produce physiological effects that directly impair memory, but state-dependency is another reason why events experienced in a drug state may be difficult to recall later while in a drug-free state.
    3) Inconsistent findings suggest that such **mood-dependent memory** is not a reliable phenomenon, although researchers continue to study whether it might occur under certain conditions.
    4) Instead, there is more consistent evidence of **mood-congruent recall**: we tend to recall information or events that are congruent with our current mood.
        a) When happy, we are more likely to remember positive events, and when sad, we tend to remember negative events.
        b) This likelihood helps to perpetuate our mood and may be one factor that maintains depression once people have entered a depressed state.
    5) There is also evidence that some people experience **mood-incongruent recall**, which is thought to be related to negative mood regulation, or attempts to improve a negative mood state.

f. Improving Memory and Academic Learning
    i. Three Broad Categories of Memory Enhancement Strategy
        1) **External aids**, such as shopping lists, notes, appointment calendars, and placing objects in he same location;
        2) **General memory strategies**, such as organizing and rehearsing information; and
        3) **Formal mnemonic techniques**, such as acronyms and other systems that take training to be used effectively.
    ii. Learning Tips
        1) Use elaborative rehearsal process information deeply.
        2) Link new information to example and items already in memory
        3) Organize information
        4) Overlearn the material
        5) Distribute learning over time
        6) Minimize interference
        7) Use imagery

5. Forgetting
    a. The Course of Forgetting
        i. **Hermann Ebbinghaus's forgetting curve** shows a rapid loss of memory for nonsense syllables at first, then a more gradual decline.
            1) The rapid decline is probably due to the meaningless nature of the nonsense syllables.
        ii. Ebbinghaus typically measure memory by using a method called **relearning** and computing a savings percentage.
            1) For example, if it initially took him 20 trials to learn a list, but only half as many trials to relearn it a week later, then the savings percentage was 50 percent.
    b. Why Do We Forget
        i. Encoding Failure
            1) Many memory failures result not from "forgetting" information that we once knew well, but from failing to encode the information into long-term memory in the first place.
                a) Much of what we sense is not processed deeply enough to commit to

memory, which is understandable given the flood of stimuli that enter the sensory registers everyday.

2) Reasons
    a) If the details of something are not meaningful to us, we would not encode them no matter how often we see it (like coins) in our daily lives.
    b) At other times, we may notice information but fail to encode it deeply because we turn out attention to something else.

ii. Decay of the Memory Trace
1) **Decay theory** proposes that with time and disuse, the physical memory trace in the nervous system fades away.
2) Scientists still debate the validity of decay theory.
    a) Decay theory soon fell into disfavour because scientists could not identify what physical memory traces were, where they were located, or how physical decay could be measured.
        i) In recent decades, however, scientists have begun to unravel some of the ways that neural circuits change when a long-term memory is formed.
    b) Decay theory's prediction that the longer the interval of disuse between learning and recall, the less would be recalled, was also problematic.
        i) When participants learn a list of words or a set of visual patterns and are retested at two different times, they sometimes recall more material during the second testing than during the first testing.
        ii) This phenomenon, called **reminiscence**, seems inconsistent with the concept that a memory trace decays over time.

iii. Interference, Retrieval Failure, and the Tip-of-the-Tongue
1) According to **interference theory**, we forget information because other items in long-term memory impair out ability to retrieve it.
    a) **Proactive interference** occurs when material learned in the past interferes with recall of newer material.
    b) **Retroactive interference** occurs when newly acquired information interferes with the ability to recall information learned at an earlier time.
2) In general, the more similar two sets of information are, the more likely it is that interference will occur.
    a) Some researchers believe that interference is caused by competition among retrieval cues: when different memories become associated with similar or identical retrieval cues, confusion can result and accessing a cue may "call up" the wrong memory.
    b) Wixted has suggested that in fact any mental activity can interfere with not-yet-consolidated memories, even if the activity is not similar to the previously learned information.
3) Retrieval failure also can occur because we have too few retrieval cues or the cues may be too weak.
4) **Tip-of-the-tongue (TOT) phenomenon** is when we cannot recall a fact or name (a target word) but feel that we are on the verge of recalling it.
    a) Often we keep recalling an incorrect word that sounds similar to or resembles the target word.
    b) Some TOT experiences seem to be illusory: rather than retrieval failure, perhaps we never knew the answer to begin with.

iv. Motivated Forgetting
1) Motivational processes, such as **repression**, may protect us by blocking the recall of anxiety-arousing memories.
2) The concept of motivated forgetting is controversial.
    a) Some evidence supports it, and other evidence does not.

b) People certainly do forget unpleasant events but it has been difficult to demonstrate experimentally that a process akin to "repression" is the cause of such memory loss or whether it is due to normal information-processing failure.

c. Amnesia
    i. Classification of Amnesia
        1) **Retrograde amnesia** represents memory loss for events that occurred prior to the onset of amnesia.
            a) Amnesiac patients with damage to their hippocampus were unable to imagine new experiences.
            b) Findings like these demonstrate the importance of memory systems and even memories themselves to everyday mental experience - without the ability to retrieve episodic memories we would be incapable of imaging new experiences.
        2) **Anterograde amnesia** refers to memory loss for events that occur after the initial onset of amnesia.
            a) H.M.'s brain operation, and particularly the removal of much of his hippocampus, produced severe anterograde amnesia and robbed him of the ability to consciously remember new experiences and facts.
            b) Anterograde amnesia can also be produced by other conditions, such as **Korsakoff's syndrome**, which can result from chronic alcoholism and may also cause severe retrograde amnesia.
    ii. Dementia and Alzheimer's Disease
        1) **Dementia** refers to impaired memory and other cognitive deficits that accompany brain degeneration and interfere with normal functioning.
            a) There are more than a dozen types and causes of dementia, and although it can occur at any point in life, dementia is most prevalent among elderly adults.
        2) **Alzheimer's disease (AD**) is a progressive brain disorder that is the most common cause of dementia among adults over the age of 65.
        3) Development of AD
            a) The early symptoms of AD, which worsen gradually over a period of years, include forgetfulness, poor judgement, confusion, and disorientation.
                i) Often, memory for recent events and new information is especially impaired.
                ii) Memory is the first psychological function affected, as AD initially attacks subcortical temporal lobe regions - areas near the hippocampus and then the hippocampus itself - that helps convert short-term memories into long-term ones.
            b) Alzheimer's disease spreads across the temporal lobes and to the frontal lobes and other cortical regions.
                i) Patients with AD have an abnormal amount of plaques and tangles in their brains.
                ii) **Plaques** are clumps of protein fragments that build up on the outside of neurons, whereas **tangles** are the fibres that get twisted and wound together within neurons.
                iii) Neurons become damaged and die, brain tissue shrinks, and communication among neurons is impaired as AD disrupts several neurotransmitter systems, especially the **acetylcholine** system, which plays a key role in synaptic transmission in several brain areas involved in memory, and drugs that help to maintain acetylcholine functioning have had some temporary success in improving AD patients' cognitive functioning.
            c) Working memory and long-term memory worsen as AD progresses.
        4) Causes of AD and its Characteristic
            a) Scientists have identified several genes that contribute to early onset

AD, an inherited from of the disease that develops before age 65 (and as early 30) but accounts for only 5 to 10 percent of Alzheimer's cases.
    b) For the more typical, late-onset AD, researchers have identified a gene called **ApoE (on chrosome pair 19)** as a major risk factor, which helps to direct the production of proteins that carry cholesterol in the blood plasma.
    c) High cholesterol and other risk factors for cardiovascular disease may likewise increase the risk of developing AD.
iii. Infantile (Childhood) Amnesia
    1) **Infantile amnesia** (also known as **childhood amnesia**) refers to the memory loss for early experiences.
        a) Even though infants and preschoolers can form long-term memories of events in their lives, as adults we typically are unable to recall these events consciously.
        b) Our memories of childhood typically do not include events before the age of three or four, although some adults can partially recall major events that happened before the age of two.
    2) As to the causes of infantile amnesia, one hypothesis is that brain regions that encode long-term episodic memories are still immature in the first years after birth.
        a) Another is that we do not encode our earliest experiences deeply an fail to form rich retrieval cues for them.
        b) Additionally, because infants lack a clear self-concept, they do not have a personal frame of reference around which to organize rich memories.

d. Forgetting to Do Things: Prospective Memory
i. In contrast to **retrospective memory**, which refers to memory for past events, **prospective memory** concerns remembering to perform an activity in the future.
ii. That people forget to do things as often as they do is interesting, because prospective memories typically involve little content.
    1) Often we need only recall that we must perform some event-based task ("remember on your way out, mail the letter") or time-based task ("remember, take your medication at 4 p.m.").
iii. Successful prospective memory, however, draws on other cognitive ability such as planning and allocating attention while performing other tasks.
    1) The frontal lobes, which direct these direct these executive processes, appear to be centrally involved in prospective memory.
iv. Overall, participants who performed better on the word-recall task (retrospective memory) did not display better memory on the simulated pill-tasking task (prospective memory).
v. Older adults generally display poorer prospective memory, especially when signaling is time-based.
    1) However, when prospective memory is tested outside the laboratory by using tasks such as simulated pill-taking, healthy adults during their 60s to their 80s often perform as well as or better than adults in their 20s.
    2) Perhaps older adults are more motivated to remember in such situations or rely more on a standard routine.

e. Methods to Enhance Memory
i. Caffeine
    1) Caffeine can enhance memory for up to 24 hours.
    2) To enhance memory, you need to have that coffee after studying, not before.
ii. Napping
    1) Napping helps the consolidation of memory.
    2) Napping also improves memory in infants.
iii. Curiosity
    1) When we are really curious about an event, we attend to it very closely, and

this increased attention can have benefits for the memory of other material that occurs at roughly the same time.
2) The researchers suggest that curiosity activates the hippocampus, enhancing memory for all things that occur during and around the topic in question.

iv. Longhand Writing
1) The researchers suggest that keyboarding is a relatively fast task and encourages taking down the information verbatim.
2) Longhand requires you to listen and assimilate the information, resulting in better memory.

v. Chewing Gum
1) Results indicated that those who chewed gum had faster reaction times and were accurate at identifying the sequences.
2) Students who chewed them stopped for five minutes before a test of memory performed better than those who did not chew at all and those who continued to chew gum during the tests.

6. Memory as Constructive Process
a. Introduction
i. Usually, our memories of things past are incomplete and sketchy.
ii. In such situations, we may literally **construct** (or **reconstruct**) a memory by piecing together bits of stored information in a way that intuitively "makes sense", and which therefore sees real and accurate.
iii. Many of us have a tendency to recall the world through slightly rosy glasses, which helps us feel good about ourselves.
1) Most importantly, errors were positively biased.

b. Memory Distortion and Schemas
i. Bartlett, who coined the term **schema**, believed that people have generalized ideas, **schemas**, about how events happen and that they use these ideas to organize and reconstruct their memories.
1) In reading a story, our pre-existing schemas no doubt affect how we encode the story, but they also influence how we fill in the gaps and reconstruct the story when we later recall it.
ii. In general, the use of appropriate schemas improves memory by helping us organizing information as we encode and retrieve it.
1) However, fitting information into our schemas is sometimes like trying to squeeze a square peg into a round hole, requiring us to reshape and distort information so that it makes sense and fits with pre-existing assumptions about the world.
iii. Memory construction extends, quite literally, to how we visualize the world.
1) When university students look at photographs that have a main object within a scene, and the then draw the pictures from memory, they consistently display the **boundary extension**, remembering a scene as more expansive - as being "wider-angle" - than it really was.
2) In real life, objects occur against an expansive background, creating a schema for how we expect scenes to look.
3) Thus, when remembering close-up images, our schemas lead us to "see beyond the edge" and retrieve a broader scene, not the one we saw.

c. The Misinformation Effect and Eyewitness Testimony
i. Introduction
1) The **misinformation effect**, the distortion of a memory by misleading post-event information, has been demonstrated in numerous studies.
2) In one celebrated case, Father Bernard Pagano, a Roman Catholic priest, was positively identified by seven eyewitnesses as the perpetrator of a series of armed robberies in the Wilmington, Delaware, area, and he was saved from almost certain conviction when the true rubber, dubbed the "gentleman bandit" because of his politeness and concern for his victims, confessed to the crimes.
a) Two pieces of information may have affected the witnesses' memory.

b) First, the gentlemanly and concerned manner of the robber is consistent with the schema many people have of priests.
c) Second, before presenting pictures of suspects to eyewitnesses, the police let it be known that the suspect might be a priest.

3) The misinformation effect can be subtle, produced by changing a single word while questioning an eyewitness.
a) "Two car crashed/collided/hit/bumped/contacted into each other ".

4) Even your mood can enhance the misinformation effect.
a) Participants were influenced by the misinformation and were more confident with their false beliefs in the sad condition.

ii. Confusing the Source
1) Misinformation effects also occur because of **source confusion** (also called the **source monitoring error**), our tendency to recall something or recognize it as familiar, but to forget where we encountered it.
2) Example
a) Suppose an eyewitness to a crime looks through a series of mugshots and reports that none of the individuals is the perpetrator.
b) Several days later, the eyewitness is brought back to view a lineup and is asked to identify the person who committed the crime.
c) In reality, none of the people in the lineup did, but one suspect was pictured in a mugshot that the eyewitness had seen days ago.
d) Source confusion occurred because the eyewitness recognized that individual's face as familiar, but failed to remember that this familiarity stemmed from the mugshot.

iii. Other Factors in Eyewitness Testimony
1) Alcohol and Marijuana
2) The Kind of Information We Have Available
a) Identifications based on voice alone tend to be less accurate than those based on both visual and auditory cues, or on visual cues alone.

3) While men and women are equally inaccurate in their identifications, men tend to be more confident in their decisions.

d. The "Recovered Memory" Controversy: Repression or Reconstruction
i. In some cases it appears that accurate memories can indeed return after decades of post-trauma forgetting.
1) Yet memory loss after psychological trauma usually is far shorter, with memory returning over weeks, months, or perhaps a few years.
2) In come cases of trauma the victim's primary problem is not memory loss but rather an inability to forget, which may involve recurrent nightmares and flashbacks.
3) Experiments with adults and children also indicate that false memories of personal events can be created by suggestive questioning or comments, or merely by having someone imaging that the event took place.

ii. The message from science is not that all claims of recovered traumatic memories should be dismissed.
1) Rather, it is to urge caution in unconditionally accepting those memories, particularly in cases where suggestive techniques are used to recover the memories.

7. The Biology of Memory
a. Sensory and Working Memory
i. Generalization
1) Sensory memory depends on our visual, auditory, and other sensory systems to detect stimulus information, transform it into neural codes, and send it to the brain, where sensory areas of the cerebral cortex initially process it.
2) As working memory becomes involved in different types of tasks - remembering a person's name and face, recalling a list of numbers, learning a concept in your textbook - cortical networks located in different lobes of

the brain become more active.

ii. Function of Frontal Lobes in Working Memory
    1) The frontal lobes generally become more active during tasks that place greater demands on working memory.
    2) The prefrontal cortex has also been shown to enhance memory by searching for commonalities and differences in material, presumably to facilitate further encoding.
    3) The frontal lobes seem to be particularly important in supporting central executive functions, such as allocating attention to the other components of working memory.
        a) This does not mean, however, that the central executive resides exclusively within the frontal lobes.
        b) Frontal-lobe damage often, but not always, impairs central executive functions of working memory.
        c) Moreover, patients with intact frontal lobes but damage in other brain areas may exhibit central executive impairments.
        d) Thus, even the master control executive functions of working memory depend on a network of neural activity that connects regions across the brain.

b. Long-Term Memory
    i. Storage of Long-term Memory
        1) Multiple brain areas are involved in the storage of long-term memory, but the hippocampus and its adjacent areas appear to play important roles in encoding certain types of long-term memories.
    ii. Declarative Memory
        1) The hippocampus and its adjacent tissue help to encode and retrieve long-term memories.
            a) Like H.M., many patients with extensive hippocampal damage retain the use of their short-term memory but cannot form new, explicit long-term declarative memories - memories for new personal experiences and facts.
            b) The hippocampus does not seem to be the site where long-term declarative memories are permanently stored, which explains why H.M. retained his long-term memories acquired earlier in life.
            c) Rather, it helps to gradually convert short-term memories into permanent ones.
        2) **Memory consolidation** refers to the hypothetical and gradual binding process that the diverse components of an experience - where something happened, what the scene or people looked like, sounds we heard, the meaning of events or information, and so on - are processed initially in different regions of the cortex and then gradually bound together in the hippocampus.
            a) Once a memory for a personal experience is consolidated, its various components appear to be stored across wide areas of the cortex, although we retrieve and reintegrate these components as a united memory.
        3) Although we have focused on the frontal lobes and hippocampus, memory formation also depends on other brain areas.
            a) For example, damage to the thalamus - the brain's major sensory relay station - can impair both the encoding of new memories and the retrieval of old ones.
            b) The amygdala encodes emotionally arousing aspects of stimuli and plays an important role in helping us from long-term memories for events that stir our emotions, and damage to the amygdala eliminates much of the "memory advantage" from emotionally arousing stimuli.
    iii. Procedural Memory
        1) Along with other parts of the brain, the cerebellum plays an important role

in forming procedural memories.

2) This role helps to explain why H.M., whose cerebellum was not damaged by the operation, showed improved performance at various hand-eye coordination tasks though he was unable to consciously remember having performed the tasks.

Chapter 8 Summary

December 1, 2017 11:23 AM

1. Memory as Information Processing
    a. Memory involves three main processes (encoding, storage, and retrieval) and three main components (sensory memory, short-term/working memory, and long-term memory).
    b. Sensory memory briefly holds incoming sensory information. Some information reaches working memory and long-term memory, where it is mentally represented by phonological, visual, semantic, or motor codes.
    c. Short-term/working memory actively processes information and supports other cognitive functions. It has auditory, visuospatial, and executive (coordinating) components. Long-term memory stores enormous amounts of information for up to a lifetime. Studies of amnesia patients and research on the serial position effect support the distinction between short- and long-term memory.
2. Encoding: Entering Information
    a. Effortful processing involves intentional encoding and conscious attention. Automatic processing occurs without intention and requires minimal effort.
    b. Deep processing enhances memory. Elaborative rehearsal provides deeper processing than maintenance rehearsal. Hierarchies, chunking, dual-coding by adding visual imagery, and other mnemonic devices facilitate deeper encoding.
    c. Schemas are mental frames that shape how we encode information. As we become experts in any given field, we develop schemas that allow us to encode information into memory more efficiently.
3. Storage: Retaining Information
    a. Associative network models view long-term memory as a network of associated nodes, with each node representing a concept or unit of information. Neural network models propose that each piece of information in memory is represented not by a single node but by multiple nodes distributed throughout the brain. Each memory is represented by a unique pattern of simultaneously activated nodes.
    b. Declarative long-term memories involve factual knowledge and include episodic memories (knowledge concerning personal experiences) and semantic memories (facts about the world and language). In contrast, procedural memory is reflected in skills and actions. Explicit memory involves conscious or intentional memory retrieval, where as implicit memory occurs when memory influences our behaviour without conscious awareness.
4. Retrieval: Accessing Information
    a. Retrieval cues activate information stored in long-term memory. Memory retrieval is more likely to occur when we have multiple cues, self-generated cues, and distinctive cues.
    b. We experience flashbulb memories as vivid and clear "snapshots" of an event and are confidence of their accuracy. However, over time many flashbulb memories become inaccurate. Overall, memory accuracy and memory confidence are only weakly related.
    c. The encoding specificity principle states that memory is enhanced when cues present during retrieval match those that were present during encoding. Typically, it is easier to remember a stimulus when we are in the same environment (context-dependent memory) or same internal state (state-dependent memory) as when the stimulus was originally encoded. One exception is mood states, where we tend to recall information or events that are congruent with our current mood.
5. Forgetting
    a. Forgetting tends to be most rapid relatively soon after initial learning, but time frame and degree of forgetting can vary widely depending on many factors.
    b. Because of encoding failure, we often cannot recall information because we never entered it into long-term memory in the first place.
    c. Decay theory proposes that physical memory traces in long-term memory deteriorate

with disuse over time, but evidence of reminiscence contradicts this view.
   d. Proactive interference occurs when material learned in the past interferes with recall of newer material. Retroactive interference occurs when newly acquired information interferes with the ability to recall information learned at an earlier time.
   e. Psychodynamic theorists propose that we may forget anxiety-arousing material through repression, an unconscious process of motivated forgetting.
   f. Retrograde amnesia represents memory loss for events that occurred prior to the onset of amnesia. Anterograde amnesia refers to memory loss for events that occur after the initial onset of amnesia. Infantile amnesia is our inability to remember personal experiences from the first few years of our lives.
   g. Whereas retrospective memory refers to memory for past events, prospective memory refers to our ability to remember to perform some activity in the future.
6. Memory as Constructive Process
   a. Our schemas may cause us to remember events not as they actually occurred but in ways that fit with our pre-existing concepts about the world.
   b. At times, we may recall information that never occurred. Schemas, spreading activation, and priming are some of the reasons why this occur.
   c. Misinformation effects occur when our memory is distorted by misleading post-event information, and they often occur because of source confusion - our tendency to recall something or recognize it as familiar but to forget where we encountered it.
   d. Like adults, children experience misinformation effects. Vulnerability is greatest among younger children and when suggestive questions are asked repeatedly. Experts cannot reliably tell when children are reporting accurate versus sincerely believed false memories.
   e. Psychologists debate whether recovered memories of child abuse are accurate and whether they are forgotten though repression or other psychological processes. Concern about the possibility of false memory has led many experts to urge caution in unconditionally accepting the validity of recovered memories.
7. The Biology of Memory
   a. Memory involves numerous interacting brain regions. Sensory memory depends on input from our sensory systems and sensory areas of the cortex that initially process this information.
   b. Working memory involves a network of brain regions. The frontal lobes play a key role in performing the executive functions of working memory.
   c. The hippocampus helps to consolidate long-term declarative memories. The cerebral cortex stores declarative memories across distributed sites. The amygdala encodes emotionally arousing aspects of events, and the cerebellum helps to form procedural memories. Damage to the thalamus can produce severe amnesia.
   d. Studies of long-term potentiation in several species indicate that as memories form, complex chemical and structural changes that enhance synaptic efficiency occur in neurons.

Chapter 9 Language and Thinking

January 10, 2018 2:34 PM

1. Language
    a. Introduction
        i. **Mental representations** include images, ideas, concepts, and principles.
        ii. **Language** consists of a system of symbols and rules for combining these symbols in ways that can generate an infinite number of possible messages and meanings.
            1) This definition encompasses four properties that are essential to any language: symbols, structure, meaning, and generality.
        iii. **Psycholinguistics** is the scientific study of the psychological aspects of language, such as how people understand, produce, and acquire language.
    b. Adaptive Functions of Language
        i. Human thoughts and behaviour depend on more than the physical structure of the brain.
            1) Although the structure of the brain may not have evolved much over the past 50,000 years, human cognitive and linguistic skills clearly have.
        ii. Some evolutionary theorists believe that the use of language evolved as people gathered to form larger social units.
            1) As the social environment became more complex, new survival problems emerged: the need to create divisions of labour and cooperative social systems, to develop social customs and communicate thoughts, and to pass on knowledge and wisdom.
            2) The development of language made it easier for humans to adapt to these environmental demands.
        iii. Humans have evolved into high social creatures who need to communicate with one another and have the physical characteristics that allow them to do so in the flexible way known: through language.
        iv. Language underlies so much of what we do that it is almost impossible to imagine functioning without it.
            1) Out conscious usually takes the form of self-talk, or inner speech.
            2) Through language, we are also able to share our thoughts, feelings, goals, intentions, desires, needs, and memories with other people and thus interact socially in rich and diverse ways that would not otherwise be possible.
            3) Some have suggested that language and memory evolved at the same time.
        v. In ways small and big, language also is an extremely powerful learning mechanism.
    c. Properties of Language
        i. Language is Symbolic and Structured
            1) Language uses sounds, written characters, or some other system or of symbols to represent objects, events, ideas, feelings, and actions.
                a) Moreover, the symbols used in any given language are arbitrary.
            2) Language also has a rule-governed structure.
                a) A language's **grammar** is the set of rules that dictate how symbols can be combined to create meaningful units of communication.
                b) **Syntax** refers to the rules that govern the order of words.
                c) You may not be able to verbalize the formal rules of English that are violated in these examples, but you know them implicitly because they are part of the language that you speak.
                d) The grammas of all languages share common functions, such as providing rules for how to change present tense or a negative.
                e) Yet just as symbols vary across languages, so do grammatical rules.
                f) Although language changes over time, with new words appearing regularly, new words and new phrases need to conform to the basic

rules of that language.

ii. Language Conveys Meaning
    1) No matter the arbitrary symbols or grammatical rules used, once people learn those symbols and rules, they are able to form and then transfer mental representations to the mind of another person.
    2) But understanding **semantics**, the meaning of words and sentences, actually is a tricky business.
        a) Sometimes we should not interpret some expressions literally.

iii. Language is Generative and Permits Displacement
    1) **Generativity** means that the symbols of language can be combined to generate an infinite number of messages that have novel meaning.
    2) **Displacement** refers to the fact that language allows us to communicate about events and objects that are not physically present.
        a) In other words, language frees us from being restricted to focusing on events and objects that are right before us in the present.

d. The Structure of Language

i. Surface Structure and Deep Structure
    1) When you read, listen to, or produce a sentence, its **surface structure** consists of the symbols that are used and their order. The syntax of a language provides the rules for ordering words properly.
        a) In contrast, a sentence's **deep structure** refers to the underlying meaning of the combined symbols, which brings us back to the issue of semantics.
    2) Sentences can have different surface structures but the same deep structure, like positive and passive voice.
        a) Sometimes, a single surface structure can give rise to two deep structures, as happens when people speak or write ambiguous sentences, like "the police must stop drinking after midnight".
    3) In everyday life, when you read or hear speech, you are moving from the surface structure to deep structure: from the way a sentence looks or sounds to its deeper level of meaning.
        a) After time, you may forget the precise words used in the sentence, but you're likely to recall its essential meaning.
        b) In contrast, when you express your thoughts to other people, you must transform deep structure (the meaning that you want to express) into a surface structure that others can understand.

ii. The Hierarchical Structure of Language: Five-Step Language Hierarchy
    1) Phonemes
        a) **Phoneme** is the smallest unit of speech sound in a language.
        b) Linguists have identified about 100 phonemes that humans can produce, but no language uses all these sounds.
            i) English uses about 40 phonemes, consisting of the various vowels and consonant sounds, as well as certain letter combinations such as th and sh..
    2) Morphemes
        a) Phonemes have no inherent meaning, but they alter meaning when combined with other elements.
        b) At the next level of the hierarchy, phonemes are combined into **morphemes**, the smallest units of meaning in a language.
            i) Notice that morphemes are not always syllables. For example, s is not a syllable, but the final "s" on a noun is a morpheme that means plural.
    3) Words, Phrases, and Sentences
        a) Morphemes, in turn, are the stuff of which words are formed.
        b) English morphemes can be combined into over 500,000 words, words into countless phrases, and phrases into an infinite number of sentences.

4) Discourse
    a) Beyond this basic hierarchy lies the sixth and most comprehensive level, that of **discourse**, in which sentences are combined into paragraphs, articles, books, conversations, and so forth.

e. Understanding and Producing Language
    i. The Role of Bottom-Up Processing
        1) In **bottom-up processing**, individual elements of a stimulus are analyzed and then combined to form a unified perception.
        2) Analyzing the hierarchical structure of spoken language as a set of building blocks that involve the use of phonemes to create morphemes and the combination of morphemes to create words reflects a bottom-up approach.
    ii. The Role of Top-Down Processing
        1) In **top-down processing**, sensory information is interpreted in light of existing knowledge, concepts, ideas, and expectations.
        2) Language by its very nature involves top-down processing, because the words you write, read, speak, or hear activate and draw on your knowledge of vocabulary, grammar, and other linguistic rules that are stored in your long-term memory.
        3) **Speech-segmentation** - perceiving where each word within a spoken sentence begins and ends - in our native language occurs automatically.
            a) When you read a sentence, the spaces between words make segmentation easy.
            b) But when people speak, they don't pause in between each pair of words.
            c) In fact, when psycholinguists measure the sound energy produced as people utter sentences, they find that the decreases in energy output between words are actually smaller than the decreases between segments within the same words.
            d) Psycholinguists have discovered that we use several cues to tell when one spoken word ends and another begins.
                i) For example, through experience we learn that certain sequences of phonemes are unlikely to occur within the same words, so when we hear these sounds in sequence we are more likely to perceive them as the ending or beginning of an adjacent word.
            e) We also use the context provided by the other words in a sentence to interpret the meaning of any individual word.
    iii. Pragmatics: The Social Context of Language
        1) It takes more than having a vocabulary and arranging words grammatically to understand language and communicate effectively with others.
        2) It also involves **pragmatics**, a knowledge of the practical aspects of using language.
            a) Language occurs in a social context, and pragmatic knowledge not only helps you understand what other people are really saying, but also help you make sure that other people get the point of what you're communicating.
            b) In essence, pragmatics is another example of how top-down processing influences language use and it is essential for language acquisition.
        3) Psycholinguists have identified social rules that guide communication between people.
            a) One rule states that messages should be as clear as possible.
            b) Thus, depending on whether you talk with an adult who is fluent in your language, a foreign visitor who barely speaks your language, or a young child, you usually adjust your speech rate, choice of words, and sentence complexity.
        4) Pragmatics also depend on other aspects of the social context.

a) The style of the message should be appropriate for the context.

iv. Language Functions, The Brain, and Sex Differences

1) Language functions are distributed in many areas of the brain, but several regions are especially significant.
   a) Broca's area, located in the left hemisphere's frontal lobe, is most centrally involved in word production and articulation.
      i) This area is also involved in the hand motor-control system, which explains why people often talk with their hands.
   b) Wernicke's area, in the rear portion of the temporal lobe, is more centrally involved in speech comprehension.
   c) People with damage in one or both areas typically suffer from **aphasia**, an impairment in speech comprehension and/or production that can be permanent or temporary.
   d) The visual area of the cortex is also involved in recognizing written words.
2) Men who suffer left-hemisphere strokes are more likely than women to show severe aphasic symptoms.
   a) In female stroke victims with left-hemisphere damage, language functions are more likely to be spared, suggesting that more of their language function is shared with the right hemisphere.

f. Acquiring a First Language

i. Biological Foundations

1) Several facts suggest a biological basis for language acquisition.
   a) First, human children, despite their limited thinking skills, begin to master language early in life without any formal instruction.
   b) Moreover, despite their differences at the phoneme level, all adult languages throughout the world - including sign languages for the deaf that developed independently in different parts of the world - seem to have common underlying structural characteristics.
   c) Language acquisition thus represents the unfolding of a biological primed process within a social learning environment.
2) The linguist Noam Chomsky proposed that humans are born with a **language acquisition device (LAD)**, an innate biological mechanism that contains the general grammatical rules (which he terms **universal grammar**) common to all languages.
   a) Among the principles inherent in LAD are that languages contain such things as noun phrases and verb phrases that are arranged in particular ways, such as subjects, predicates, and adjectives.
   b) Chomsky likened LAD to a huge electrical panel with banks of linguistic switches that are thrown as children hear the words and syntax of their native language.
   c) In this manner, universal grammar becomes calibrated to the grammar and syntax of one's native tongue.

ii. Social Learning Processes

1) The behaviorist B. F. Skinner developed an operant conditioning explanation for language acquisition.
   a) His basic premise was that children's language development is strongly governed by adults' positive reinforcement of appropriate language and non-reinforcement or correction of inappropriate verbalizations.
2) However, most modern psycholinguists doubt that operant learning principles alone can account for language development.
   a) For one thing, children learn so quickly.
   b) Moreover, observational studies have shown that parents do not typically correct their children's grammar as language skills are developing. Rather, parents' corrections focus primarily on the truth value of what the child is trying to communicate.

c) Much of children's language is very different from that of their parents, and thus it can't be explained simply as an imitative process.

3) Nonetheless, social learning is a crucial contributor to language acquisition, and the interplay between biological and environmental factors is a given for most modern theorists.
   a) Psychologist Jerome Bruner proposed the term **language acquisition support system (LASS)** to represents factors in the social environment that facilitate the learning of a language.
   b) One could say that when LAD and LASS interact in a mutually supportive fashion, normal language development occurs.

iii. Developmental Timetable and Sensitive Periods
1) As biological factors (including the maturation of speech-production mechanisms) and experiential factors combine their influences, language acquisition proceeds according to a developmental timetable that is common to all cultures.
   a) Children progress from reflexive crying at birth through stages of cooing, babbling, and one-word utterances.
   b) By two years of age, children are uttering sentences called **telegraphic speech** that at first consist of a noun and a verb, with nonessential words left out as in a telegraph message.
   c) Soon, additional words may be added.
   d) From that point on, speech development accelerates as vocabulary increases and sentences become more grammatically correct.
   e) In a short span of five years, an initially non-verbal creature has come to understand a produce a complex language.
2) Some linguists are convinced there is also a sensitive period from infancy to puberty during which the brain is most responsive to language input from the environment.
   a) Support for a sensitive period comes from studies of children who lived by themselves in the wild or who were isolated from human contact by deranged parents.
   b) There is considerable neural plasticity and transfer of training in auditory learning, so we are not exactly sure of how wide or narrow the critical period might be.
3) Because sign languages share the deep-structure characteristics of spoken languages, deaf children who learn sign language before puberty develop normal linguistic and cognitive abilities, even though they never hear a spoken word.
   a) In contrast, deaf people who are not exposed to sign language before age 12 who language-learning deficits later in life.

g. Bilingualism: Learning a Second Language
i. Introduction
1) A second language is learned best and spoken most fluently when it is learned during the sensitive period of childhood.
   a) Much of the evidence argues that the vocabulary of a language can be learned at any age, but mastery of the syntax, or grammar, depends on early acquisition.
   b) After about age seven, mastery of English grammar, for example, becomes progressively more difficult.
2) One concern with the early learning of multiple languages is that children will confuse the two languages.
   a) Young bilingual children do sometimes mix their two languages, but as McGill University Fred Genesee has shown, children begin to differentiate their two languages by two years of age, perhaps younger, and such code mixing is not a lasting or important source of confusion.
3) Some of the early research on bilingualism suggested that having to learn

two vocabularies and sets of grammar put bilingual speakers at a disadvantage.
    a) However, when matched on background variables, bilingual speakers scored at least as well as monolinguals on performance tests.
    b) More recent research has found that bilingual children actually show superior cognitive processing when compared with their monolingual peers.
    c) Bilingual children also perform better than monolingual children on perceptual tasks that require them to inhibit attention to an irrelevant feature of an object and pay attention to another feature.
    d) Positive correlates of bilingualism, such as greater flexibility in thinking and better performance on standardized intelligence tests, have been discovered in a number of countries, including Switzerland, South Africa, and Canada.

ii. Learning a Second Language: Is Earlier Better?
    1) Given that children are language sponges, it sees obvious that a second language would be learned best and spoken most fluently when acquired early in life.
        a) Some psycholinguists believe that there is a critical period for learning a second language that ends in childhood or possibly in the early teens.
    2) However, age of acquisition can easily be confounded with years of exposure and practice.
        a) Thus researchers must try to compare the proficiency of people who are early versus late second language learners yet who also have had a similar amount of overall exposure to that second language.
    3) The finding of some experiments strongly supported the critical period hypothesis.
        a) Overall, the early arrivals performed far better than the late arrivals.
        b) Moreover, even among the early arrivals, those who had arrived by age seven mastered English grammar just as well as native-born Americans, whereas immigrants who had arrived between the ages of 8 and 10 and between 11 and 16 did progressively worse on the grammar test.
        c) The 17 to 39-year-olds showed the poorest understanding of grammar and, within this age group, breaking the data down by age subgroups made little difference.
    4) Other findings, however, complicate the picture.
        a) David Birdsong and Michelle Molis used the same grammar test in a study of native Spanish speakers who had immigrated to America at different ages and were now either faculty members, students, or employees at a university.
        b) Once again, despite having similar amount of overall exposure to English, early arriving immigrants performed much better than late-arriving immigrants.
        c) But unlike the previous study, performance among early arrivals generally remained high all the way through age 16.
        d) And among the late arrivals, age did make a difference.
    5) Overall, at present, the data suggest that there may at least be a **sensitive** (rather than **critical**) period for learning a second language that extends through mid-adolescence.

h. Linguistic Influence on Thinking
    i. The linguist Benjamin Lee Whorf contended in his **linguistic relativity hypothesis** that language not only influences but also determines what we are capable of thinking.
        1) If the linguistic relativity hypothesis is correct, then people whose cultures have only a few words for colours should have greater difficulty in

perceiving the spectrum of colors than do people whose languages have many colour words.
2) There are experiments that support or argue against this theory.
3) Still, most psycholinguists do not agree with Whorf's strong assertion that language determines how we think.

ii. They would say instead that language can **influence** how we think, categorize information, and attend to our daily experiences.
a) Language can also colour our perceptions, the decision we make, and the conclusions we draw.
b) Language can help to create and maintain stereotypes.
c) Language not only influence how we think but also may influence how well we think in certain domains, like the fact that English-speaking children consistently score lower than children from Asian countries in mathematical skills.

iii. In sum, language provides the foundation of many human behaviours and capabilities.
1) As a central topic of psychological research, it continues to be studied vigorously at the biological, psychological, and environmental levels of analysis.

i. Level of Analysis for Language
i. Biological Level
1) Acquiring language depends on brain maturation; it also modifies the brain.
2) There appears to be a maturational critical or sensitive period for acquiring normal language capabilities.
3) Using language involves a network of brain structures; among bilingual speakers, whether the two languages share the same network depends age of acquisition and other factors.
4) Hemispheric lateralization for language may differ between men and women.

ii. Environmental Level
1) Social learning experiences guide language acquisition, beginning with early caretaker speech that exposes infants to the phonemes of a particular language.
2) Formal educational experiences facilitate language development and are integral to learning to read.
3) Extensive exposure to a bilingual environment influences the number of languages that children acquire.
4) There are cultural variations in word use, such as in the number of words used to identify colours or the degree of sexist language.

iii. Psychological Level
1) Cognitive processes (e.g., attention, memory) are involved in learning a language's symbols and grammatical rules.
2) Bottom-up and top-down processes influence our ability to recognize speech and to read.
3) Bilingualism appears to influence other cognitive abilities.
4) Language influences how we think.

2. Thinking
a. Thought, Brain, and Mind
i. Conscious thought arises from the unified activity of different brain areas.
1) In essence, of the many brain regions and connecting circuits that are active at any instant, a particular subset becomes joined in unified activity that is trong enough to become a conscious thought or perception.
2) The specific pattern of brain activity that composes this dominant subset varies from monent to moment as we experience different thoughts and respond to changing stimuli.
3) Although we're still far from understanding exactly how the brain produces thought, it is clear that from a biological level of analysis, thought exists as

patterns of neural activity.

ii. Subjectively, at the psychological level, thinking may seem to be the intenral language of the mind - somewhat like "inner speech" - but is actually includes several mental activities.
    1) One mode of thought does indeed take the form of verbal sentences that we say or hear in our minds.
        a) This is called **propositional thought** because it expresses a proposition, or statement, such as "I'm hungry" or "It's almosttime for dinner".
    2) Another thought mode, **imaginal thought**, consists of images that we can see, hear, or feel in our mind.
    3) A third mode, **motoric thought**, relates to mental representations of motor movements, such as throwing an object.
    4) All three modes of thinking enter our abilities to reason, solve problems, and engage in many forms of intelligent behaviour.

b. Concepts and Propositions
    i. Much of our thinking occurs in the form of **propositions**, statements that express ideas.
        1) All propositions consist of concepts combined in a particular way.
    ii. **Concepts** are basic units of semantic memory - mental categories into which we place objects, activities, abstractions, and events that have essential features in common.
        1) Concepts can be acquired through explicit instruction or through our own observations of similarities and differences among various objects and events.
        2) Many concepts are difficult to define explicitly, like you can not easily define what a vegetable is but can easily give an example of that.
            a) According to Eleanor Rosch, many concepts are defined by **prototypes**, the most typical and familiar members of a category or a class.
        3) The use of prototypes is perhaps the most elementary method of forming concepts.
            a) It requires that we note only similarities among objects.
            b) Because prototypes may differ as a result of peronal experience, there is considerable room for arbitrariness and individual differences in prototypic concepts.

c. Reasoning
    i. Introduciton
        1) One aspect of intelligent thinking is the ability to reason and think logically.
            a) Such thinking helps us acquire knowledge, make sound decisions, and solve problems.
            b) Reasoning helps us avoid the hazards and time-consuming efforts of trial and error.
        2) Philip Johnson-Laird proposed that we reason about an observation (e.g., viewing a triangle) by constructing mental models of each possibility based on that observation and our existing knowledge ("this is a square," "this is a triangle"), and then compare each possibility to determine which most closely matches our experience.
            a) This process of constructing and comparing mental models suggests that reasoning is based not on formal rules of inference as previously thought, but on internal representations of our world combined with our knowledge about the world.
    ii. Deductive Reasoning
        1) In **deductive reasoning**, we reason from the top down, that is, from general principles to a conclusion about a specific case.
        2) When people reason deductively, they begin with a set of **premises** (propositions assumed to be true) and determine what the premises imply

about a specific situation.

3) Deductive reasoning is the basis of formal mathematics and logic.
    a) Logicians regard it as the strongest and most valid form of reasoning because the conclusion cannot be false if the premises (factual statements) are true.
4) More formally, the underlying deductive principle may be stated: Given the general proposition "if X, then Y", if X occurs, then you can infer Y.
    a) Thus, to use a classic deductive argument, or **syllogism**,
        i) If all humans are mortal (first premise), and
        ii) If Socrates is a human (second premise),
        iii) then, Socrates must be mortal (conclusion).

iii. Inductive Reasoning

1) In **inductive reasoning**, we reason from the bottom up, starting with specific facts and trying to develop a general principle.
    a) Scientists use induction when they discover general principles, or laws, as a result of observing a number of specific instances of a phenomenon.
2) An important difference between deductive and inductive reasoning lies in the certainty of the results.
    a) Deductive reasoning are certain to be true if the premises are true, but inductive reasoning leads to likelihood rather than certainty.
3) In daily life and in science, inductive and deductive reasoning may be used at different points in problem solving and decision making.
    a) Psychologists often make informal observations.
    b) These specific observations may prompt them to construct an initial explanation for the observed phenomenon.
    c) This is inductive reasoning, so the explanation could be wrong even if it is consistent with all the known facts.
    d) Therefore, scientists move to a deductive process in which they design experiments to formally test specific if-then hypotheses, moving now from a general explanatory principles to a specific observation (the experiment's result).
    e) If the results of these experimental tests do not support their hypotheses, the scientists conclude that their explanation or theory cannot be correct and needs to be revised or discarded.

iv. Stumbling Blocks in Reasoning

1) Distraction by Irrelevant Information
    a) People often fail to solve problems because they simply don't focus on the relevant information.
    b) Instead, they take into account irrelevant information that leads them astray.
2) Belief Bias
    a) **Belief bias** is the tendency to abandon logical rules in favour of our own personal beliefs.
    b) Johnson-Laird suggests that whereas people construct mental models of the possibilities compatible with a set of premises to determine if a given conclusion is valid, errors in deductive reasoning often occur because people fail to consider all possible models.
        i) The stronger your belief in a particular topic, the more you reject other possibilities and the stronger the bias effect.
3) Emotions and Framing
    a) When we evaluate problems or make decisions, at times we may abandon logical reasoning in favour of relying on our emotions to guide us.
        i) And even when we try to reason logically, emotions may still creep into the picture.
    b) Reasoning can also be affected by the particular way that information

is presented to us, or **framed**.

i) **Framing** refers to the idea that the same information, problem, or options can be structured and presented in different ways.
ii) Framing influences how we perceive information and can interfere with logical reasoning.
One. This may be especially so when choices are framed to highlight potential positive or negative outcomes, thereby triggering emotions - such as fear, anger, or sadness - that may alter our perceptions of the risks associated with various choice options.

d. Problem Solving
i. Four Stages of Problem Solving
1) Understanding, or Framing, the Problem
a) Our initial understanding of a problem is a key step toward a successful solution.
i) If we frame a problem poorly, then we can easily be led into a maze of blind alleys and ineffective solutions.
ii) If we frame it optimally, then we at least have a chance to generate an effective solution.
b) A knack for framing problems in effective ways that differ from conventional expectations has been called **outside-the-box-thinking**.
2) Generating Potential Solutions
a) Once we have interpreted the problem, we can begin to formulate potential solutions or explanations.
b) Ideally, we might proceed in the following fashion:
i) Determine which procedures and explanations will be considered.
ii) Determine which solutions are consistent with the evidence that has so far been observed. Rule out any solutions that do not fit the evidence.
3) Testing the Solutions
a) Consider the possible solutions that remain.
i) If a solution requires you to choose between specific explanations, ask if there is any test that should give one result if one explanation is true and another result if a different explanation is true.
ii) If so, evaluate the explanations again in light of the evidence from that test.
b) Abraham Luchins developed the water jugs problems to demonstrate the manner in which a **mental set** - the tendency to stick to solutions that have worked in the past - can result in less-effective problem solving.
4) Evaluate Results
a) After solving a problem, we should ask ourselves, "would there have been an easier or more effective way to accomplish the same objective?".
b) This question can lead to the development of additional problem-solving principles that may be applicable to future problems.
ii. The Role of Problem Solving Schemas
1) **Problem-solving schemas** are like mental blueprints or step-by-step scripts for selecting information and solving specialized classes of problems.
a) Once we master them, we seem to know what to do without having to engage in step-by-step formal problem-solving procedures.
b) Algorithms and heuristics are two important strategies for problem solving.
2) **Algorithms** are formulas or procedures that automatically generate correct solutions.

a) However, using algorithms can be very time-consuming.
b) You might therefore decide to use some rule-of-thumb strategy, which is called heuristics.

3) **Heuristics** are general problem-solving strategies that we apply to certain classes of situations.
a) In **means-ends analysis**, we identify differences between the present situation and the desired state, or goal, and then make changes that will reduce these differences.
b) **Sub-goal analysis** is formulating sub-goals, or intermediate steps, toward a solution.
c) Heuristics enter not only problem-solving strategies but also into a wide range of decisions and judgements.

iii. Uncertainty, Heuristics, and Decision Making
1) Introduction
a) Few decisions in everyday life can be made with the absolute certainty that comes from applying some mathematical formula or other algorithm.
b) Typically, the best we can hope for is a decision that has a high probability of a positive outcome.
c) Because we seldom know what the exact probabilities are, we tend to apply certain heuristics to form judgements of likelihood.
d) These heuristics can serve us well, but they can lead to errors in judgement.

2) The Representativeness Heuristic
a) We use the **representativeness heuristic** to infer how closely something or someone fits our prototype for a particular concept, or class, and therefore how likely it is to be a member of that class.
b) Sometimes, however, our use of representativeness can cause us to make decisions that fly in the face of logic.
i) The reason that people make this sort of error is that they could confuse representativeness with probability.
c) Kahneman notes that the use of representativeness reflects what he calls **System 1 thinking** - we respond reflexively to situations in order to quickly identify the situation at hand and respond to any perceived danger.

3) The Availability Heuristic
a) Another heuristic that can sometimes lead us astray is the **availability heuristic**, which causes us to base information in memory.
b) We tend to remember events that are most important and significant to use.
i) Usually that principle serves us well, keeping important information at the forefront in our memories, ready to be applied.
ii) But if something easily comes into mind, we may exaggerate the likelihood that it could occur
iii) A recent memorable event can increase people's belief that they may suffer a similar fate.
c) Thus, at times the representativeness and availability heuristics can lead us astray by distorting our estimate of how likely an event really is.
i) In other words, they can bind us to the **base rate**, or actual frequencies, at which things occur.
ii) In general, it is always best to find out what the actual probabilities are and make judgements on that basis.

iv. Confirmation Bias and Overconfidence
1) How to Test a Hypothesis or Solution
a) The best thing we can do to test our ideas is to seek evidence that will

disconfirm them, rather than look for evidence that supports them.
b) This is because the most informative piece of evidence we can obtain is one that rules out a hypothesis or an idea.
i) Disconfirming evidence proves conclusively that our idea cannot be true in its current form.
ii) In contrast, confirming evidence only supports our idea, and it doesn't prove it with certainty, for it is possible that some future observation will disconfirm it or that another explanation fits the facts even better.

2) Confirmation Bias
a) People are prone to fall into a trap called **confirmation bias**, tending to look for evidence that will confirm what they currently believe rather than looking for evidence that could disconfirm their beliefs.
b) Confirmation bias often contributes to a distorted sense of how correct our opinions and beliefs are.

3) Overconfidence
a) **Overconfidence**, the tendency to overestimate one's correctness in factual knowledge, beliefs, and decisions, is another reason people do not challenge their beliefs.
b) It apparently stems from people's need to see themselves knowledgeable and competent.

e. Knowledge, Expertise, and Wisdom

i. Acquiring Knowledge: Schemas and Scripts

1) Knowledge forms a foundation for expertise and wisdom.
a) Each culture passes down its knowledge and world view from one generation to the next through language, instruction, and socialization.
b) This vast library of knowledge, shaped by cultural learning and by other environmental experiences (including trial-and-error learning), also supports the reasoning, decision-making, and problem-solving skills.

2) One way to think about knowledge acquisition is a process of building schemas.
a) Most broadly, a **schema** is a mental framework, and organized pattern of thought about some aspect of the world.
b) Concepts and categories represent types of schemas, and together they help you build a mental framework.
c) Algorithms and heuristics also are types of schemas - problem-solving schemas - that provide you with mental frameworks for solving certain types of problems.
d) Another type of framework, called a **script**, is a mental framework concerning a sequence of events that usually unfolds in a regular almost standardized order.

3) In sum, your knowledge grows as you acquire new scripts, concepts, and other types of schemas; as your existing schemas become more complex, and as you form connections between schemas.

ii. The Nature of Expertise

1) Whether in medicine, science, sports, politics, or other fields, experts have developed many schemas to guide problem solving in their field, and just as critically, they are much better than novices at recognizing when each schema should be applied.
2) Applying the correct mental blueprint provides a proven route to solving a problem quickly and effectively.

iii. Expert Schemas and Memory

1) Because they rely on learned schemas, experts take advantage of their spacious long-term memory.
a) They can quickly analyze a problem deductively, select the retrieval

cues needed to pull the appropriate schema from memory, and apply the schema to solve the problem at hand.

2) In contrast, novices who haven't yet learned specialized schemas must use general problem-solving method in working memory, the space-limited blackboard of the mind.
    a) In so doing, they tax their working memory - the weakest link in the human mind.
3) When people develop expertise, their brain functioning changes in ways that increase processing efficiency.
    a) This change even occurs in animals.

iv. What is Wisdom
1) To German psychologist Paul Baltes and his colleagues, **wisdom** represents a system of knowledge about the meaning and conduct of life.
    a) Baltes and his colleagues reviewed numerous cultural, historical, philosophical, religious, and psychological views of wisdom.
2) Baltes and his colleagues concluded that wisdom has five major components:
    a) **Rich factual knowledge about life**: this includes knowledge about human nature, social relationships, and major life events.
    b) **Rich procedural knowledge about life**: such knowledge includes strategies for making decisions, handling conflict, and giving advice.
    c) **An understanding of lifespan contexts**: this includes an awareness that life involves many contexts, such as family, friends, work, and leisure.
    d) **An awareness of the relativism of values**: this includes recognizing that values and priorities differ across people and societies.
    e) **The ability to recognize and manage uncertainty**: this ability stems from an awareness that the future cannot be fully known.

f. Mental Imagery
i. Introduction
1) A **mental image** is a representation of a stimulus that originates inside your brain rather than from external sensory input.
    a) Nighttime dreams are among the most common forms of mental imagery.
2) Although people have mental images that subjectively involve sounds, tastes, smells, and so on, visual mental images are the most common and most thoroughly researched.

ii. Mental Rotation
1) **Mental rotation task** is when people rotate one object in their mind's eye until it lines up sufficiently with the other objct to permit a same-different judgment.
2) Shepard and Metzler did asked people to do the mental rotation task and press a button for the answer, and they found that participants were able to mentally rotate the objects as if the objects existed physically in three-dimensional space but that the seed of this mental rotation process was limited.
    a) The average rate at which these particular objects can be rotated is roughly 60° per second.

iii. Are Mental Images Pictures in the Mind?
1) Mental Imagery as Perception
    a) Many researchers believe that mental images, while not literally pictures in the mind, fuction in ways analogous to actual visual images and are represented in the brain as a type of perceptual code.
    b) Stephen Kosslyn and his colleagues conducted an experiment and found that the greater the distance between the two locations on the mental image of the map, the longer it took participants to scan and find the second location.

i) This result supports the view that mental images involve a spatial representation.
c) Kosslyn also conducted experiments that indicated that the size and level of detail of mental images can be changed in ways that correspond to perceiving actual objects.

2) Mental Imagery as Language
a) Some researchers argue that mental imagery is more closely tied to lanuage than to visual perception.

iv. Mental Imagery and the Brain
1) If mental imagery is rooted in perception, then people who experience brain damage that causes perceptual difficulties might also be expected to show similar impairments in forming mental images.
a) In most instances, this seems to be the case, but there are exceptions.
b) Most often, however, damage to brain regions involved in perception also disrupts people's ability to form mental images.

2) Brain-imaging studies of healthy people reveal that many brain regions that become more active when people perceive actual objects also become more active when people form mental images of those objects.
a) Moreover, researchers have found evidence of neurons, called **imagery neurons**, that fire in response to a particular stimulus regardless of whether it is visual or imagined.

3) Altogether, studies of brain functioning suggest that while imagery and visual perception do not map onto all the same neural components, there is a lot of overlap between these two processes.

g. Metacognition: Knowing Your Own Cognitive Abilities
i. Recognizing What You Do and Don't Know
1) **Metacognition** refers to your awareness and understanding of your own cognitive abilities.
a) Metacognition has to do with truly knowing whether you do or do not understand the concept.

2) One component of metacognition is metacomprehension: people who display good **metacomprehension** are accurate in judging what they do or don't know.

3) Another component, called **metamemory**, represents your awareness and knowledge of your memory capabilities.
a) Your ability to accurately judge how well you will be able to remember those items for an upcoming test reflects one aspect of metamemory.

ii. Further Advice on Improving Metacomprehension
1) As a student, you also want to be able to accurately assess your understanding of how well you know the material before it's time to take a test.
a) One way to do this is to take advantage of practice test.

h. Level of Analysis for Thinking Process
i. Biological Level
1) Conscious thoughts exist as patterns of neural activity.
2) Developing expertise changes brain functioning in ways that improve processing efficiency.
3) In general, during mental imagery the brain's activity corresponds to that of visual perception.
4) Often, brain damage that disrupts visual perception also impairs mental imagery.

ii. Environmental Level
1) Irrelevant information can impair reasoning.
2) How a question is framed influences our ability to reason logically.
3) The resemblance of a stimulus to a prototype can prompt the proper or improper use of the representativeness heuristics.
4) Dramatic, vivid events may lead us to overestimate the likelihood of such

future events.
5) Cultural and educational experiences foster expertise and wisdom.
6) Following instructions to write a delayed summary of textbook material increases students' metacomprehension.

iii. Psychological Level
1) Much of our thinking involves concepts and takes the form of propositional thought.
2) Belief bias can impair logical reasoning.
3) We often rely on heuristics to solve problems and make decisions.
4) At times the representativeness and availability heuristics, confirmation bias, and overconfidence may impair our decision making.
5) To solve problems in their fields, experts make more effective use of schemas than do novices.
6) In some ways, mental images function analogously to visual images.

Chapter 9 Summary

January 11, 2018 2:51 PM

1. Language
    a. Human languages across the globe share the same underlying features. Language is symbolic and structured, conveys meaning, is generative, and permits displacement. Language has many adaptive functions, such as facilitating cooperative social systems and allowing people to transmit knowledge to one another. Scientists believe that humans have evolved an innate capacity for acquiring language.
    b. The surface structure of a language refers to how symbols are combined; the deep structure refers to the underlying meaning of the symbols. Language elements are hierarchically arranged: from phoneme to morpheme to words, phrases, and sentences. Discourse involves higher-level combinations of sentences.
    c. Understanding and producing language - including pattern recognition of words and the hierarchical structure of language - involve bottom-up and top-down processing.
    d. In infancy, babies can perceive all the phonemes that exist in all the languages of the world. Between 6 and 12 months of age, their speech discrimination narrows to include only the sounds specific to their native tongue. By ages four to five, most children have learned the basic grammatical rules for combining words into meaningful sentences.
    e. Language development seems to depend heavily on innate mechanisms that permit the learning and production of language, provided that the child is exposed to an appropriate linguistic environment during a sensitive period that extends from early childhood to puberty.
    f. Although research findings are not entirely consistent, it appears that a second language is most easily mastered and fluently spoken if it is learned during a sensitive period that ranges from early childhood possibly through mid-adolescence. Bilingual children tend to perform better than monolingual children on a variety of cognitive tasks.
    g. In general, it appears that when people acquire a second language early in life or learn it to a high degree of proficiency later in life, both languages share a common neural network.
    h. Language influences what people think and how effectively they think. Expansion of vocabulary allows people to encode and process information in more sophisticated ways.
    i. Researchers have attempted to teach apes to use hand signs or keyboard symbols to communicate in language-like fashion. At best, apes are capable of learning, combining, and communicating with symbols at a level similar to that of a human toddler. Skeptics question whether apes can learn syntax and generate novel ideas.
2. Thinking
    a. At the level of the brain, thoughts are patterns of neural activity. At the level of the mind, thoughts are propositional, imaginal, or motoric mental representations.
    b. Concepts are mental categories, or classes, that share certain characteristics. Many concepts are based on prototypes, the most typical and familiar members of a class. How much something resembles the prototype determines whether the concept is applied to it. Propositional thought involves the use of concept in the form of statements.
    c. In deductive reasoning, we reason from general principles to a conclusion about a specific case. Inductive reasoning, in contrast, involves reasoning from a set of specific facts or observations to a general principle. Deduction is the strongest and most valid form of reasoning, because the conclusion cannot be false if the premises are true. Inductive reasoning cannot yield certainty.
    d. Unsuccessful deductive reasoning can result from 1) failure to select the appropriate information; 2) failure to apply the appropriate deductive reasoning rules, particularly in novel situations; and 3) belief bias, the tendency to abandon logical rules in favor of personal beliefs.

e. Problem solving proceeds through a number of steps: 1) understanding the nature of problem, 2) establish initial hypotheses or potential solutions, 3) testing the solutions against existing evidence to rule out hypotheses that do not apply, and 4) evaluate results.
f. Problem-solving schemas are shortcut methods for solving specialized classes of problems. They are stored in long-term memory and can help to overcome the limitations of working memory. Expertise results from acquiring a range of successful problem-solving schemas through training and practical experience, as well as knowing when to apply them.
g. Algorithms are formulas or procedures that guarantee correct solutions. Heuristics are general strategies that may or may not provide correct solutions. Means-ends analysis is one commonly used heuristic. The representativeness heuristic is the tendency to judge evidence according to whether it is consistent with an existing concept or schema. The availability heuristic is the tendency to base conclusions and probability judgements on what is readily available in memory.
h. Humans exhibit confirmation bias, a tendency to look for facts to support hypotheses rather than to disprove them; and they suffer from overconfidence, a tendency to overestimate their knowledge, beliefs, and decisions.
i. In some situations, divergent thinking is needed for generating novel ideas or variations on ideas. Functional fixedness can blind us to new ways of using an object or a procedure, thereby interfering with creative problem solving. In some cases, a period of incubation permits problem solving to proceed on a subconscious level while giving the problem solver psychological distance from the problem.
j. Knowledge acquisition can be viewed as a process of building schemas, which are mental frameworks. Scripts, which are one type of schema, provide a framework for understanding sequences of events that usually unfold in a regular, almost standardized, order.
k. Experts rely heavily on schemas that they have developed from experience. Compared with novices, experts have more schemas to guide problem solving in their field and are much better at recognizing when each schema should be applied. Schemas also enable experts to take greater advantage of long-term memory.
l. Wisdom represents a system of knowledge about the meaning and conduct of life. According to one model, wisdom has five major components: rich factual knowledge, rich procedural knowledge, an understanding of lifespan of contexts, an awareness of the relativism of values and priorities, and the ability to recognize and manage uncertainty.
m. A mental image is a representation of a stimulus that originates inside the brain rather than from external sensory input. The objective, quantifiable study of mental imagery received a huge boost from research examining people's ability to mentally rotate objects.
n. Mental images of objects seem to have properties that are analogous to the properties of actual objects. Thus, one viewpoint holds that mental images are basically perceptual in nature. A second viewpoint proposes that mental images actually are based on language. Overall, brain research offers more support to the imagery-as-perception view.

Chapter 10 Intelligence

January 15, 2018 12:00 PM

1. Intelligence in Historical Perspective
    a. Definition
        i. **Intelligence** is the ability to acquire knowledge, to think and reason effectively, and to deal adaptively with the environment.
    b. Sir Francis Galton: Quantifying Mental Ability
        i. In his book Hereditary Genius, Sir Francis Galton showed through the study of family trees that eminence and genius seemed to occur within certain families.
        ii. Galton's research convinced him that eminent people had "inherited mental constitutions" that made them more fit for thinking than their less successful counterparts.
            1) Exhibiting his own belief bias, Galton dismissed the fact that the more successful people he studied almost invariably came from privileged environments.
        iii. Galton then attempted to demonstrate a biological basis for eminence by showing that people who were more socially and occupationally successful would also perform better on a variety of laboratory tasks thought to measure the "efficiency of the nervous system".
            1) He developed measures of reaction speed, hand strength, and sensory acuity.
            2) He even measured the size of people's skulls, believing that skull size reflected brain volume and hence intelligence.
    c. Alfred Binet's Mental Tests
        i. Alfred Binet wanted to find an objective way to find certain children who seemed unable to benefit from normal public schooling as early as possible so that some form of special education could be arranged for them.
            1) In developing his tests, Binet made two assumptions about intelligence.
                a) First, mental abilities develop with age.
                b) Second, the rate at which people gain mental competence is a characteristic of the person and is fairly constant over time.
            2) To develop a measure of mental skills, Binet asked experienced teachers what sorts of problems children could solve at ages three, four, five, and so on, up though the school years.
                a) He then used their answers to develop a standardized interview in which an adult examine posed a series of questions to a child to determine whether the child was performing at the correct mental level for his or her age.
                b) The result of the testing was a score called the **mental age**.
        ii. Stern's **intelligence quotient (IQ)** was the ratio of mental age to chronological age, multiplied by 100.
            1) Two Reasons of not Using the Mental Age Standard Today
                a) Many of the basic skills measured by intelligence tests are acquired by about age 16 through normal life experiences and schooling, so that Stern's quotient is less useful for adults.
                b) Moreover, some intellectual skills show an actual decline at advanced ages.
            2) Today's intelligence tests provide an "IQ" score that is based on a person's performance relative to the scores of other people the same age, with a score of 100 corresponding to the average performance of that age group.
2. The Nature of Intelligence
    a. The Psychometric Approach: The Structure of Intellect
        i. Introduction

1) **Psychometrics** is the statistical study of psychological tests.
2) The psychometric approach to intelligence tries to identify and measure the abilities that underlie individual differences in performance.

ii. Factor Analysis
1) To identify the mental abilities of human mind, researchers administer diverse measures of mental abilities and then correlate them with one another.
    a) They reason that if certain tests are correlated highly with one another - if they cluster mathematically - then performance on these tests probably reflects the same underlying mental skill.
2) A statistical technique called **factor analysis** reduces a large number of measures to a smaller number of clusters, or factors, with each cluster containing variables that correlate highly with one another but less highly with variables in other clusters.

iii. The g Factor: Intelligence as General Mental Capacity
1) The British psychologist, Charles Spearman concluded that intellectual performance is determined partly by a **g factor**, or general intelligence, and partly by whatever special abilities might be required to perform that particular task.
    a) Spearman contended that because the general factor - the g factor - cuts across virtually all tasks, it constitutes the core of intelligence.
2) Today, many theorists continue to believe that g factor is the core of what we call intelligence.
    a) Moreover, g matters a great deal as a predictor of both academic and job performance.
    b) General intelligence also predicts memory gain through consolidation during sleep.

iv. Intelligence as Specific Mental Abilities
1) L.L. Thurstone of the University of Chicago concluded that human mental performance depends not on a general factor but rather on seven distinct abilities, which he called **primary mental abilities**.
    a) S - space: reasoning about visual scenes
    b) V - verbal comprehension: understanding verbal statements
    c) W - word fluency: producing verbal statements
    d) N - number facility: dealing with numbers
    e) P - perceptual speed: recognizing visual patterns
    f) M - rote memory: memorizing
    g) R - reasoning: dealing with novel problems
2) For practical reasons, educators tend to find the specific-abilities notion of intelligence more attractive and useful than the general mental ability model.
    a) They are more interested in identifying the specific mental skills involved in learning subjects.
    b) They are also interested in helping children increase the specific mental abilities that are needed for success in various subjects.
    c) Additionally, it may appear more feasible to enhance specific mental skills than to raise general intelligence.

v. Crystallized and Fluid Intelligence
1) Raymond Cattell and John Horn proposed a new model of intelligence: they broke down Spearman's general intelligence into two distinct but related subtypes of g (with a correlation of about 0.5).
    a) **Crystalized intelligence (g_c)** is the ability to apply previously acquired knowledge to current problems.
        i) Vocabulary and information tests are good measures of crystallized intelligence.
        ii) Crystallized intelligence, which is the basis for expertise, depends on the ability to retrieve previously learned

information and problem-solving schemas from long-term memory.
iii) It is dependent on previous learning and practice.

b) **Fluid intelligence ()** is the ability to deal with novel problem-solving situations for which personal experience does not provide a solution.
i) It involves inductive reasoning and creative problem-solving skills.
ii) Fluid is dependent primarily on the efficient functioning of the central nervous system rather than on prior experience and cultural context.
iii) People high in fluid intelligence can perceive relations among stimulus patterns and draw inferences from relationships.
iv) Fluid intelligence requires the abilities to reason abstractly, think logically, and manage information in working memory so that new problems can be solved on the blackboard of the mind.

c) Thus, long term memory contributes strongly to crystalized intelligence, whereas fluid intelligence is particularly dependent on efficient working memory.

2) The **g_c - g_f model** is based in part on what has been learned about intellectual development in adulthood.
a) Cattell and Horn concluded that over our lifespan, we progress from using fluid intelligence to depending more on crystallized intelligence.
b) Early in life, we encounter many problems for the first time, so we need fluid intelligence to figure out solutions.
c) As experiences makes us more knowledgeable, we have less need to approach each situation as a new problem and instead, we simply call up appropriate information and schemas from long-term memory, thereby utilizing our crystallized intelligence.
d) This is the essence of wisdom.

3) Because long-term memory remains strong even as we age, performance on tests of crystallized intelligence improves during adulthood and remains stable well into late adulthood.
a) In contrast, performance on tests of fluid intelligence begins to decline as people enter late adulthood.

4) Furthermore, different brain areas are active during tasks associated with fluid and crystallized intelligence.
a) Haasz at al. have shown that fluid intelligence is related to increased connectivity in the brain's white matter, while crystalized intelligence seems to be more associated with frontal and parietal lobe grey matter.

vi. Carroll's Three-Stratum Model: A Modern Synthesis

1) The **three-stratum theory of cognitive abilities** establishes three levels of mental skills - general, broad, and narrow - arranged in a hierarchical model.
a) At the top, or third stratum, of the model is a g factor thought to underlie most mental activity.
b) Below g at the second stratum are eight broad intellectual factors arranged from left to right in terms of the extent to which they are influenced by (or correlated with) g.
i) Fluid intelligence
ii) crystallized intelligence
iii) general memory & learning
iv) Broad visual perception
v) Broad auditory perception
vi) Broad retrieval ability
vii) Broad cognitive speediness
viii) Processing speed (reaction time / decision speed)
c) Finally, at the first stratum of the model are nearly 70 highly specific

cognitive abilities that feed into the broader second stratum factors.
    i) On average, these specific ability measures tend to correlate around 0.30 with one another, reflecting the common g factor at the top of the model.

b. Cognitive Process Approaches: The Nature of Intelligent Thinking
    i. **Cognitive process theories** explore the specific information-processing and cognitive processes that underlie intellectual ability.
    ii. Robert Sternberg's **triarchic theory of intelligence** addresses both the psychological processes involved in intelligent behaviour and the diverse forms that intelligence can take. Sternberg's theory divides the cognitive processes that underlie intelligent behaviour into three specific components.
        1) **Metacomponents** are the higher-order processes used to plan and regulate task performance.
            a) They include problem-solving skills such as identifying problems, formulating hypotheses and strategies, testing them logically, and evaluating performance feedback.
            b) Sternberg believes that metacomponents are the fundamental differences in fluid intelligence.
            c) He finds that intelligent people spend more time framing problems and developing strategies than do less intelligent people, who have a tendency to plunge right in without sufficient forethought.
        2) **Performance components** are the actual mental processes used to perform the task.
            a) They include perceptual processing, retrieving appropriate memories and schemas from long-term memory, and generating responses.
        3) **Knowledge-acquisition components** allow us to learn from our experiences, store information in memory, and combine new insights with previously acquired information.
            a) These abilities underlie individual differences in crystallized intelligence.
    iii. Sternberg believes that there is more than one kind of intelligence and suggests that environmental demands may call for three different classes of adaptive problem solving and that people differ in their intellectual strengths in these areas.
        1) **Analytical intelligence** involves the kinds of academically oriented problem-solving skills measured by traditional intelligence tests.
        2) **Practical intelligence** refers to the skills needed to cope with everyday demands and to manage oneself and other people effectively.
        3) **Creative intelligence** comprises the mental skills needed to deal adaptively with novel problems.

c. Broader Conceptions of Intelligence: Beyond Mental Competencies
    i. Introduction
        1) Some psychologists think that intelligence may be more broadly conceived as relatively **independent intelligences** that relate to different adaptive demands.
    ii. Gardner's Multiple Intelligences
        1) The Seven Intelligences
            a) **Linguistic Intelligence**: the ability to use language well, as writers do.
            b) **Logical-mathematical intelligence**: the ability to reason mathematically and logically
            c) **Visuospatial intelligence**: the ability to perceive pitch and rhythm and to understand and produce music
            d) **Bodily-kinesthetic intelligence**: the ability to control body movements and skillfully manipulate objects, as demonstrated by a highly skilled dancer, athlete, or surgeon.
            e) **Interpersonal intelligence**: the ability to understand and relate well to others.

f) **Intrapersonal intelligence**: the ability to understand oneself.
g) **Naturalistic intelligence**: the ability to detect and understand phenomena in the natural world, as a zoologist or meteorologist might.

2) Gardner's Opinions
   a) The form of intelligence that is most highly valued within a given culture depends on the adaptive requirements of that culture.
   b) These different classes of abilities require the functioning of separate but interacting modules in the brain.
   c) Gardner's approach, though provocative, remains controversial because it goes far beyond traditional conceptions of intelligence as mental skills.

iii. Emotional Intelligence

1) According to Mayer and Salovey, **emotional intelligence** involves the abilities to read others' emotions accurately, to respond to them appropriately, to motivate oneself, to be aware of one's own emotions, and to regulate and control one's own emotional responses.
2) According to Mayer and Salovey, emotional intelligence includes four components, or branches, all of which can be measured by specific tasks in the Mayer-Salovey-Caruso Emotional Intelligence Test.
   a) **Perceiving emotions** is measured by people's accuracy in judging emotional expressions in facial photographs, as well as the emotional tones conveyed by different landscapes and designs.
   b) **Using emotions to facilitate thought** is measured by asking people to identify the emotions that would best enhance a particular type of thinking, such as how to deal with a distressed co-worker or plan a birthday party.
   c) To measure **understanding emotions**, people are asked to specify the conditions under which their emotions change in intensity or type; another task measures people's understanding of which basic emotions blend together to create subtle emotions, such as envy or jealousy.
   d) Finally, **managing emotions** is measured by asking respondents to indicate how they can change their own or others' emotions to facilitate success or increase interpersonal harmony.
3) The scoring method for the MSCEIT tasks yields high reliability among expert scorers; it produces scores for each branch, as well as a total emotional intelligence score.
   a) Other measures of emotional intelligence, which ask people how competent they are in emotional areas, tend not to correlate highly with the MSCEIT or predict competent behaviours as well.
4) Proponents of emotional intelligence point to the important adaptive advantages of emotional skills in meeting the challenges of daily life, and they believe that the ability to read, respond to, and manage emotions have evolutionary roots.
   a) Emotionally intelligent people, they suggest, form stronger emotional bonds with others; enjoy greater success in careers, marriage, and child-rearing; modulate their own emotions so as to avoid strong depression, anger, or anxiety; and work more effectively toward long-term goals by being able to control impulses for immediate gratification.
   b) In the end, some people who are high in emotional intelligence may enjoy more success in life than do others who surpass them in mental intelligence.
   c) They also tend to use more effective coping strategies and report lower levels of depression and greater life satisfaction.
5) Critics of Emotional Intelligence

a) Landy argues that many claims of a relation between emotional intelligence and success in the workplace have not been scientifically scrutinized.
b) Some psychologists believe that the concept of intelligence is being stretched too far from its original focus on mental ability.
i) They would prefer a different term, such as emotional competence, to distinguish this concept from the traditional mental-skills concept of intelligence.

3. The Measurement of Intelligence
   a. Wechsler Tests
      i. Verbal Comprehension Index Scale
      ii. Perceptual Reasoning Index Scale
      iii. Working Memory Index Scale
      iv. Processing Speed Index Scale
   b. Increasing the Informational Yield from Intelligence Tests
      i. Revisions of both the Stanford-Binet and the Wechsler scales have been responsive to advances in the understanding of the mental processes that underlie intelligence.
      ii. The WISC-IV, used to assess children between ages 6 and 11, provides, in addition to its Full-Scale IQ, separate scores for Verbal Comprehension, Perceptual Organization, Freedom from Distractibility, and Processing Speed.
         1) These scores make the tests more useful for understanding test takers' intellectual strengths and weaknesses and possibly planning educational interventions for them.
      iii. Measurement off specific abilities is also supported by the finding that as children mature, their general intelligence remains stable, but specific abilities become increasingly more differentiated.
   c. Theory-Based Intelligence Tests
      i. Advances in the theory of intelligence have stimulated the development of new instruments to test the specific abilities dictated by the theories.
      ii. Cattell-Horn's Crystallized and Fluid Intelligence
         1) Several recently developed tests, such as the Kaufman Adolescent and Adult Intelligence Test and the Woodcock-Johnson Psycho-Educational Battery, are specifically designed to measure fluid and crystallized abilities separately.
         2) The Kaufman test has three crystallized ability subscales and three fluid ability subscales, and test results yield separate g_c and g_f IQs, as well as a composite, or full-scale, IQ.
      iii. Sternberg's Triarchic Model of Intelligence
         1) The Sternberg Triarchic Ability Test (STAT) measures the three forms of intelligence identified in his model - analytic, practical, and creative.
         2) This test can be useful in identifying students' levels of each other the three types of intelligence so that school curricula can be individualized to capitalize on their strengths and thereby optimize learning and school performance.
   d. Should We Test for Aptitude or Achievement?
      i. **Achievement test** is designed to find out how much they have learned so far in their lives.
      ii. **Aptitude test** contains novel puzzle-like problems that presumably go beyond prior learning and are thought to measure the applicant's potential for future learning and performance.
      iii. The argument for achievement is that it is usually a good predictor of future performance in a similar situation. If a student learned a lot of academic material in high school, he or she is likely to also learn a lot in college or university.
         1) The argument against achievement testing is that it assumes that everyone has had the same opportunity to learn the material being tested. In post-secondary selection, for example, a given applicant's test score could

depend on whether that person went to a good school rather than on his or her ability to learn in college or university.

iv. The argument for aptitude testing is that it is fairer because it supposedly depends less on prior knowledge than on a person's ability to react to the problems presented on the test.
    1) The argument against aptitude test is that it is difficult to construct a test that is independent of prior learning. Further, such a test may require an ability to deal with puzzles that is not relevant to success in situations other than the test itself.

v. In fact, most intelligence tests measure a combination of aptitude and achievement, reflecting both native ability and previous learning.
    1) This combination approach has raised major scientific and social issues concerning the meaning of test scores, the extent to which improvement can be fostered by educational experiences, and the usefulness of the measures for describing mental competence and predicting performance in non-test situations.

e. Psychometric Standards for Intelligence Tests
    i. Definition and Explanation
        1) A **psychological test** is a method for measuring individual differences related to some psychological concept, or construct, based on a sample of relevant behaviour in a scientifically designed and controlled situation.
            a) In the case of intelligence testing, intelligence is the **construct** and scores obtained on the test are its **operational definition**.
    ii. Three Key Measurement Concepts and Standards
        1) Reliability
            a) **Reliability** refers to consistency of measurement.
                i) It can refer to consistency of measurement over time, consisting of measurement by the items within the test itself, or consistency in scores assigned by different examiners.
            b) **Test-retest reliability**: are scores on the measure stable over time?
                i) This is assessed by administering the measure to the same group of participants on two or more separate occasions and correlating the two o more sets of scores.
                ii) After about age seven, scores on intelligence tests show considerable stability, even over many years.
            c) **Internal consistency** refers to consistency of measurement within the test itself.
                i) Do all the items on the measure seem to be measuring the same thing, as indicated by high correlation among them?
            d) **Interjudge reliability** refers to consistency of measurement when different people observe the same event or score the same test.
                i) Do different raters or scorers agree on their scoring or observation.
                ii) To attain high interjudge reliability, the scoring instructions must be so explicit that trained professionals will use the scoring system in the same way.
        2) Validity
            a) **Validity** refers to how well a test actually measures what it is designed to measure.
            b) **Construct validity** exists when a test successfully measures the psychological construct it is designed to measure, as indicated by the relations between test scores and other behaviours that it should be related to.
                i) By a perfect construct validity is never attained, for other factors, such as motivation and educational background, also influence test scores.
            c) Two other kinds of validity contribute to construct validity.

i) **Content validity** refers to whether the items on a test measure all the knowledge or skills that are assumed to underlie the construct of interest.
   One. Do the questions or test items relate to all aspects of the construct being measured.
ii) **Criterion-related validity** refers to the ability of test scores to correlate with meaningful criterion measures.
   One. If an intelligence test is measuring what it is assumed to measure, then the IQ it yields should allow us to predict other behaviours that are assumed to be influenced by intelligence. These outcome measures are called **criterion measures**.

d) Intelligence and Academic Performance
   i) Intelligence tests do fairly well predicting academic and other forms of achievement.

e) Job Performance, Income, and Longevity
   i) Intelligence test scores also predict military and job performance.
      One. General mental ability predicts both occupational level and performance within one's chosen occupation.
      Two. Intelligence individuals are far more likely to attain prestigious occupations.
      Three. People with higher intelligence perform better on their jobs, and the more complex the job, the more strongly intelligence is related to performance.
   ii) Intelligence predicts other life outcomes as well.
      One. People high in intelligence show better recovery from brain injuries.
      Two. Higher childhood intelligence was associated with significantly greater survival to age 76 in both men and women, but the results were particularly striking for women.

3) Standardization
   a) **Standardization** has two meanings: 1) the development of norms and 2) rigorously controlled testing procedures.
   b) The first meaning of standardization is especially important in providing a meaningful IQ score.
      i) It involves the collection of norms, test scores derived from a large sample that represent particular age segments of the population.
      ii) When norms are collected for mental skills and for many other human characteristics, the scores usually form a normal distribution, a bell-shaped curve with most scores clustering around the center of the curve
   c) The Flynn Effect: Are We Getting Smarter?
      i) A notable discovery by New Zealand researcher James Flynn suggests that much of the world's population is scoring progressively higher on intelligence tests, which phenomenon is called the **Flynn effect**, or **rising-curve phenomenon**.
         One. The increase seems to be occurring to the same degree for both men and women and for different ethnic groups.
      ii) The reasons underlying the Flynn effect are not clear, but several possibilities have been suggested.
         One. One possibility is that better nutrition has helped fuel the IQ increase.
         Two. Richer and more complex learning environments that require more complex coping may have increased mental

abilities.

Three. Technological advances may have helped shape the kinds of analytical and abstract reasoning skills that boost performance on intelligence tests.

iii) The rising-curve phenomenon means that the intelligence score distribution has to be recalibrated upward periodically if the average IQ is to remain at 100, the traditional midpoint of the intelligence range.

d) Testing Conditions: Static and Dynamic Testing

i) Test instructions and procure are designed to create a well-controlled, or standardized, environment for administering the intelligence test so that other uncontrolled factors will not influence scores.

One. The goal is to make sure that all testees are responding to as similar a stimulus situation as possible so that their scores will be solely a reflection of their ability.

Two. This traditional approach to testing is called **static testing**.

Three. Some theorists suggest that the static approach to testing may reveal an incomplete picture of a person's abilities by measuring only the products of previous learning.

ii) In **dynamic testing**, the standard testing is followed with an interaction in which the examiner gives the respondent guided feedback on how to improve performance and observe how the person utilizes the information.

One. This part of the session provides a window to the individual's ability to profit from instruction and improve performance, and may disclose cognitive capacities not revealed by static testing.

Two. Dynamic testing can be particularly useful when people have not had equal learning opportunities, as occurs in disadvantaged groups

Three. Equally important is the fact that dynamic feedback tends to improve test scores, and these new scores often relate more highly to educational outcomes than do the original test scores.

Four. Dynamic testing can also be particularly useful and revealing when testing people from cultures that are not accustomed to taking Western-style tests, as well as children with learning disabilities.

f. Assessing Intelligence in Non-Western Culture

i. Robert Sternberg has advanced a *theory of successful intelligence* in which intelligence is whatever is required to meet the adaptive demands of a given culture.

1) Sternberg believes that fundamental mental skills are required for successful behaviour in any culture.

a) These include the ability to mentally represent problems in a way that facilitate their solution, to develop potential solutions and choose successfully from among them, to utilize mental resources wisely, and to evaluate the effects of one's action plans.

2) What differs is the kinds of problems to which these basic intellectual skills are applied.

a) People from different cultures may think about the same problem in very different ways.

ii. To main approaches have been taken to meet the challenges of cross-cultural intelligence assessment.

1) On is to choose reasoning problems that are not tied to the knowledge base of any culture but that reflect the ability to process and evaluate stimulus

patterns.
    a) **Raven Progressive Metrices** is a test that is frequently used to measure fluid intelligence.
    b) The Raven test has been used in many cultures and measures a general mental capacity that is also measured by traditional intelligence tests in our culture.
  2) A second and more challenging approach is to create measures that are tailored to the kinds of knowledge and skills that are valued in the particular culture.
    a) Such tests may measure how smart an individual is in terms of the practical skills and adaptive behaviours within that culture.
    b) Scores may be unrelated or even negatively correlated with other measures of intelligence, yet they may predict successful functioning within that culture.
iii. Galton Resurrected: Intelligence and Neural Efficiency
  1) As tools for directly measuring brain functions become more sophisticated, however, Galton's legacy lives on in current attempts to relate neural measures to IQ.
  2) Two types of evidence suggest that this line of research may bear fruit.
    a) The first comes from electrophysiological studies of brain responses to visual and auditory stimuli.
      i) Modest relations have been shown between the nature and speed of the brain's electrical response to stimuli.
      ii) These electrical responses may reflect the speed and efficiency of information processing in the brain.
    b) The second line of evidence comes from studies of brain metabolism.
      i) PET scans of people's brains taken while they engage in problem-solving tasks have shown lower levels of glucose consumption in people oh high intelligence, suggesting that their brains are working more efficiently and expending less energy.
      ii) Intelligence also involves speed of processing, which relates to the efficiency of neural connections.
  3) Some neuroscientists believe that individual differences in brain plasticity - the ability of the brain to change by forming new connections among neurons in response to environmental input - may be the key neural factor underlying differences in intelligence.
    a) The ability to quickly establish new neural networks would increase processing speed and efficiency, and people with brains capable of greater plasticity would therefore develop better intellectual skills.
    b) This suggestion receives support from evidence that there may be a critical period for the growth of new neural circuits that ends at the about age 16, the same age period by which crystallized intelligence seems to achieve stability.
  4) Some authors have even suggested that the size of one's brain may be critical.

4. Heredity, Environment, and Intelligence
  a. Relationships of Genes and Environment
    i. Genes and environment both influence intelligence, but they rarely operate independently of one another.
    ii. The environment can influence how genes express themselves, as when prenatal factors or malnutrition retard gene-directed brain development.
    iii. Genetic factors can influence the effects produced by the environment. Genetic factors influence which environments people select for themselves, how they respond to the environment, and how the environment responds to the person.
  b. Analysis of Genes
    i. Intelligence clearly has a strong genetic component, with heritability coefficients

ranging between 0.50 and 0.70 being reported consistently in both twin and adoption studies.
1) This indicates that more than half, and perhaps more than two-third, of the within group variation in IQ is attributable to genetic factors.
2) Overall, the more genes people have in common, the more similar they tend to be in IQ.

ii. Genetic factors become even more important as we age.
1) One reason may be that new genes come on line to affect intelligence as more-advanced cognitive processes emerge during development.
2) Another is that genetic influences snowball during development as people create and select environments that are compatible with their genetic characteristics.

iii. Although genes are important foundation of the g factor, there clearly is not a single "intelligence gene".
1) The diverse abilities measured by intelligence tests are undoubtedly influenced by large numbers of interacting genes, and different combinations seem to underlie specific abilities.

c. Analysis of Environment
i. Although one's genotype is an important factor in determining intelligence test scores, environment seems to account for 30 to 50 percent of the IQ variation among people.
ii. Both shared and unshared environments are involved.
1) Behaviour-genetic studies indicate that between a quarter and a third of the population variability in intelligence can be attributed to shared environmental factors, particularly the family environment.
2) Scores on general intelligence correlate around 0.40 with the socioeconomic status in which a child is reared.

iii. According to the Flynn effect, the notable IQ increases that have occurred in Western countries during the last century.
1) They are due to better and longer schooling during the past century, more complex and stimulating environments provided by better-educated parents, and by technological advances, as well as better nutrition.

iv. Educational experiences can have a significant positive impact on intelligence, and school-related gains in intelligence are most likely to be observed under the following conditions.
1) Rather than "teaching to" general mental ability, help students learn the specific cognitive skills and problem-solving approaches that underlie success in particular subjects. This is an outgrowth of education's increasing de-emphasis on the g factor and renewed emphasis on the development of specific mental skills.
2) Replace the traditional emphasis on repetition and rote learning of facts with instruction in how to learn, critically think about, and apply course content.
3) Rather than waiting until low-level skills have been mastered before teaching learning tools such as memory-enhancement strategies, apply this "learning to learn" approach from the very beginning so that the skills are applied to even the most-basic course content.

5. Group Differences in Intelligence
a. Ethnic Group Differences
i. Introduction
J. Philippe Ruston at Western University suggested that over 60 measures, ranging from intelligence, to brain size, to a host of physical and social variables, there was a consistent pattern.
a) Individuals of East Asian decent scored the highest, those of African descent score the lowest, and Caucasians fell in the middle.
b) There was an immediate flurry of political activity following Rushton's announcement of these findings at a conference.

c) Because the questions under scrutiny are complex and the evidence does not warrant any simple conclusions, the debate is unlikely to be resolved any time soon.

K. Where ethnic groups are concerned, everyone agrees on certain facts.
a) National comparisons indicate that Japanese children have the highest mean IQ in the world.
i) Their mean score of 111 places 77 percent of Japanese children above the mean scores of North American and European children.
b) Within United States, significant ethic differences also exist.
i) Asian Americans test slightly below White American norms on verbal skills but somewhat higher on tests related to spatial and mathematical reasoning.
ii) Hispanic people who have become U.S. - acculturated score at about the same level as White Americans.
iii) African Americans score, on average, about 12 to 15 IQ points below the White American average.

ii. Are the Tess Biased?
A. Some have expressed concerns that these tests underestimate the mental competence of minority group members because the tests are based on Euro-American White culture and therefore are culturally biased.
a) **Outcome bias** refers to the extent that a test underestimates a person's true intellectual ability.
b) **Predictive bias** occurs if the test successfully predicts criterion measures, such as school or job performance, for some groups but not for others.
B. Defenders of intelligence tests dismiss both types of bias.
a) They point out that ethic group differences appear throughout intelligence tests, not just on those items that would, at face value, appear to be culturally biased.
b) They also point out that intelligence test scores predict the performance of minority group members as accurately as they predict White people's performance.

iii. What Factors Underlie the Differences?
A. On the nurture side, there is no question that a higher proportion of White than African-American children are raised and schooled in enriched environments that optimize the development of cognitive skills.
a) However, social changes over the past 25 years have provided African Americans with greater access to educational and vocational opportunities and have coincided with an increase in African-American IQs that has reduced the IQ differences between African Americans and White Americans by about a third.
b) People who are impressed by this decreasing test gap tend to attribute ethic differences to environmental differences that could be changed, ranging from nutritional factors to educational opportunities.
B. Another factor worth noting is a tendency, even among scientists, to overemphasize genetic differences between groups.
a) Indeed, where measured directly, genetic differences, like test scores, tend to be greater within any given racial group than they are between racial groups.

b. Sex Differences in Cognitive Ability
i. The gender differences lie not in levels of general intelligence, but rather in the patterns of cognitive skills that men and women exhibit.
A. Men, on average, tend to outperform women slightly on certain spatial tasks. Men are more accurate in target-directed skills, such as throwing and catching objects, and they tend to perform slightly better on tests of

mathematical reasoning.
    B. Women, on average, perform better on tests of perceptual speed, verbal fluency, and mathematical calculation and on precise manual tasks requiring fine-motor coordination.
  ii. Psychologists have proposed explanations for these gender differences, citing both biological and environmental factors.
    A. The environmental explanations typically focus on the socialization experiences that males and females have as they grow up, especially the kinds of sex-typed activities that boys and girls are steered into.
    B. Evolutionary theorists have also weighed in on the differences, suggesting that sex-role specialization developed in ancestral environments.
      a) Men's rules, such as navigating and hunting, favored the development of the visuospatial abilities that show up in sex-difference research.
      b) Women's rules, such as child-rearing and tool-making activities, favored the development of verbal and manual precision abilities.
    C. From a biological perspective, these differences may reflect structural differences in the brains of men and women.
      a) Sex differences in mental rotation tasks are related to the amount of grey matter (favoring males) while differences in verbal skills are related to the amount of white matter (favoring females).
    D. Increasingly, biological explanations have focused on the effects of hormones on the developing brain.
      a) These influences begin during a critical period shortly after conception, when the sex hormones establish sexual differentiation.
      b) They also alter brain organization and appear to extend to a variety of behavioral differences between men and women, including aggression and problem-solving approaches.

6. Extremes of Intelligence
  a. The Intellectually Gifted
    i. Gifted people's high IQs do not mean that they are good at everything: many are enormously talented in one area of mental competence but quite average in other domains.
    ii. Only a small percentage of gifted children attain true eminence in later life. Eminence seems to be a special variety of giftedness, and is believed by Joseph Renzulli to have three interacting factors.
      A. The first is highly developed mental abilities - not only general intelligence but also specific mental abilities related to one's chosen field.
      B. The second factor is the ability to engage in creative problem-solving - that is, to come up with novel and unconventional ideas, to judge their potential value, and to apply them to challenging problems.
      C. The third factor is motivation and dedication.
    iii. Like children at the low end of the competence continuum, intellectually gifted children often need special educational opportunities.
      A. They may become bored in regular classrooms and even drop out of school if they are not sufficiently challenged.
  b. The Intellectually Disabled
    i. In the DSM-IV-TR, the American Psychiatric Association devised a four-level system that classifies intellectual disability as mild, moderate, severe, or profound on the basis of IQ scores.
      A. The vast majority are mildly disabled, obtaining IQs between about 50 and 70. Most members of this largest group, given appropriate social and educational support, are capable of functioning adequately in mainstream society, holding jobs, and raising families.
      B. Progressively greater environmental support is needed as we move toward the profoundly disabled range, where institutional care is usually required.
      C. The DSM-5 has shifted away from basing these distinctions totally on IQ scores and requires a test of adaptive functioning in addition to IQ.

ii. Intellectual disability has a variety of causes: some genetic, some due to other biological factors, and some due to environmental causes.
    A. Genetic abnormalities account for about 28 percent of all intellectual disability disorder cases.
    B. Heritability plays a different role in mild disability than it does in profound disability.
        a) Cases of profound intellectual disability are more likely to be caused by genetic accidents instead of an inherited genotype.
    C. Intellectual disability can also be caused by accidents at birth, such as severe oxygen deprivation (anoxia); and by diseases experienced by the mother during pregnancy, such as rubella or syphilis.
    D. Likewise, drugs and alcohol take by the mother - especially in the first weeks of pregnancy when a woman is often unaware she is pregnant - can cause neural damage and intellectual disability.
    E. Despite this range of potential causes, in a significant majority (75 to 80 percent) of intellectually disabled people, no clear biological cause can be found. Experts theorize that these cases may be due to undetectable brain damage, extreme environmental deprivation, or a combination of the two.
iii. In the United States, federal law requires that cognitively disabled children, who were formerly segregated into special education classes, be given individualized instruction in the lease restrictive environment.

Chapter 10 Summary

January 15, 2018 2:08 PM

1. Intelligence in Historical Perspective
    a. Intelligence is the ability to acquire knowledge, to think and reason effectively, and to deal adaptively with the environment. Because cultural environments differ in the skills most important for adaptation, cultural conceptions of intelligence may differ markedly.
    b. Galton's studies of hereditary genius and Binet's methods for measuring differences in children's mental skills were important historical milestones in the study of intelligence.
2. The Nature of Intelligence
    a. The psychometric approach to intelligence attempts to map the structure of intellect and establish how many different classes of mental ability underlie test performance. A newer approach, the cognitive processes approach, focuses on the specific thought processes that underlie mental competencies.
    b. Factor analysis can be applied to correlations among test scores to identify clusters of measures that correlate highly with one another and therefore are assumed to have a common underlying factor, such as verbal ability or mathematical reasoning.
    c. Spearman believed that intelligence is determined both by specific cognitive abilities and by a general intelligence (g) factor that constitutes the core of intelligence. Thurstone disagreed, viewing intelligence as a set of specific abilities. Thurstone's position is best supported by observed distinctions between verbal and spatial abilities.
    d. Cattell and Horn differentiated between crystalized intelligence, the ability to apply previously learned knowledge to current problems, and fluid intelligence, the ability to deal with novel problem-solving situations for which personal experience does not provide a solution. They argued that over our lifespan, we show a progressive shift from using fluid intelligence to using crystallized intelligence as we attain wisdom.
    e. Carroll's three-stratum model is based on reanalysis of hundreds of data sets. Mental abilities are represented at three levels, with general intelligence (g) at the apex and highly specific cognitive and perceptual skills at its base. Carroll's model may be the most accurate psychometric representation of human cognitive abilities.
    f. Cognitive process theories of intelligence focus on the elementary information-processing abilities that contribute to intelligence. Sternberg's triarchic theory of intelligence includes a components subtheory that addresses the specific cognitive processes that underlie intelligent behaviour.
    g. Sternberg and Gardner maintain that there are distinct forms of intelligence beyond the traditional concept. Sternberg differentiates between analytical, practical, and creative intelligence, and Gardner proposes nine different kinds of intelligence. The theory of emotional intelligence refers to people's ability to read and respond appropriately to others' emotions, to motivate themselves, and to be aware of and in control of their emotions.
3. The Measurement of Intelligence
    a. Most modern intelligence tests, such as the Wechsler scales, measure an array of different mental abilities. In addition to a global, or full-scale IQ, they provide scores for each subtest and summary scores for broader abilities, such as verbal and performance IQs. Some recent tests are derived directly from theories of intelligence. The Kaufman scale provide separate scores for crystallized and fluid intelligence, and Sternberg's STAT measures analytical, practical, and creative intelligence.
    b. Achievement tests measure what has already been learned, whereas aptitude tests are assumed to measure potential for future learning and performance. Most intelligence tests measure combinations of achievement and aptitude, for it is difficult to separate past learning and future learning potential.
    c. Three important standards for psychological tests are reliability (consistency of measurement over time, within tests, and across scorers), validity (successful measurement of the construct and acceptable relations with relevant criterion

measures), and standardization (development of norms and standard testing conditions).

d. IQ scores successfully predict a range of academic, occupational, and life outcomes, including how long people live. Such findings indicate that intelligence tests are measuring important adaptational skills.
e. The Flynn effect refers to the notable rise in intelligence test scores over the past century, possibly due to better living conditions, more schooling, or more complex environment.
f. In dynamic testing, standard test administration is followed by feedback and suggestions from the examiner and a retaking of the test, thus allowing an assessment of how well the person profits from feedback and how intellectual skills might be coached in the future. Dynamic testing provides information that static testing does not, and retest scores sometimes relate more strongly to criterion measures.
g. Intelligence testing in non-Western cultures is a challenge. One approach is to use tests that are not tied to any culture's knowledge base. Another approach is to devise tests of the abilities that are important to adaptation in that culture. These culture-specific abilities may bear little relation to the mental skills assessed by Western intelligence tests.
h. Recent physiological evidence suggests that the brains of intelligent people may function more efficiently. Brain size is not significantly related to intelligence, but the neural networks laid down in the process of brain development may be extremely important. One current theory is that differences in brain plasticity might underlie intelligence.

4. Heredity, Environment, and Intelligence
    a. Intelligence is determined by interacting hereditary and environmental factors. Genes account for between 50 and 70 percent of population variation in IQ. Shared family environment accounts for perhaps one-fourth to one-third of the variance during childhood, but its effects seem to dissipate as people age. Educational experiences also influence mental skills. Heredity establishes a reaction range with upper and lower limits for intellectual potential. Environment affects the point within that range that will be reached.
    b. Intervention programs for disadvantaged children have positive effects on late achievement and life outcomes if they begin early in life and are applied intensively. They have little effect when applied after school begins or with middle- or upper-class children.
    c. Heritability estimates of intelligence can vary, depending on sample characteristics. In impoverished families, share environment was more important than genes, whereas the opposite was found in affluent families. Twin studies also show that heritability effects on intelligence increase in adulthood.
5. Group Differences in Intelligence
    a. Cultural and ethnic differences in intelligence exist (though they may be narrowing), but the relative contributions of genetic and environmental factors are still in question. Evidence exists for both genetic and environmental determinants. Whether intelligence tests exhibit outcome bias in underestimating the mental abilities of minorities is a point of contention, but the tests do not appear to have predictive bias.
    b. Although the differences are not large, men tend as a group to score higher than women on certain spatial and mathematical reasoning tasks. Women perform slightly better than men on tests of perceptual speed, verbal fluency, mathematical calculation, and fine-motor coordination. Both environmental and biological bases of sex differences have been suggested.
6. Extremes of Intelligence
    a. Even people with IQs in the 150s often shows discrepancies in specific skills. Those who achieve eminence tend to have, in addition to high IQs, high levels of interest and motivation in their chosen activities.
    b. Cognitive disability can be caused by a number of factors. Biological causes are identified in only about 28 percent of cases. Cognitive disability can range from mild to profound. The vast majority can of disabled individuals are able to function in the mainstream of society, given appropriate support. Genetic factors seem relatively unimportant in

profound intellectual disability, but they seem to play an important role in mild disability, which is more likely to run in families.

Level of Analysis for Intellectual Functioning

1. Biological Level
    a. Genetic factors account for significant group variation in intelligence. They help to establish a biological reaction range that sets limits on the impact of environmental factors.
    b. Brain size and neural efficiency are underlying factors for intellectual performance.
    c. Sex hormones play a role in certain types of mental abilities and appear to contribute to the modest sex differences that exist in certain cognitive abilities.
2. Environmental Level
    a. Shared and unshared learning environments that interact with biological reaction range influence intellectual development.
    b. Cultural factors influence which behavioural capabilities are prized, adaptive, and defined as intelligent.
    c. Sex roles influence the development of stereotypes concerning sex differences in specific abilities.
    d. Administration of intelligence measures may place culturally different people at a disadvantage.
3. Psychological Level
    a. There exists a general intelligence factor (g factor) that underlies other, more specific abilities.
    b. Specific cognitive and perceptual skills influence more specific task performance.
    c. Other cognitive skills underlie personal and emotional intelligence, as well as specific competencies described in Gardner's multiple intelligences and Sternberg's triarchic theory.
    d. Motivational factors clearly influence intellectual outcomes.

Chapter 11 Motivation and Emotion

January 22, 2018 9:49 AM

1. Perspectives on Motivation
    a. Definition
        i. **Motivation** is a process that influences the direction, persistence, and vigour of goal-directed behaviour.
    b. Instinct Theory and Evolutionary Psychology
        i. Darwin's theory of evolution inspired early psychological views that instincts motivate much of our behaviour.
            1) An **instinct** is an inherited predisposition to behave in a specific and predictable way when exposed to a particular stimulus.
            2) Instincts have a generic basis, are found universally among all members of the species, do not depend on learning, and have survival value for the organism.
        ii. Human instinct theories faded because there was little evidence to support them and they often relied on circular reasoning.
        iii. Modern evolutionary psychologists propose that many psychological motives have evolutionary underpinnings that are expressed through the actions of genes.
            1) From this perspective, the **adaptive significance** of behaviour is a key to understanding motivation.
    c. Homeostasis and Drive Theory
        i. **Homeostasis** is a state of internal physiological equilibrium that the body strives to maintain.
            1) Maintaining homeostasis requires a sensory mechanism for detecting changes in the internal environment, a response system that can restore equilibrium, and a control centre that receives information from the sensors and activates the response system.
            2) Homeostatic regulation also can involve learned behaviour: when we are hot we seek a shady place or cold drink.
        ii. According to Clark Hull's influential **drive theory of motivation**, psychological disruptions to homeostasis produce **drives**, states of internal tension that motivate an organism to behave in ways that reduce this tension.
            1) Drives such as hunger and thirst arise from tissue deficits and provide a source of energy that pushes an organism into action.
            2) Reducing drives is the ultimate goal of motivated behaviour.
    d. Incentive and Expectancy Theories
        i. Whereas drives are viewed as internal factors that push organisms into action, **incentives** represent environmental stimuli that pull and organism toward a goal.
            1) Incentive theories focus attention on external stimuli that motivate behaviour, though historically the concepts of incentives and drives were often linked.
            2) Modern incentive theory emphasizes the pull of external stimuli and how stimuli with high incentive value can motivate behaviour, even in the absence of biological need.
        ii. One important cognitive approach, called **expectancy * value theory** (or simply **expectancy theory**), proposes that goal-directed behaviour is jointly determined by two factors: the strength of the person's expectation that particular behaviours will lead to a goal, and the value the individual places on that goal.
            1) These two factors are multiplied, producing the following equation: motivation = expectancy * incentive value.
        iii. Many cognitive theorists distinguish between **extrinsic motivation**, performing an activity to obtain an external reward or avoid punishment, and **intrinsic motivation**, performing an activity for its own sake - because you find it enjoyable

or stimulating.
1) According to the **overjustification hypothesis**, giving people extrinsic rewards to perform activities that they intrinsically enjoy may overjustify that behaviour and reduce intrinsic motivation.

e. Psychodynamic and Humanistic Theories
   i. Freud's psychoanalytic theory highlighted the motivational underworld.
      1) To Freud, much of our behaviour results from a never-ending battle between unconscious impulses struggling for release and psychological defences used to keep them under control.
      2) Energy from these unconscious motives - especially from instinctive sexual and aggressive drives - is often disguised and expressed through socially acceptable behaviours.
      3) Today's diverse psychodynamic theories continue to emphasize that, along with conscious mental processes, unconscious motives and tensions guide how we act and feel.
   ii. Humanist Abraham Maslow believed that psychology's other perspectives ignored a key motive: our striving for personal growth.
      1) Maslow distinguished between **deficiency needs**, which are concerned with physical and social survival, and **growth needs**, which are uniquely human and motivate us to develop our potential.
      2) He proposed the concept of a **need hierarchy**, a progression of needs containing deficiency needs at the bottom and growth needs at the top.
      3) **Self-actualization** represents the need to fulfill our potential, and it is the ultimate human motive.
      4) Content of the Need Hierarchy
         a) Deficiency Needs
            i) Physiological needs: food, drink
            ii) Safety needs: security, psychological safety
            iii) Belongingness and Love Needs: affiliation, acceptance, and affection
            iv) Esteem Needs: approval, recognition
         b) Growth Needs
            i) Cognitive Needs: knowledge, understanding
            ii) Aesthetic needs: beauty, symmetry
            iii) Self-actualization
   iii. **Self-determination theory** focuses on three fundamental psychological needs: competence, autonomy, and relatedness. When these needs are not met, there can be consequences for both psychological and physical well-being.
      1) **Competence** motivation reflects a human need to master new challenges and perfect skills, which motivates much exploratory and growth-inducing human behaviour.
      2) The need for **autonomy** (or self-determination) is satisfied when people experience their actions as a result of free choice without outside interference.
      3) **Relatedness** refers to our desire to form meaningful bonds with others.
      4) The most positive psychological outcome of all results from a balance among the three needs.

2. Hunger and Weight Regulation
   a. The Physiology of Hunger
      i. Introduction
         1) **Metabolism** is the body's rate of energy (or caloric) utilization, and about two-thirds of the energy we normally use goes to support **basal metabolism**, the resting, continuous metabolic work of body cells.
         2) Several mechanisms attempt to keep the body in energy homeostasis by regulating food intake.
            a) There are short-term signals that start meals by producing hunger and stop food intake by producing **satiety**, the state in which we no longer

feel hungry as a result of eating.
    b) Your body also monitors long-term signals based on how much body fat you have.

ii. Signals That Start and Terminate a Meal
    1) From A.L. Washburn's experiment, the findings revealed that Washburn's stomach contractions did indeed correspond to subjective feelings of hunger.
        a) However, contraction of stomach does not cause the feeling of hunger, as animals display hunger and satiety even if all nerves from their stomach to their brain are cut.
        b) Other signals must help to trigger hunger.
    2) **Glucose** is a simple sugar that is the body's, and especially the brain's, major source of immediately usable fuel.
        a) After a meal, some glucose is transported into cells to provide energy, but a large portion is transferred to your liver and fat cells, where it is converted into other nutrients and stored for later use.
        b) Sensors in the hypothalamus and liver monitor blood glucose concentrations.
        c) When blood glucose levels decrease, the liver responds by converting stored nutrients back into glucose, and this action produces a drop-rise glucose pattern, which can powerfully generate feelings of hunger.
    3) As we eat, several bodily signals combine and ultimately cause us to end our meal.
        a) **Stomach and intestinal distention** are satiety signals.
            i) The walls of these organs stretch as food fills them up, sending nerve signals to the brain.
            ii) Nutritionally rich food seems to produce satiety signals more quickly than equal volume of less nutritious food, suggesting that some satiety signals respond to food content.
        b) Patients who have had their stomachs removed continue to experience satiety not only because of intestinal distention, but also because of chemical signals.
            i) The intestines respond to food by releasing several hormones, called **peptides**, that help to terminate a meal.
            ii) **CCK (cholecystokinin)** is released into your bloodstream by the small intestine as food arrives from the stomach. It travels to the brain and stimulate receptors in several regions that decrease eating.
            iii) **Ghrelin** is released into the bloodstream by the stomach and small intestine and is now through to be one of the most important signals for hunger among humans.
                One. Ghrelin has also been reported to increase thoughts about food and mental images of food, especially the mental image of a favourite meal.

iii. Signals That Regulate General Appetite and Weight
    1) Fat cells are not passive storage sites for fat, and they actively regulate food intake and weight by secreting **leptin**, a hormone that decreases appetite.
        a) As we gain fat, more leptin is secreted into the blood and reaches the brain, where receptor sites on certain neurons detect it.
        b) These leptin signals influence neural pathways to decrease appetite and increase energy expenditure.
    2) Leptin may regulate appetite by increasing the potency of these other signals.

iv. Brain Mechanisms
    1) Areas near the side, called the **lateral hypothalamus**, seemed to be a "hunger on" center.

a) Electrically stimulating a rat's LH causes it to start eating, and lesioning the LH causes it to refuse to ear, even to the point of starvation.

2) Structures in the lower-middle area, called the **ventromedial hypothalamus (VMH)**, seemed to be a "hunger off" center.
    a) Electrically stimulating the VMH caused even a hungry rat to stop eating, and lesioning the VMH produced gluttons who ate frequently and doubled or tripled their body weight.
3) As scientists explored further, they learned that, although the LH and VMH played a role in hunger regulation, they were not really hunger on and off centers.
    a) Rats with LH damage stop eating and lose weight in part because they develop trouble swallowing and digesting, and they become generally unresponsive to external stimuli, not just to food.
    b) Moreover, cutting the axons from many brain areas funnel that funnel into the hypothalamus and then fan out upon leaving it, anywhere along their path - not just within the hypothalamus, duplicates some of the effects of the LH and VMH lesions.
4) Many neural circuits within the hypothalamus that regulate food intake involve the **paraventricular nucleus (PVN)**, a cluster of neurons packed with receptor sites for various transmitters that stimulate or reduce appetite.
    a) The PVN appears to integrate several different sort-term and long-term signals that influence metabolic and digestive processes.
    b) One transmitter, **neuropeptide Y**, is a powerful appetite stimulant.
    c) When leptin reaches the hypothalamus, it seems to inhibit the activity of neurons that release neuropeptide Y into the PVN, and therefore appetite is reduced.

b. Psychological Aspects of Hunger
    i. From a behavioural perspective, eating is positively reinforced by the good taste of food and negatively reinforced by hunger reduction.
    ii. Cognitively, we develop an expectation that eating will be pleasurable, which becomes an important motivator to seek and consume food.
    iii. Attitudes, habits, and psychological needs also regulate food intake.
        1) Beliefs such as "don't leave food on your plate" and conditioned habits like "autopilot" snacking while watching TV may lead us to eat even when we do not feel hungry.
        2) Conversely, countless dieters intentionally restrict their food intake even though they are hungry. Especially for women, such food restriction often stem from social pressure to conform to cultural standards of beauty.
    iv. University women overestimated how think they needed to be to meet men's preferences, whereas men overestimated how bulky they should be to match women's preferences.
        1) Women also perceived their body shape as heavier than ideal, where men viewed their body shape as close to ideal.
    v. People who perceive themselves as heavy tend to have lower self-esteem, and this relation is stronger among women than men.
        1) According to Barbara Frederick's **objectification theory**, Western culture teaches women to view their bodies as objects, much as external observers would.
        2) This perspective increase body shame and anxiety, which in turn leads to eating restriction and even eating disorders.

c. Environmental and Cultural Factors
    i. Although not very sensitive to manipulation of biological variables such as overfeeding, underfeeding, or changes in the caloric density of the diet, people are very sensitive to changes in environmental stimuli, such as portion size, the number of people present during a meal, the amount that others eat, and the variety of foods available.
    ii. Food availability is the most obvious environmental regulator of eating.

1) Food scarcity limits consumption, and abundant low-cost food, including high-fat foods, in many countries contributes to a high rate of obesity among children and adults.

iii. Food taste, variety, and serving size all powerfully regulate eating.
1) Good tasting food positively reinforces eating and increases food consumption.
2) Food variety increases consumption. But we usually feel most comfortable selecting from among familiar foods.
3) People presented with larger portion size eat more.

iv. Through classical conditioning we learn to associate the smell of and sight of food with its taste, and these food cues can trigger hunger.

v. We typically eat more when dining with other people than when eating alone, in part because meals take longer.

vi. Cultural norms influence when, how, and what we eat.

d. Obesity
i. Genes and Environment
1) Heredity influences our basal metabolic rate and tendency to store energy as either fat or lean tissue.
a) Overall, genetic factors appear to account for about 40 to 70 percent of the variation in body mass among women and men.
b) More than 200 genes have been identified as possible contributors to human obesity, and in most cases, it is the combined effect of a subset of genes - rather than single-gene variations - that produces an increased risk.
2) Genes have not chanced much in recent decades, but obesity rates in Canada and the United States have increased significantly, and according to some experts, the culprits are:
a) An abundance of inexpensive, tasty, high-fat foods available almost where;
b) A cultural emphasis on getting the best value, which contributes to the supersizing of menu items; and
c) Technological advances that decrease the need for daily physical activity and encourage a sedentary lifestyle.

ii. Dieting and Weight Loss
1) Weight gain tends to promote additional weight gain, in part by altering body chemistry and energy expenditure.
a) Obese people generally have higher levels of insulin than people of normal weight, which increases the conversion of glucose into fat.
b) Substantial weight gain also makes it harder to exercise vigorously, and dieting slows basal metabolism because the body responds to food deprivation with decreased energy expenditure.
c) However, there is no consistent evidence that the body's energy-saving metabolic slowdown become more pronounced with each weight loss attempt.
2) Certainly, achieving weight loss is not easy, and combining healthy eating (reducing energy input) with exercise (increased energy output) has a greater chance of success than dieting alone.
3) Health concerns motivate some dieters, but psychological and social concerns are the primary motivators for many others.

3. Sexual Motivation
a. Sexual Behaviour: Patterns and Changes
i. 70% of people in the age group of 18- to 59-year-olds have sex with a partner at least a few times per month.
1) Overall, single adults who cohabit are the most sexually active, followed by married adults.
2) Single adults who do not cohabit are the least active.

ii. Although men and women have sex with a partner about equally often, men

masturbate and fantasize about sex more often than women do.

iii. Overall, males tend to have their first sexual intercourse experience one to two years earlier than females, but by the end of high school, similar proportions of males and females have had sexual intercourse at least once, and a high proportion of high school-aged youth are sexually active.
    1) Premarital intercourse has become more common in many countries over the past half-century.
    2) Changing social norms, a trend toward sexual activity at a younger age, and a tendency to delay marriage have all contributed to an increase in premarital sex.

iv. Some findings suggest, however, that these premarital trends may be levelling off and possibly reversing.
    1) This may be a response to an increased cultural emphasis on the depth of relationships and to the crisis concerning AIDS and other STDs.

b. The Physiology of Sex
    i. The Sexual Response Cycle
        1) Excitement Phase
            a) During the **excitement phase**, arousal builds up rapidly.
            b) Blood flow increases to arteries in and around the genital organs, nipples, and women's breasts, pooling and causing these body areas to swell (this process is called **vasocongestion**).
            c) The penis and clitoris begin to become erect, the vagina becomes lubricated, and muscle tension increases throughout the body.
        2) Plateau Phase
            a) In the **plateau phase**, respiration, heart rate, vasocogestion, and muscle tension continue to build until there is enough muscle tension to trigger orgasm.
        3) Orgasm Phase
            a) During the **orgasm phase** in males, rhythmic contractions of internal organs and muscle tissue surrounding the urethra project semen out of the penis.
            b) In females, orgasm involves rhythmic contractions of the outer third of the vagina, surrounding muscles, and the uterus.
        4) Resolution Phase
            a) In males, orgasm is ordinarily followed by the **resolution phase**, during which physiological arousal decreases rapidly and the genital organs and tissues return to their normal condition.
                i) During the resolution phase, males enter a **refractory period** during which they are temporarily incapable of another orgasm.
            b) Females may have two or more successive orgasms before the onset of the resolution phase, most women would experience only one.
        5) Moreover, sexual responses varies across people and time, and this four-stage model represents only an average.
    ii. Hormonal Influences
        1) Hypothalamus controls the pituitary gland, which regulates the secretion of hormones called **gonadotropins** into the bloodstream.
            a) In turn, these hormones affect the rate at which the **gonads** (testes in the male and ovaries in the female) secrete **androgens**, the so called "masculine" sex hormones such as testosterone, and **estrogens**, the so-called "feminine" sex hormones such as estradiol.
            b) Note that, despite these labels, both men and women produce androgens and estrogens.
        2) Sex hormones have **organizational effects** that direct the development of male and female sex characteristics.
            a) In the womb, male and female embryos form a primitive gonad that has the potential to develop into either testes or ovaries.
            b) Male

i) If genetically male, the embryo forms testes about eight weeks after conception.
ii) Then as the testes release sex hormones during a key period of prenatal development, there typically is sufficient androgen activity to produce a male pattern of genital, reproductive, brain, and other organ development.
iii) Years later, as part of this pattern, the hypothalamus stimulates an increased release of sex hormones from the testes when the male reaches puberty.

c) Female
i) A genetically female embryo does not form testes and, in the absence of sufficient androgen activity during this prenatal period, a female pattern of development ensues.
ii) As part of this pattern, at puberty the hypothalamus stimulates the release of sex hormones from the ovaries on a cyclical basis that regulates the female menstrual cycle.

3) Sex hormones also have **activational effects** that stimulate sexual desire and behaviour.
a) The activational effects of the sex hormones begin at puberty, when the individual's gonads begin to secrete sex hormones.
b) Mature males have a relative constant secretion of sex hormones, and their readiness for sex is largely governed by the presence of environmental stimuli.
c) In contrast, hormone secretions in female animals follow an estrus cycle, and they are sexually receptive only during periods of high estrogen secretion.
d) Sex hormones also influence human sexual desire, as when the hormonal surge of puberty results in increased sexual motivation for most people.
i) But in humans, normal short-term hormonal fluctuations have relatively little effect on sexual reusability.
ii) Women may experience high sexual desire at any time during their menstrual cycle.

4) In men and women, androgens - rather than estrogens - appear to have the primary influence on sexual desire.
a) However, desire does not go up and down as blood levels of sex hormones change.
b) Rather, a baseline level of certain hormones, such as testosterone, appears necessary to maintain sexual desire.

c. The Psychology of Sex
i. Sexual Fantasy
1) Among 18- to 59-year-old American adults, about half of men and a fifth of women fantasize about sex at least once a day.
2) Sexual fantasies alone may trigger genital erection and orgasm in some people, and are often used to enhance arousal during masturbation.
3) Most men and women also fantasize at least occasionally during sexual intercourse.

ii. Desire, Arousal, and Sexual Dysfunction
1) Psychological factors not only can trigger sexual arousal, but also inhibit it.
a) About one in three women and one in six men report that they lack an interest in sex.
b) Other people desire sex but have difficulty becoming or staying aroused.
i) Stress, fatigue, and anger at one's partner can lead to temporary arousal problems.

2) **Sexual dysfunction** refers to chronic, impaired sexual functioning that distresses a person.

a) It may result from injuries, diseases, and drug effects, but some cases are psychological consequence of sexual assault or childhood sexual abuse.

d. Cultural and Environmental Influences
    i. Cultural Norms
        1) What is considered proper, moral and desirable varies enormously across cultures.
    ii. Arousing Environmental Stimuli
        1) Erotic portrayals of sex can trigger arousal and sexual behaviour as long as people perceive those stimuli positively.
    iii. Pornography, Sexual Violence, and Sexual Attitudes
        1) The rapid growth in access to the Internet has been accompanied by a dramatic increase in the availability of pornography, and consumption of pornography has been increasing since the 1970s.
        2) Statistics Canada reported that 39 percent of adult Canadian women have had at least one experience of some form of sexual assault.
            a) Contrary to a common belief, most sexual assaults are not committed by strangers.
        3) Two psychological viewpoints are especially relevant to predicting pornography's effects.
            a) According to **social learning theory**, people learn through observation.
                i) Many pornographic materials model rape myths - that sex is impersonal, that men are entitled to sex when they want it, and that women enjoy being dominated and coerced into sex.
                ii) Men who view such materials should become more likely to treat women as objects and sexually aggress toward them.
            b) In contrast, Freud and other psychoanalysts advocated a **catharsis principle**, which states that as inborn aggressive and sexual impulses build up, actions that release this tension provide a catharsis that temporarily returns us to a more balanced physiological sate.
                i) Thus, viewing pornography, especially materials that contain aggressive or violent content, should provide people with a safe outlet for releasing sexual and aggressive tensions, and should decrease sexually aggressive behaviours toward women.
            c) Correlational studies of real-world sexual violence do not clearly support either viewpoint.
            d) In an experiment, viewing the rape depictions increased men's aggression toward a female confederate but not toward a male confederate.
        4) Strong messages against coercive sexual practices may promote attitudes that help to reduce sexual crimes against women.

e. Sexual Orientation
    i. Introduction
        1) **Sexual orientation** refers to one's emotional and erotic preference for partners of a particular sex.
    ii. Prevalence of Different Sexual Orientations
        1) For decades, researchers viewed sexual orientation as a single dimension ranging from exclusively heterosexual to exclusively homosexual, with equally heterosexual and homosexual at the midpoint.
        2) But this concept is simplistic, and modern researchers propose that sexual orientation has three dimensions.
    iii. Determinants of Sexual Orientation
        1) During the 20th century, theory after theory about the origins of sexual orientation fell by the scientific wayside.
            a) An early and unsupported biological theory was that homosexual and heterosexual males differ in their adult levels of sex hormones.
            b) One psychodynamic view proposed that male homosexuality develops

when boys grow up with a weak, ineffectual father and identify with a domineering or seductive mother.
c) Another hypothesized that being sexually seduced by an adult homosexual caused children to divert their sex drive toward members of their own sex.
d) Behaviorists suggested that homosexuality was a conditioned response, developed by associating adolescent sexual urges with the presence of same-sex peers.

2) Overall, there is no direct causes of sexual orientation except for one common pattern: even in childhood, homosexual men and women felt that they were somehow different from their same-sex peers and were more likely to engage in gender-nonconforming behaviours.
3) At present, many researchers believe that human sexual orientation has genetic roots.
a) The closer the genetic relatedness, the higher the concordance rates for sexual orientation.
b) On another biological front, altering animals' prenatal exposure to sex hormones can influence their sexual orientation, and several case studies of humans suggest a relation between their prenatal sex hormone exposure and adulthood sexual orientation.
4) Several biological factors, or a biological predisposition and socialization experiences, may combine to determine or sexual orientation.

4. Achievement Motivation
a. The Thrill of Victory, the Agony of Defeat
i. **Need for achievement** represents the desire to accomplish tasks and attain standards of excellence.
1) It is viewed as relatively stable personality characteristics that energizes and guides our achievement behaviour.
ii. People can strive to succeed for two radically different reasons.
1) The first is a positively oriented **motive for success** and the second is a negatively oriented motivation to avoid failure, more commonly called **fear of failure**.
iii. The worry associated with fear of failure and performance-avoidance goals impairs task performance.
1) Anxiety makes it difficult to process information effectively and attend to the task requirements, and performance deteriorates.
b. Achievement Goal Theory
i. **Achievement goal theory** focuses on the manner in which success is defined both by the individual and within the achievement situation itself.
ii. Individual
1) At the individual level, achievement goal theorists are interested in the achievement goal orientation that people have.
2) They differentiate between a **mastery orientation**, in which the focus is on personal improvement, giving maximum effort, and perfecting new skills, and a **performance orientation**, in which the goal is to outperform others (hopefully, with as little effort as possible).
iii. Achievement Situation
1) Another way to understand achievement motivation is to examine the goals that people seek to attain in task situations.
a) **Mastery-approach goals** focus on the desire to master a task and learn new knowledge or skills.
b) **Performance-approach goals** reflect a competitive orientation that focuses on outperforming other people.
c) **Mastery-avoidance goals** reflect a fear of not performing up to one's own standards.
d) **Performance-avoidance goals** centre on avoiding being outperformed by others.

2) Performance goals have also been referred to as ego goals because an individual showing this pattern is preoccupied with him- or herself.
3) Men were twice as likely as women to report performance-avoidance goals, and women were more likely than men to report mastery-avoidance goals.
    a) No sex differences were found in the two approach orientations.
4) University students' achievement goals for a particular class, measured early in the academic term, help predict their psychological responses to the course as well as their course performance.
    a) Students with mastery-approach motivation have higher intrinsic motivation to learn the material, perceive exams as a positive challenge, and rate the course as more interesting and enjoyable.
    b) Students with performance-avoidance motivation lack intrinsic motivation, perceive exams as anxiety-provoking threats, report low levels of interest and enjoyment, and perform more poorly than any other motivational group.
    c) Performance-approach is mostly associated with high performance but with less intrinsic motivation and enjoyment than mastery-approach motivation.
    d) Mastery-avoidance motivation is not strongly related to quality of performance.

c. Achievement Needs and Situational Factors
    i. People with a strong need for achievement - particularly those who score high on motivation for success and low on fear of failure - are ambitious and persist longer after encountering difficulty than do people with a low need for achievement.
    ii. People's striving for success depends on the specific situation.
        1) In the laboratory and the workplace, high-need achievers generally do not outperform individuals with low achievement motivation when conditions are relaxed and tasks are easy.
        2) But when tasks are challenging or the importance of doing well is stressed, high-need achievers outshine low-need achievers.
        3) Competitive situations decrease low-need achievers' task enjoyment, but are music to the ears of high-need achievers.
    iii. In general, high-need achievers are most likely to strive hard for success when
        1) They perceive themselves as personally responsible for the outcome.
        2) They perceive some risk of not succeeding; and
        3) There is an opportunity to receive performance feedback.
    iv. The key to understanding this behaviour is to recognize that it is the individual's perception of task uncertainty that counts.
d. Family and Cultural Influences
    i. Family
        1) High need for achievement develops when parents encourage and reward achievement, but do not punish failure.
            a) Conversely, fear of failure seems to develop when successful achievement is taken for granted by parents, but failure is punished.
        2) Providing children with a cognitively stimulating home environment that has many opportunities for learning fosters their intrinsic motivation to perform academic tasks.
    ii. Culture
        1) Individualistic cultures, such as those in North America and much of Europe, tend to stress personal achievement.
            a) In cultures that nurture collectivism, such as those in China and Japan, achievement motivation more strongly reflects a desire to fit into the family and social group, meet its expectations, and work for its goals.
        2) These cultural differences, however, do not portray a black-and-white picture.
        3) The relation between cultural values and achievement motivation also is suggested by the correspondence between the amount of achievement

imagery in children's storybooks and measures of national accomplishment.
4) Culture can influence achievement motivation, but at the same time, the desire to achieve can transcend culture.
a) Throughout history, there have been people who have left their homelands to seek better lives elsewhere.

5. Motivational Conflict
   a. Kurt Lewin described such conflict in terms of two opposing tendencies: approach and avoidance.
      i. When something attracts us, we tend to approach it; when something repels us, we tend to avoid it.
      ii. Different combinations of approach and avoidance can produce three basic types of conflicts.
      iii. **Approach-approach conflict** involves opposition between two attractive alternatives.
         1) Conflict is at its greatest when both alternatives are equally attractive and important.
      iv. **Avoidance-avoidance conflict** is when a person faces two undesirable alternatives.
      v. **Approach-avoidance conflict** involves being attracted to and repelled by the same goal.
         1) In approach-avoidance relationships, the tendency to approach a desired goal and the desire to avoid it both grow stronger as we get nearer to the goal.
         2) A critical factor is that avoidance tendency usually increases in strength faster than does the approach tendency.
         3) Thus, at first we may be attracted to a goal and only slightly repelled by its drawbacks. As we get closer to it, the negative aspects become more dominant, and we may stop and then retreat, approach again, and continue to vacillate in a state of conflict.
   b. Another issue that can trigger a motivational conflict comes from the fact that some consequences are in the future.
      i. That is, you have an immediate incentive and a delayed incentive.
      ii. **Delay discounting** refers to the decrease in the value of a future incentive.
6. The Nature and Functions of Emotion
   a. Introduction
      i. **Emotions** are positive or negative feelings (affective states) consisting of a pattern of cognitive, physiological, and behavioural reactions to events that have relevance to important goals or motives.
         1) The events in question may be external situations or internal thoughts, memories, or images.
      ii. The concept of motivation and emotion have always been closely linked, and the dividing line between them is not always clear.
         1) One reason is that motivation and emotion both involve states of arousal, and they both can trigger patterns of action.
         2) There is always a link between motives and emotions, because we react emotionally only when our motives and goals are gratified, threatened, or frustrated.
      iii. One way to distinguish between motivation and emotion is to place them within a stimulus-response framework.
         1) Motives operate as **internal stimuli** that energize and direct behaviour toward some goal or incentive, whereas emotions are basically reactions, or **responses**, to events that relate to important goals.
   b. The Adaptive Value of Emotion
      i. Emotions signal that something important is happening, and they direct our attention to that event.
         1) Some emotions, such as fear or anger, are part of an emergency arousal system that increases the chances of survival by energizing, directing, and

sustaining fighting o fleeing when confronted by threat or danger.
2) Positive emotions help us form lasting social relationships and work to broaden our thinking and behaviour so that we explore, consider new ideas, try out new ways to achieve goals, and savor what we have.

ii. Emotions are also important form of social communication.
1) By providing observable information about our internal states and intentions, emotions influence how other people behave toward us.
2) Emotional messages begin to have an impact early in life.

c. The Nature of Emotion
i. Introduction
1) Four Common Features of Emotions
a) First, emotions are responses to external or internal eliciting stimuli.
b) Second, emotional responses result from our interpretation or **cognitive appraisal** of these stimuli, which gives the situation its perceived meaning and significance.
c) Third, our bodies **respond physically** to our appraisal.
i) We may become physically stirred up, as in fear, joy, or anger, or we may experience decreased arousal, as in contentment or depression.
d) Fourth, emotions include **behaviour tendencies**.
i) Some are **expressive behaviours**, like exhibiting surprise, smiling with joy, or crying.
ii) Others are **instrumental behaviours**, ways of doing something about the stimulus that aroused the emotion.
2) Emotion is a dynamic ongoing **process**, and thus any of its four elements can change rapidly as the situation and our responses to it influence one another.
a) Four elements: cognitive appraisal, physiological responses, expressive behaviours, and instrumental behaviours.

ii. Eliciting Stimuli
1) Emotions are responses to situations, people, objects, or events.
a) The stimuli that trigger cognitive appraisals and emotional responses can be external or internal.
2) Innate biological factors help to determine which stimuli have the greatest potential to arouse emotions.
3) Learning also influences the ability of particular objects or people to arouse emotions.
a) Previous experiences can make certain people or situations eliciting stimuli for emotions.
4) On the broadest level, cultures have different standards for defining the good, the bad, and the ugly, and these standards affect how eliciting stimuli will be appraised and responded to emotionally.

iii. The Cognitive Component
1) Appraisal Processes
a) Both conscious and unconscious processes are involved in appraisals.
i) Some appraisals seem to involve little more than an almost automatic interpretation of sensory input based on previous conditioning.
b) The idea that emotional reactions are triggered by cognitive appraisals rather than external situations helps to account for the fact that different people, or even same people at different time, can have very different emotional reactions to the same object.
2) Culture and Appraisal
a) Where appraisals are concerned, there seem to be certain universals, but also some degree of cultural diversity in some of the more subtle aspects of interpreting situations.

iv. The Physiological Component

1) Affective Neuroscience
    a) The brain's involvement in emotion is complex, and many aspects are not well understood. It is clear, however, that emotions involve important interactions between cortical and subcortical areas.
        i) Subcortical structures, such as the hypothalamus, the amygdala, the hippocampus, and other limbic system structures play major roles in emotion.
            One. They can produce either lack of emotion or unrestrained emotion by stimulating it or removing it.
        ii) The cerebral cortex has many connections with the hypothalamus and limbic system, allowing constant communication between cortical and subcortical regions.
            One. Cognitive process surely involve activities in the cortex.
            Two. Moreover, the ability to regulate emotion depends heavily on the executive functions of the prefrontal cortex, which lies immediately behind the forehead.
    b) Groundbreaking research and theorizing by psychologist Joseph Ledoux has revealed important links between the cortex and the limbic system.
        i) Structures
            One. Thalamus routes sensory input to various parts of the brain.
            Two. The amygdala helps to coordinate the trigger physiological and behaviour responses to emotion-arousing situations.
            Three. The cortex is where sensory input is organized as perceptions and evaluated by the thinking or linguistic part of the brain.
        ii) Dual System
            One. The thalamus sends messages along two independent neural pathways, one travelling to the cortex and the other directly to the amygdala.
            Two. This means that the amygdala can receive direct input from the senses and generate emotional reactions before the cerebral cortex has had time to fully interpret what is causing the reaction.
            Three. This primitive mechanism (which is the only emotional mechanism in species such as birds and reptiles) has survival value because it enables the organism to react with great speed.
    c) Brain activity is also involved in the regulation of emotional behaviour.
        i) Deficits in prefrontal functions allow emotions to be expressed in an unregulated manner that can have negative consequences.
    d) Neuroscientist Candace Pert argues that, because all the neural structures involved in emotion operate biochemically, it is the ebbs and flows of various neurotransmitter substances that activate the emotional programs residing in the brain.
2) Hemispheric Activation and Emotion
    a) The association of the right hemisphere with negative emotions and the left hemisphere with positive emotions has become widely accepted.
3) Autonomic and Hormonal Processes
    a) The state of arousal ,or the **fight-or-flight response**, is produced by the sympathetic branch of the autonomic nervous system and by hormones from the endocrine system.
        i) The sympathetic nervous system produces arousal within a few seconds by directly stimulating the organs and muscles of the body.

ii) Meanwhile, the endocrine system pumps epinephrine, cortisol, and other stress hormones into the bloodstream.
One. These hormones produce physiological effects like those triggered by the sympathetic nervous system, but their effects are longer lasting and can keep the body aroused for a considerable time.

b) Do different emotions produce different patterns of arousal?
i) On the one hand, many investigators conclude that complex and subtle emotions such as jealousy and tenderness do not involve distinct patterns of arousal.
ii) On the other hand, autonomic patterns do show subtle differences in certain basic emotions, such as anger and fear.
iii) But whether people can detect such subtle physiological differences in a manner that would allow them to identify and label their emotions is an unanswered question.

c) We cannot easily control autonomic nervous system activation with exposure to emotion-evoking stimuli.
i) This simple observation led to the idea that changes in physiological arousal might tell us whether someone is lying or telling the truth with the **polygraph**, or the lie-detector.
ii) Although controversial, research has found an especially high rates of false positives, identifying an innocent person as guilty, with polygraph tests.

v. The Behavioural Component
1) Expressive Behaviours
a) Although we can never directly experience another person's feelings, we can often infer that someone is angry, sad, fearful, or happy on the basis of his or her emotional displays, or **expressive behaviours**.
b) Sometimes, too, others' emotional displays can evoke similar emotional responses in us, a process known as **empathy**.

2) Evolution and Emotional Expression
a) Charles Darwin argued that emotional displays are products of evolution that developed because they contributed to species survival, and emphasized the basic similarity of emotional expression in animals and humans.
b) Two key findings suggest that humans have innate or **fundamental emotional patterns**.
i) First, the expressions of certain expressions are similar across a variety of cultures, suggesting that certain expressive behaviour patterns are wired into the nervous system.
ii) Second, children who are blind from birth seem to express these basic emotions in the same ways that sighted children do, ruling out the possibility that they are learned solely through observation.
c) The evolutionary view does not assume that all emotional expressions are innate, nor does it deny that innate emotional expressions can be modified or inhibited as a result of social learning.

3) Facial Expression of Emotion
a) Most lower animals have relatively few facial muscles, so their facial expressions are limited.
i) Only monkeys, apes, and humans have enough well-developed facial muscles to produce a large number of expressions.
b) The development of sophisticated measuring procedures, such as the Facial Action Coding System by Paul Ekman and Wallace Friesen, have permitted the precise study of facial expressions.
c) Although facial expressions can be valuable cues for judging emotion, even people within the same culture may learn to express the same

emotions differently.
i) Fortunately, we usually know something about the situation to which the person is reacting, and this often is an important basis for judging emotions.
ii) Across many cultures, women have generally proven to be more accurate judges of emotional expressions than men.
One. Perhaps the ability to accurately read emotions has greater adaptive significance for women, whose traditional role within many cultures has been to care for others and attend to their needs.
Two. This ability may also result from cultural encouragement for women to be sensitive to others' emotions and to express their feelings openly.

4) Cultural Display Rules
a) The norms for emotional expression within a given culture are called **display rules**.
i) Certain gestures, body postures, and physical movements can convey vastly different meanings in different cultures.
b) Emotional expressions differ across cultures since the display rules of a particular culture dictate when and how particular emotions are to be expressed.
c) Innate biological factors and cultural display rules combine to shape emotional expression.

5) Instrumental Behaviours
a) Emotional responses are often calls to action, requiring some sort of response to the situation that aroused the emotion, which are called **instrumental behaviours**, directed at achieving some goal.
b) Instrumental actions fall into five broad categories: moving toward others (e.g. love), moving away from others (fear, revulsion), moving against others (anger), helplessness, and submission.
i) Within each of these broad categories, many different goal-directed behaviours can occur.
ii) Whether an instrumental behaviour will be successful depends on the appropriateness of the response to the situation, the skill with which it is carried out, and the level of emotional arousal that accompanies the behaviour.
c) In many situations, the relation between emotional arousal and performance seems to take the shape of an upside-down, or inverted, U.
i) As physiological arousal increases up to some optimal level, further increases in arousal impair performance.
ii) The relation between arousal and performance depends not only on arousal level, but also on task complexity.
One. Task complexity involves how complicated the task is, and how well the task has been learned.
Two. Generally, as task complexity increases, the optimal level of arousal for maximum performance decreases.

7. Theories of Emotion
a. The James-Lange Somatic Theory
i. To proponents of the **James-Lange Somatic Theory**, body informs mind and our physiological reactions determine our emotions.
1) We know we are afraid or in love only because our bodily reactions tell us so.
b. The Cannon-Bard Theory
i. Content of the Cannon-Bard Theory
1) The **Cannon-Bard theory** proposed that, when we encounter an emotion-arousing situation, the thalamus simultaneously sends sensory messages to

the cerebral cortex and to the body's internal organs.
2) The message to the cortex produces the experience of emotion, and he one to the internal organs produces the physiological arousal.
3) Thus, neither cognition nor arousal causes the other; they ae independent responses to stimulation from the thalamus.

ii. The Role of Autonomic Feedback
1) When organisms were deprived of sensory feedback from their internal organs so that they never knew when these organs were aroused, animals and people can still experience the same emotions.
2) Thus those experiments cast doubt on the claim that arousal feedback from the body is absolutely.

iii. The Facial Feedback Hypothesis
1) According to the **facial feedback hypothesis**, the feedback from facial muscles involved in emotional displays to the brain might play a key role in determining the nature and intensity of emotion that we experience, as the James-Lange theory would suggest.
2) Research shows that positive or negative emotional responses can indeed be triggered by contraction of specific facial muscles.

c. Cognitive-Affective Theories
i. **Cognitive-affective theories** focus on the ways in which cognition and physiological responses interact.
ii. Lazarus emphasizes the link between cognitive appraisal and arousal, and argues that all emotional responses require some sort of appraisal, whether we are aware of that appraisal or not.
1) If a person or animal appraises his or her relationship with the environment in a particular way, then a specific emotion, which is tied to the appraisal, always results;
2) If two persons make the same appraisal, then they will experience the same emotion regardless of the actual circumstances.

iii. It is worth emphasizing a key difference between the Cannon-Bard and the cognitive-affective theories of emotion.
1) According to the Cannon-Bard theory of emotion, when you encounter a specific environmental cue, a matching emotion is triggered.
2) The cognitive-affective theories of emotion, however, argue that what matters is how you appraise, or interpret, environmental stimuli.

iv. Schachter's **two-factor theory of emotion**, also called the **Schachter-Singer theory of emotion**, states that arousal and cognitive labelling based on situational cues are the critical ingredients in emotional experience.
1) The intensity of physiological arousal tells us how strongly we are feeling something, but situational cues give us the information we need to tell us what we are feeling.

Chapter 11 Summary

January 22, 2018 10:31 AM

1. Perspectives on Motivation
    a. Motivation is a process that influences the direction, vigour, and persistence of behaviour. Evolutionary psychologists propose that in our ancestral past, motivational tendencies that had adaptive significance were more likely to be passed from one generation to the next, eventually evolving into genetically based predispositions to act in certain ways.
    b. Homeostatic models view motivation as an attempt to maintain equilibrium in bodily systems. Drive theories propose that tissue deficits create drives, such as hunger, that motivate or push am organism from within to reduce the deficit and restore homeostasis.
    c. Incentive theories emphasize the role of environmental factors that pull people toward a goal. The cognitive expectancy * value theory explains why the same incentive may motivate some people but not others.
    d. Psychodynamic theories emphasize that unconscious motives and mental processes guide much of our behaviour. Humanist Abraham Maslow proposed that needs exist in a hierarchy, from basic biological needs to the ultimate need for self-actualization.
    e. Self-determination theory focuses on three psychological needs: competence, autonomy, and relatedness.
2. Hunger and Weight Regulation
    a. The body monitors several chemicals involved in energy utilization. Changing patterns of glucose usage provide one signal that helps to initiate hunger. The hormone ghrelin powerfully increases feelings of hunger. Upon eating, hormones such as CCK are released into the bloodstream and signal the brain to stop eating. Fat cells release leptin, which acts as a long-term signal that helps to regulate appetite. The hypothalamus and other brain regions play a role in hunger regulation.
    b. The expected good taste of food motivates eating, and the thought of food can trigger hunger. Our memory, attitudes, habits, and psychological needs affect our food intake.
    c. The availability, taste, variety, and amount of food powerfully regulate eating. Through classical conditioning, neutral stimuli can acquire the capacity to trigger hunger. Cultural norms affect our food preferences and eating habits.
    d. Heredity and the environment affect our susceptibility to become obese. Homeostatic mechanisms make it difficult to lose substantial weight.
3. Sexual Motivation
    a. The last half-century has witnessed changing patterns of sexual activity, such as an increase in premarital sex.
    b. During sexual intercourse, people often experience a four-stage physiological response pattern consisting of excitement, plateau, orgasm, and resolution.
    c. Sex hormones have organizational effects that guide the prenatal development of internal and external organs along either a male or female pattern. Sex hormones also have activational effects that influence sexual desire.
    d. Sexual fantasy can trigger arousal, whereas stress and psychological difficulties can interfere with sexual arousal. Cultural norms determine the sexual practices and beliefs that are considered moral, proper, and desirable.
    e. Environmental stimuli affect sexual desire. Viewing sexual violence reinforces men's belief in rape myths and increases men's aggression toward women, at least temporarily.
    f. Sexual orientation involves dimensions of self-identity, sexual attraction, and actual sexual behaviour. No single biological, social, or psychological factor - and no specific combination of causes - has been clearly identified as the cause of sexual orientation.
4. Achievement Motivation
    a. High-need achievers seek moderately difficult tasks that are challenging but attainable.

Low-need achievers are more likely to choose easy tasks in which success is assured or very difficult tasks in which success is not expected.

b. Master-approach, performance-approach, mastery-avoidance, and performance-avoidance motivation are four basic achievement goal orientations.
c. Child-rearing and cultural factors influence our level and expression of achievement motivation.

5. Motivational Conflict
    a. Motivational goals may conflict with one another. Approach-approach conflicts occur when a person has to select between two attractive alternatives. Avoidance-avoidance goals involve choosing between two undesirable alternatives.
    b. Approach-avoidance conflicts occur when we are attracted to, and repelled by, the same goal. As we approach the goal, the avoidance tendency usually increases in strength more rapidly than the approach tendency.
6. The Nature and Functions of Emotion
    a. An emotion is a positive or negative feeling (or affective state) consisting of cognitive, physiological, and behavioral reactions to events that have relevance to important goals or motives. Negative emotional responses are a central feature of the stress response.
    b. Emotions further our well-being in several ways: by rousing us to action, by helping us communicate with others, and by eliciting empathy and help. Negative emotions narrow attention and behaviours, where positive thoughts tend to broaden our thinking and behaviour.
    c. The primary components of emotion are the eliciting stimuli, cognitive appraisals, physiological arousal, and expressive and instrumental behaviours. Individual differences in personality and motivation affect the experience and expression of emotion, as do cultural factors.
    d. Although innate factors can affect the eliciting properties of certain stimuli, learning can also play an important role in determining the arousal properties of stimuli.
    e. The cognitive component of emotional experience involves the evaluative and personal appraisal of the eliciting stimuli. The ability of thoughts to elicit emotional arousal has been demonstrated clinically and in experimental research. Cross-cultural research indicates considerable agreement across cultures but also some degree of variation in more complex appraisals.
    f. Out physiological responses in emotions are produced by the hypothalamus, the limbic system, and the cortex, and by the autonomic and endocrine systems. There appear to be two systems for emotional behaviour, one involving conscious process by the cortex, the other unconscious processing by the amygdala.
    g. Studies suggest that negative emotions reflect greater relative activation of the right hemisphere, whereas positive emotions are related to relatively greater activation in left hemisphere.
    h. The validity of the polygraph as a lie detector has been questioned largely because of the difficulty of establishing which emotion is being expressed.
    i. The behavioural component of emotion includes expressive and instrumental behaviours. Different parts of the face are important in the expression of various emotions. The accuracy of people's interpretation of these expressions increases when situational cues are also available. Based in part on similarities in facial expression of emotions across widely separate cultures, evolutionary theorists propose that certain fundamental emotional patterns are innate. They agree, however, that cultural learning can influence emotional expression in important ways.
    j. Research on the relation between arousal and performance suggests that there is an optimal level of arousal for the performance of any task. This optimal level varies with the complexity or difficulty of the task; complex tasks have lower optimal arousal levels.
7. Theories of Emotion
    a. Several past and present theories posit causal relations among emotional components. The James-Lange/somatic theory maintains that we first become aroused and then judge what we are feeling. The Cannon-Bard theory proposes that arousal and cognition are simultaneously triggered by the thalamus. Cognitive appraisal theory states that appraisals trigger emotional arousal. According to Schachter's two factor theory, arousal

tells us how strongly we feel, while cognitions derived from situational cues help us label the specific emotion.

b. The facial feedback hypothesis, derived from the James-Lange/somatic theory, states that feedback from the facial muscles associated with innate emotional displays affects cognitive and physiological processes. Recent evidence supplies support for the theory.
c. Because of the two-way relations between the cognitive and physiological components of emotion, it is possible to manipulate appraisals and thereby influence the level of arousal. Arousal changes can also affect appraisal of the eliciting stimuli.
d.

Chapter 12 Development Over the Lifespan

January 28, 2018 9:44 PM

1. Introduction
    a. **Developmental psychology** examines changes in our biological, physical, psychological, and behavioural processes as we age.
    b. Q11`Research Methods
        i. Using a **cross-sectional design**, we would compare people of different ages at the same point in time.
            1) The cross-sectional design is widely used because data from many age groups can be collected relatively quickly, but a key drawback is that the different age groups, called **cohorts**, grew up in different historical periods.
        ii. A **longitudinal design** repeatedly tests the same cohort as it grows older.
            1) A longitudinal design is time-consuming and, as years pass, our sample may shrink substantially as people move, drop out of the study, or die.
        iii. A **sequential design** combines the cross-sectional and longitudinal approaches by testing several age cohorts as they grew older and determine whether they follow a similar developmental pattern.
            1) This design is the most comprehensive, but also the most time-consuming and costly.
2. Prenatal Development
    a. Three Stages of Prenatal Development
        i. The Germinal Stage
            1) The **germinal stage** constitutes approximately the two weeks of development, beginning when one sperm fertilizes a female egg (ovum), which is called a **zygote**.
            2) Through repeated cell division the zygote becomes a mass of cells that attaches to the mother's uterus about 10 to 14 days after conception.
        ii. The Embryonic Stage
            1) The **embryonic stage** extends from the end of the second week through the eighth week after conception, and the cell mass now is called an **embryo**.
            2) Two life-support structures, the placenta and umbilical cord, develop at the start of this stage.
                a) Located on the uterine wall, the **placenta** contains membranes that allow nutrients to pass from the mother's blood to the umbilical cord.
                b) In turn, the **umbilical cord** contains blood vessels that carry these nutrients and oxygen to the embryo, and waste products back from the embryo to the mother.
            3) Supplied with nutrients, embryonic cells divide rapidly and become specialized.
                a) Bodily organs and systems begin to form, and by week eight the heart of the two centimeter-long embryo is beating, the brain is forming, and facial features, such as eyes, can be recognized.
        iii. The Fetal Stage
            1) At the ninth week after conception, the embryo is called a **fetus** till birth, during which muscles become stronger and other bodily systems continue to develop.
                a) At about 24 weeks the eyes open, and by 28 weeks the fetus attains the **age of viability**, meaning that it is likely to survive outside the womb in case of premature birth.
    b. Genetics and Sex Determination
        i. The 23rd chromosome in the egg is always an X, and the 23rd chromosome is the sperm is an X in about half of the cases and a Y in the other half.
            1) The Y chromosome contains a specific gene, known as the **TDF (testis**

determining factor) gene, that triggers male sexual development.
2) The union of an egg with a sperm cell having a Y chromosome results in an XY combination and, therefore, a boy; otherwise XX combination and a girl.

ii. At roughly six to eight weeks after conception, the TDF gene initiates the development of testes.
1) Once formed, the testes secret sex hormones called **androgens** that continue to direct a male pattern of organ development.
2) If the TDF gene is not present, testes o not form and - in the absence of sufficient androgen activity during this **prenatal critical period** - an inherent female pattern of organ development ensues.

c. Environmental Influences
i. **Teratogens** are environmental agents that cause abnormal prenatal development.
1) The placenta prevents many dangerous substances from reaching the embryo and fetus, but some harmful chemical molecules and diseases can pass through.
2) Sexually transmitted diseases can pass from mother to fetus and produce brain damage, blindness, and deafness, depending on the disease.

ii. Prenatal exposure to stress and the stress hormones is an important risk factor for later mental health problems, including anxiety and depression.

iii. Mercury, lead, radiation, and many other environmental toxins can produce birth defects, as can many drugs.
1) **Fetal alcohol spectrum disorders (FASD)** involve a range of mild to severe cognitive, behavioural, and physical deficits caused by prenatal exposure to alcohol.
a) **Fetal alcohol syndrome (FAS)**, involves a cluster of severe developmental abnormalities.
2) Nicotine is another known teratogen.
3) Caffeine may affect the embryonic development of both the cerebral cortex and the hippocampus.

3. Infancy and Childhood
a. The Amazing Newborn
i. Newborn Sensation and Perception
1) Infants are very nearsighted; their visual acuity is about 20/800, or 40 times worse than normal adult acuity of 20/20, and can focus on an object 20 to 40 cm away.
a) Robert Fantz used the **preferential looking procedure** to study infants' visual preferences.
b) Infants preferred complex patterns to simple patterns and solid colors.
2) Newborns readily turn toward off-centred auditory and tactile targets and odors.
3) Newborns orient to significant stimuli in their environment, the most important being their mother's face, voice, and smell, optimizing their access to food, warmth, and social stimulation.

ii. Newborn Learning
1) Using the habituation procedure, people has shown that newborns rapidly learn to associate particular sounds with particular objects, including mother's face and voice.
2) Newborns can learn through classical and operant conditioning, and imitation.
3) In sum, newborns are born with mechanisms that help them respond to caretakers and important events in their environment.

b. Sensory-Perceptual Development
i. Newborn's crude sensory-perceptual abilities improve rapidly.
1) Their visual field in each eye expands to almost adult size by six months of age, while acuity improves in a continuous developmental function from 20/800 at birth to 20/100 by six months of age, and then progresses more slowly until it reaches adult level by about four years of age.

ii. Not all perceptual developmental functions show improvement with age during infancy.
    1) A U-shaped function exists for sound localization - the remarkable ability of newborns to turn toward sounds at birth disappears in the second month of life and returns again at four to five.
    2) Auditory pattern perception is also relatively advanced in young infants who can detect tiny changes in adult speech sounds that differentiate one word from another by one to two months of age.
        a) The infants lost this ability by 12 months of age, and they began to speak words in their native language.
iii. Young infants also appear to perceive music as adults do.
iv. To summarize, sensory-perceptual processes are exercises in the uterus, and they all, including vision, operate at some level at birth.
    1) Most improve rapidly during the first year of life but some perceptual abilities appear rather suddenly several months later after birth while others decline temporarily or disappear during the first year of life.

c. Physical, Brain, and Motor Development
    i. Introduction
        1) Because of **maturation**, the genetically programmed biological process that governs our growth, our bodies and movement skills develop rapidly during infancy and childhood.
        2) The **cephalocaudal principle** reflects the tendency for development to proceed in a head to foot direction.
        3) The **proximodistal principle** stats that development begins along the innermost parts of the body and continues toward the outermost parts.
    ii. The Young Brain
        1) No organ develops more dramatically than the brain, which develop from 25 percent to 50 percent of its eventual adult weight by six months of age.
            a) The first brain areas to mature fully lie deep within the brain and regulate basic survival functions, such as heartbeat and breathing.
            b) Among the last areas to mature is the frontal cortex, which is vital to our highest-level cognitive functions.
        2) Rapid brain growth during infancy and early childhood slows in later childhood.
            a) Although five-year-olds' brains have reached almost 90 percent of their adult size, brain maturation continues.
            b) New synapses form, unnecessary synapses are pruned back and lost, association areas of the cortex mature, and the cerebral hemispheres become more highly specialized.
    iii. Motor Development
        1) Motor development tends to follow a regular stage-like sequence, and while infants vary in the age at which they acquire a particular skill, the sequence in which each skill appears is similar across infants.
        2) Some motor skills also follow a U-shaped developmental function.
            a) The newborn stepping reflex usually drops out after one to two months of age and reappears around 12 months of age.
    iv. Environmental and Cultural Influences
        1) Although physical and motor development are guided by genetic programs, they are also influenced by experience.
            a) Diet is an obvious example.
            b) Along with proper nutrition, babies thrive in an enriched environment - one in which they have the opportunity to interact with others and to manipulate suitable toys and other objects.
            c) Physical touch, too, affects growth in infancy - massaging premature and full-term human infants accelerate their weight gain and neurological development.
        2) Experience also can influence basic motor skill development.

a) Developmental differences are not due to biological differences, but are more likely the result of economic and cultural factors and differences in parenting.

3) Our discussion of physical growth and perceptual-motor development reinforces three points that apply across the realm of human development:
   a) Biology sets limits on environmental influences.
   b) Environmental influences can be powerful.
   c) Biological and environmental factors interact.

d. Cognitive Development
   i. Piaget's Stage Model
      1) Introduction
         a) Piaget proposed that children's thinking changes qualitatively with age, and that it differs from the way adults think.
            i) He believed that cognitive development result from an interplay of maturation and experience.
         b) Cognitive development occurs as we acquire new schemas, and as our existing schemas become more complex, during which, according to Piaget, two key processes are involved.
            i) **Assimilation** is the process by which new experiences are incorporated into existing schemas.
            ii) **Accommodation** is the process by which new experiences cause existing schemas to change.
               One. The imbalance or **disequilibrium** between existing schemas and new experiences ultimately forces those schemas to change.
               Two. Every time a schema is modified, it helps to create a better balance, an **equilibrium**, between the environment and the child's understanding of it.
      2) Sensorimotor Stage
         a) In the **sensorimotor stage**, from birth to about age two, infants understand their world primarily through sensory experiences and physical (motor) interactions with objects.
         b) For young infants, they don't understand the concept of **object permanence**, the understanding that an object continues to exist even it no longer can be seen, until around eight months.
         c) Infants begin to acquire language after age one, and toward the end of the sensorimotor period they increasingly use words to represent objects, needs, and actions.
      3) Preoperational Stage
         a) At around age two, children enter a **preoperational stage** in which they represent the world symbolically through words and mental images, but do not yet understand basic mental operations or rules.
         b) Rapid language development helps children label objects and represent simple concepts.
            i) Children can think about the past and future, and can better anticipate the consequences of their actions.
            ii) Symbolic thinking enables them to engage in "make believe" or pretend play.
         c) Despite these advances, their cognitive abilities till have major limitations.
            i) The preoperational child does not understand **conservation**, the principle that basic properties of objects, such as their volume, mass, or quantity, stay the same even though their outward appearance may change.
            ii) Children's thinking at this age displays **irreversibility**: it is difficult for them to reverse an action mentally.
            iii) Preoperational children exhibit **centration**: they focus on only

one aspect of the situation.
iv) Preoperational children's thinking also reflects **egocentrism**, difficulty in viewing the world from someone else's perspective.

4) Concrete Operational Stage
   a) Between about seven and 12 years of age, children in the **concrete operational stage** could perform basic mental operations concerning problems that involve tangible objects and situations.
      i) They grasped the concept of reversibility, displayed less centration, and easily solved conservation problems.
      ii) They grasped the concept of serial ordering, easily arranging a set of objects along various dimensions.
      iii) These children also formed mental representations of a series of actions.
   b) However, concrete operational children often have difficulty with hypothetical problems or problems requiring abstract reasoning; they often rigid types of thinking.
5) Formal Operational Stage
   a) In the **formal operational stage**, individuals think logically about both concrete and abstract problems, form hypotheses, and systematically test them.
   b) Children entering this stage also begin to think more flexibly when tackling hypothetical problems, such as brainteasers, and typically enjoy the challenge.

ii. Assessment of Piaget's Theory: Stages, Ages, and Culture
1) First, the general cognitive abilities associated with Piaget's four stages occur in the same order across cultures.
2) Second, children acquire many cognitive skills and concepts at an earlier age than Piaget believed.
3) Third, cognitive development within each stage seems to proceed inconsistently.
4) Fourth, culture influences cognitive development.
5) Fifth, and most broadly, cognitive development is more complex and variable than Piaget proposed.

iii. Vygotsky: the Social Context of Cognitive Development
1) Russian psychologist Lev Vygotsky highlighted how the sociocultural context interacts with the brain's biological maturation.
2) **Zone of proximal development** refers to the difference between what a child can do independently and what a child can do with assistance from adults or more advanced peers.
3) The zone of proximal development is important.
   a) First, it helps us recognize what children may soon be able to do by themselves.
   b) Second, it emphasizes that people can help to move a child's cognitive development forward within limits (the zone) dictated by the child's biological maturation.

iv. Information-Processing Approaches
1) Introduction
   a) In contrast to Piaget's stage approach, many researchers view cognitive development as continuous, gradual process in which the same set of information-processing abilities becomes more efficient over time.
2) Information-Search Strategies
   a) In short, older children are better able to search systematically for relevant information.
3) Processing Speed, Attention, and Response Inhibition
   a) Processing speed, attention, and the ability to inhibit responses all show improvements with age.

b) Processing speed improves rapidly across childhood and then changes more gradually during adolescence.
c) Older children are also better able to focus their attention and inhibit responses to distractions.

4) Working Memory and Long-term Memory
a) Children's worming memory improves with age.
b) Older children also can retain and manipulate visuospatial information in working memory effectively than younger children.
c) Older children are also more likely than younger children to use strategies to improve memory, like rehearsal.

v. Theory of Mind: Children's Understanding of Mental States
1) The term **theory of mind** refers to a person's beliefs about the mind and the ability to understand other people's mental states; that is, we have theories about the contents of other people's minds.
2) Piaget believed that children younger than six or seven have trouble recognizing what other people are thinking.
3) Lying and deception also reflect a theory of mind.
a) Evidence clearly indicates that those who understand false beliefs are more likely to lie, starting as early as three years of age.

e. Social-Emotional and Personality Development
i. Early Actions and Emotion Regulation
1) Although infants can't describe their feelings, their facial expressions, vocalizations, and other behaviours provide a window into their emotional lives.
2) Around 18 months of age, infants begin to develop a sense of self.
a) After age two, as toddlers learn about performance standards and rules that they are supposed to follow, they begin to display pride, shame, and guilt.
3) Just as emotional reactions become more diverse with age, so does **emotion regulation**, the process by which we evaluate and modify our emotional reactions.
4) As children age, their emotional expressiveness and ability to regulate their emotions become part of their overall emotional competence, which in turn influences their social behaviour and how well their peers and other people like them.
5) Socialization influences children's emotional development, as parents, teachers, and peers serve as models and reinforce children for some types of emotional responses but not others.

ii. Temperament
1) From the moment of birth, infants differ from one another in **temperament**, a biologically based general style of reacting emotionally and behaviourally to the environment.
2) Shyness forms part of a more general temperament style called **behavioural inhibition**.
a) Inhibited infants are quiet and timid; they cry and withdraw when they are exposed to unfamiliar people, objects, and sounds.
b) For the vast majority - those who were only mildly to moderately inhibited or uninhibited between the ages of one and two - their temperament did not predict how shy or outgoing they would be.
c) But for infants who were highly inhibited or uninhibited, the findings are that highly uninhibited infants tended to become sociable and talkative seven-year-olds, whereas highly inhibited infants developed into quiet, cautious, and shy seven-year-olds.

iii. Erikson's Psychosocial Theory
1) Psychoanalytic psychologist Erik Erikson believed that personality develops through confronting a series of eight major **psychosocial stages**, each of which involves a different crisis over how we view ourselves in relation to

other people and the world.
    a) Each crisis is present throughout life, but takes on special importance during a particular age period.
    b) Because each stage of life creates new opportunities, personality is not fixed in childhood.
    c) Successfully resolving each crisis helps to prepare us to meet the next.
2) Eight Stages (with the first four stages in childhood)
    a) First Year: **Basic Trust vs. Basic Mistrust**
        i) Depending on how adequately our needs are met, and how much love and attention we receive during the first year of life, we develop a basic trust or basic mistrust of the world.
    b) 1 - 2: **Autonomy vs. Shame and Doubt**
        i) During the next two years, children become ready o exercise their individuality.
        ii) If parents unduly restrict children or make harsh demands during toilet training, children develop shame and doubt about their abilities and later lack the courage to be independent.
    c) 3 - 5: **Initiative vs. Guilt**
        i) From age 3 through five, children display great curiosity about the world.
        ii) If they are allowed freedom to explore and receive answers to their questions, they develop a sense of initiative.
        iii) If they are held back or punished, they develop guilt about their desires and suppress their curiosity.
    d) 6 - 12: **Industry vs. Inferiority**
        i) From age six until puberty, the child's life expands into school and peer activities.
        ii) Children who experience pride and encouragement in mastering tasks develop industry - a striving to achieve.
        iii) Repeated failure and lack of praise for trying leads to a sense of inferiority.
    e) 12 - 20: **Identity vs. Role Confusion**
    f) 20 - 40: **Intimacy vs. Isolation**
    g) 40 - 65: **Generativity vs. Stagnation**
    h) 65: **Integrity vs. Despair**

iv. Attachment
1) Introduction
    a) Imprinting refers to a sudden, powerful, biologically primed form of attachment for some bird species and a few mammals, which involves a **critical period**.
    b) In humans**,** attachment refers to the strong emotional bond that develops between children and their primary caregivers.
        i) There is no immediate post-birth critical period, but the first few years of life seem to be a **sensitive period** when we most easily form a secure bond with caregivers that enhances our adjustment later in life.
        ii) Although it is difficult to form strong attachments to caregivers later in childhood, it is still possible.
2) The Attachment Process
    a) Harry Harlow, through experiments of monkey with two artificial and surrogate mothers, showed that **contact comfort** - body contact with a comforting object - is more important in fostering attachment than is the provision of nourishment.
    b) British psychoanalyst John Bowlby proposed that attachment during infancy develops in three phases:
        i) **Indiscriminate attachment**: newborns cry, vocalize, and smile, and they emit these behaviours toward everyone. In turn, these

behaviours evoke caregiving from adults.

ii) **Discriminate attachment**: around three months of age, infants direct their attachment behaviours more toward familiar caregivers than toward strangers.

iii) **Specific attachment behaviour**: by seven or eight months of age, infants develop their first meaningful attachment to specific caregivers.

c) As an infant's attachment becomes more focused, two types of anxiety occur.

i) **Stranger anxiety**, distress over contact with unfamiliar people, emerges around age six or seven months, and ends by 18 months of age.

One. When approached by, touched by, or handed over to a stranger, the infant becomes afraid, cries, and reaches for the caregiver.

ii) **Separation anxiety**, distress over being separated from a primary caregiver, typically begins a little later, peaks around age 12 to 16 months, and disappears between two and three years of age, showing an inverted U-shape age function.

d) These responses, which coincide with infants' increasing cognitive and physical abilities, may be adaptive reactions shaped over the course of evolution.

e) Around age three or four, as children's cognitive and verbal skills grow, they develop a better understanding of their attachment relationships.

i) According to Bowlby, a stage of **goal-corrected partnership** emerges in which children and caregivers can describe their feelings to each other and maintain their relationships whether they are together or apart.

3) Types of Attachment

a) Canadian psychologist Mary Ainsworth developed the **Strange Situation Test (SST)**, a standardized procedure for examining infant attachment.

i) The infant, typically a 12- to 18-month-old, first plays with toys in the mother's presence.

ii) Then a stranger enters the room and interacts with the child.

iii) Soon the mother laves the child with the stranger.

iv) Later the stranger leaves and the child is left alone.

v) Finally, the mother returns.

b) Four Types of Attachment

i) Securely Attached Infants

One. Securely attached infants explore the playroom and react positively to strangers.

Two. They are distressed when she leaves and happily greet her when she returns.

ii) Insecurely Attached Infants

One. Anxious-Resistant Infants

First. Anxious-resistant infants are fearful when the mother is present, demand her attention, and are highly distressed when she leaves.

Second. They are not soothed when she returns and may angrily resist her attempts at contact.

Two. Anxious-Avoidant Infants

First. Anxious-avoidant infants show few signs of attachment and seldom cry when the mother leaves and don’t seek contact when she returns.

iii) Disorganized Attachment Infants

One. Disorganized attachment is sometimes referred to as **disorganized-disoriented attachment**.
Two. Infants that who disorganized attachment may appear disoriented and confused, or they may show contradictory behaviours.

c) Trusting relationship with a caregiver is an important component of early social development.

v. Attachment Deprivation
1) Being raised without attachment to a real, interactive caregiver produced long-term social impairment.
2) In sum, it appears that infancy is a sensitive, but not critical, period in which an initial attachment to caregivers forms most easily and facilitates subsequent development.
a) Prolonged attachment deprivation creates developmental risks, but when deprived children are placed in a nurturing environment at a young enough age, many if not most become attached to their caretakers and grow into well-adjusted adults.
b) Clearly, although unfavorable environments can significantly impair development, some children exposed to extreme adversity are highly resilient and thrive in later life.

vi. The Daycare Controversy

vii. Styles of Parenting
1) Two Dimensions
a) **Warmth versus Hostility**.
i) Warm parent communicate love and caring for the child, and respond with greater sensitivity and empathy to the child's feelings.
ii) Hostile parents express rejection and behave as if they did not care about the child.
b) **Restrictiveness versus Permissiveness**
i) Parents differ in the extent to which they make and enforce rules, place demands on children, and discipline children.
c) Combining these dimensions yields four parenting styles that are associated with different patterns of child development.
2) Four Parenting Styles
a) **Authoritative Parents**
i) Authoritative parents are controlling but warm.
One. They establish clear rules, consistently enforce them, and reward children's compliance with warmth and affection.
Two. They communicate high expectations, caring, and support.
ii) This style is associated with the most positive childhood outcomes.
One. Children with authoritative patents tend to have higher self-esteem, are higher achievers in school, and have fewer conduct problems.
b) **Authoritarian Parents**
i) Authoritarian parents exert control over their children, but do so within a cold, unresponsive, or rejecting relationship.
ii) Their children tend to have lower self-esteem, be less popular with peers, and perform more poorly in school than children with authoritative parents.
c) **Indulgent Parents**
i) Indulgent parents have warm and caring relationships with their children, but do not provide the guidance and discipline that helps children learn responsibility and concern for others.
ii) Their children tend to be more immature and self-centered.
d) **Neglectful Parents**

i) Neglectful parents provide neither warmth nor rules and guidance.
ii) Their children are most likely to be insecurely attached, have low achievement motivation and disturbed relationships with peers and adults at school, and be impulsive and aggressive.
One. Neglect parenting is associated with the most negative developmental outcomes.

viii. Gender Identity and Socialization
1) Parenting also influences children's development in other ways, such as helping children develop a **gender identity**, a sense of "femaleness" or "maleness" that becomes a central aspect of our personal identity.
a) Early in life, infants display some knowledge about gender.
b) However, it's not between two and three years of age that most children develop a basic gender identity; they can label themselves and others as being either a boy or a girl, but their understanding of gender is still fragile.
c) **Gender constancy**, which is the understanding that being male or female is a permanent part of a person, develops around age six or seven.
2) As gender identity develops, children also acquire **sex-role stereotypes**, which are beliefs about the types of characteristics and behaviours that are appropriate for boys and girls to possess.
a) **Socialization**, which refers to the process by which we acquire the beliefs, values, and behaviours of a group, plays a key role in shaping our gender identity and sex-role stereotypes.
b) **Sex-typing** involves treating others differently based on whether they are female or male.
i) From infancy onward, girls and boys are viewed and treated differently.
c) Sex-role stereotypes also are transmitted through observational learning and operant conditioning.
3) As children make the transition to adolescence and enter junior high school, they generally display more flexible thinking about gender.
a) Overall, however, stereotypes about men's and women's psychological traits seem to become a little more rigid, and most people continue to adhere to relatively traditional beliefs.

f. Moral Development
i. Kohlberg's Stage Model
1) Study Method
a) Kohlberg analyzed responses to various moral dilemmas and concluded that there are three main levels of moral reasoning, with two substages within each level.
2) Level of Moral Reasoning
a) Level 1: **Preconventional**: actual or anticipated punishment and rewards, rather than internalized values.
i) Stage 1: Punishment/Obedience Orientation: obeying rules and voiding punishment
ii) Stage 2: Instrumental/Hedonistic Orientation: self-interest and gaining rewards
b) Level 2: **Conventional**: conformity to the expectations of social groups - person adopts other people's values
i) Stage 3: Good Child Orientation: gaining approval and maintaining good relations with others
ii) Stage 4: Law and Order Orientation: doing one's duty, showing respect for authority, and maintaining social order
c) Level 3: **Postconventional**: moral principles that are well thought and part of one's belief and value system

i) Stage 5: Social Contract Orientation: general principles agreed upon by society that foster community welfare and individual rights; recognition that society can decide to modify laws that lose their social utility
ii) Stage 6: Universal Ethical Principles: abstract ethical principles based on justice and equality; following one's conscience

ii. Culture, Gender, and Moral Reasoning
1) Conclusion
a) From childhood through adolescence, moral reasoning changes from preconventional to conventional levels.
b) In adolescence and even adulthood, postconventional reasoning is relatively uncommon.
c) A person's moral judgments do not always reflect the same level of stage within levels.
2) Claimed Bias
a) Fairness and justice are Kohlberg's postconventional ideals, but in many cultures the highest moral values focus on principles that do not fit easily into Kohlberg's model, such as respect for all animal life, collective harmony, and respect for the elderly.
b) Women place greater value than men do on caring and responsibility for others' welfare.
i) Overall, however, evidence of gender bias is mixed.

iii. Moral Behaviour and Conscience
1) Moral reasoning does not necessarily translate into moral behaviour.
2) By the age of two, children understand that there are rules for behaviour, and their emotional expressions suggest that they experience guilt when they break a known rule.
a) This internal regulatory mechanism, often referred to as **conscience**, tends to stop themselves from acting in destructive or antisocial ways when they are not being monitored by parents or other adults.
b) Children are most likely to internalize their parents' values when they have a positive relationship with them, when parents establish clear rules and provide explanations that facilitate children's awareness of parental values, and when discipline is firm but not harsh.
3) Children's temperament also enters into the picture.
a) Fearful, inhibited children tend to internalize parental values more easily at an earlier age than less fearful children, particularly when their parents provide gentle discipline.
b) For relatively fearless, uninhibited children, whether discipline is gentle or harsh is less important.
c) A secure attachment with warm parents, rather than fear of punishment, appears to motivate fearless children to internalize their parents' standards.

4. Adolescence and Adulthood
a. Introduction
i. **Adolescence** refers to the period of development and gradual transition between childhood and adulthood.
ii. **Puberty** refers to a period of rapid physical maturation in which the person becomes capable of sexual reproduction.
iii. Although the developmental periods overlap, puberty is a biologically defined period whereas adolescence is a broader social construction.
b. Physical Development
i. Puberty
1) During adolescence, puberty ushers in important bodily changes as the brain's hypothalamus signals the pituitary gland to increase its hormonal secretions.
a) Pituitary hormones stimulate other glands, speeding up maturation of

the **primary sex characteristics**, the sex organs involved in reproduction.
    b) Hormonal changes also produce **secondary sex characteristics**, non-reproductive physical features, such as breasts in girls and facial hair in boys.
2) The pubertal landmark in girl is **menarche**, the first menstrual flow.
    a) For boys, it is the production of sperm and the first ejaculation.
    b) In North America and Europe, these events occur most around age 11 to 13 for girls and 12 to 14 for boys.
3) The physical changes of puberty have psychological consequences.
    a) The hormones that steer puberty affect brain function and can influence mood and behaviour.
4) Whether puberty occurs early or late also matters.
    a) Overall, early maturation tends to be associated with fewer negative outcomes for boys than for girls.

ii. The Adolescent Brain
1) Compared with infancy and early childhood, overall brain growth slows from childhood to adolescence.
2) Cortical white matter within the frontal cortex increases linearly with age especially in areas that are important for impulse control and abstract thought.
    a) In contrast, non-myelinated grey matter in the frontal cortex peaks at around 11 years of age for girls and a year later for boys, presumably reflecting the pruning of unnecessary cells by maturation and experience.
    b) This maturation of neural networks permits more-efficient communication between brain regions.
3) Neural restructuring is especially prominent in the prefrontal cortex and the limbic system, regions that play a key role in planning and coordinate behaviours that satisfy motivational goals, emotional urges, and behavioural control.
    a) The corpus callosum, a structure that allows the two hemispheres of the brain to communicate with each other, changes significantly during adolescence, increasing in area by up to 10 percent within a two-year period.

iii. Physical Development in Adulthood
1) Young adults are at the peak of their physical, sexual, and perceptual functioning.
2) Physical status typically declines at mid-life.
    a) At age 40 the **basal metabolic rate**, the rate at which the resting body converts food into energy, slows and this produces a tendency to gain weight.
    b) Around age 50, women's ovaries stop producing estrogen; they lose their fertility and experience **menopause**, the end of the menstruation.
    c) Men remain capable of fathering children, but their fertility gradually declines in middle age.
3) Despite this decline, many middle-aged adults are in excellent health and are vigorously active.
    a) Growing experience in job and recreational skills can offset much of the age-related physical decline.
4) The physical changes of middle adulthood become more pronounced in late adulthood.
    a) Lean body mass decreases while the amount of fatty tissue tends to increase, bones lose calcium becoming more brittle and slower to heal, and hardened ligaments make movements stiffer and slower.
    b) But with regular exercise, good nutrition, and the right attitude, many

adults maintain physical vigour and an active lifestyle well into old age.

iv. The Adult Brain
    1) During the earliest years of adulthood, the brain's neural networks generally continue to become more efficiently integrated, but like other parts of the body, the brain declines later in adulthood.

c. Cognitive Development
    i. Adolescent Egocentrism
        1) **Adolescent egocentrism** is a self-absorbed and distorted view of one's uniqueness and importance and importance.
        2) Two Main Parts of Adolescent Egocentrism
            a) First, adolescents often overestimate the uniqueness of their feelings and experiences, which is called the **personal fable**.
            b) Second, many adolescents feel that they are always on stage and that everybody's going to notice how they look and what they do. This sensitivity to social evaluation is called the **imaginary audience**.
    ii. Reasoning and Information Processing in Adolescence
        1) Abstract reasoning abilities increase substantially during adolescence.
            a) Adolescenidts can more easily contemplate hypothetical issues, ranging from scientific problems to questions about social justice and the meaning of life.
            b) They reason more flexibly than children and use both deductive and inductive problem-solving, which signifies that adolescents have moved beyond concrete operational thinking and entered a new stage of cognitive development: formal operational thinking.
        2) Continued improvements in information-processing capacities help abstract thinking to develop and foster better performance across a wide range of tasks.
            a) Although advancing more slowly than during childhood, the speed with which adolescents process information quickens, their working memory becomes more efficient, and they become better able to ignore distracting information, suppress irrelevant responses, and stay focused on the task at hand.
    iii. Changes in Adulthood
        1) Post-formal Operational Thinking
            a) Several theorists disagree with Piaget's belief that formal operational thinking was the final stage of cognitive development and people simply use formal operations in new and more complex ways.
            b) They propose a fifth stage of cognitive development called **post-formal thought**, in which people can reason logically about opposing points of view and accept contradictions and irreconcilable differences.
            c) Post-formal thinkers also realize that, from social behaviour to ethics and politics, life involves many interacting factors.
                i) When reasoning about social problems, post-formal thinkers engage in complex thought and are more likely to acknowledge opposing points of view and see both sides of a disagreement as having legitimate arguments.
        2) Information Processing and Memory
            a) In general, information-processing abilities decline during adulthood, but the age at which they begin to decline and the amount of decline can vary substantially.
            b) Examples
                i) Perceptual speed (reaction time) begins to decline steadily in early adulthood, by some estimates as soon as one's early 20s.
                ii) Memory for new factual information declines during adulthood.
                iii) Spatial memory declines with age.

iv) Recall declines more strongly than recognition, because recall requires more processing resources.
v) The effects of aging on prospective memory - the ability to remember to perform some action in the future - are less clear.

3) Intellectual Changes in Adulthood
a) Cross-sectional research typically found that fluid intelligence began to decline steadily in early adulthood, whereas crystallized intelligence peaked during middle adulthood and then began to decline in late adulthood.
b) Both the cross-sectional and longitudinal data, along with findings from other studies, indicate that fluid intellectual abilities typically begin to decline at an earlier age than crystalized intelligence.
c) Age-related intellectual declines are partly due to poorer perceptual speed, memory, vision, and hearing.
i) Thus, we find a bigger intellectual decline during old age when test questions call for quick responses than when they involve unlimited or ample time.

iv. Maintaining Cognitive Functioning
1) In Schaie's longitudinal research, he found that adults who retained their level of cognitive functioning tended to engage in more cognitively stimulating jobs and personal activities, to marry a spouse with greater intellectual abilities than their own, and to maintain a higher level of perceptual processing speed.
2) Current research suggests that practice can boost many adults' performance on particular mental tasks.

d. Social-Emotional and Personality Development
i. Adolescents' Search for Identity
1) **Identity versus role confusion** refers to the pivotal crisis of adolescent personality development - "who am I", "what do I believe in".
a) Erikson believed that an adolescent's identity crisis can be resolved positively, leading to a stable sense of identity, or can end negatively, leading to confusion over one's identity and values.
2) Marcia classified the identity status of each person as follows:
a) **Identity Diffusion**
i) These teens and adults had not yet gone through an identity crisis, unconcerned or even cynical about identity issues and were not committed to a coherent set of values.
b) **Foreclosure**
i) These individuals had not yet gone through an identity crisis either, but for a different reason: they committed to an identity and set of values before experiencing a crisis.
c) **Moratorium**
i) These people wanted to establish a clear identity and were currently experiencing a crisis but had not yet resolved it.
d) **Identity Achievement**
i) These individuals had through an identity crisis, successfully resolved, and emerged with a coherent set of values.

ii. Relationship with Parents and Peers
1) Parents
a) Among both sexes and all ethnic groups, teenagers' level of conflict with mothers and fathers was low.
b) Most adolescents also state that if they face a serious problem, they can confide in one or both parents.
c) Yet many adolescents also feel that for various reasons, including the right to preserve their independence, it is acceptable to lie to their parents at times.
d) Some parents and teenagers do struggle a lot,, and parent-teen

conflict is correlated with other signs of distress.

2) Peers
    a) Peer relationships increase in importance during adolescence, and some studies find teenagers spend more time with peers than doing almost anything else.
    b) Adolescent friendships are typically more intimate than those at previous ages and involve a greater sharing of problems.
    c) Peers can strongly influence a teenager's values and behaviours, thereby facilitating the processing of separating from parents and establishing one's own identity.
        i) Peer pressure against misconduct typically has an even stronger effect, and closeness to parents is an added buffer that helps many teenagers resist peer pressure to engage in risky behaviour.

iii. The Transition to Adulthood
1) In traditional cultures, marriage typically is the key transitional event into adulthood.
2) Marriage signifies that, in the eyes of the culture, each partner has acquired these skills and is deemed capable of raising a family.
3) Individualism - becoming a responsible, independent person - was judged to be the single most important general criterion.
4) The question of whether the transition to adulthood is viewed differently among various ethnic groups and among people from other culture needs closer examination.

iv. Stages versus Critical Events in Adulthood
1) Stages
    a) **Intimacy versus isolation** is the major developmental challenge of early adulthood (age 20 to 40).
        i) Intimacy is the ability to open oneself to another person and to form close relationships.
        ii) This is the period of adulthood in which many people form close adult friendships, fall in love, and marry.
    b) Middle adulthood (ages 40 to 65) brings with the issue of **generativity versus stagnation**.
        i) Through their careers, raising children, or involvement in other activities, people achieve generativity by doing things for others and making the world a better place.
    c) Late adulthood (age 65 and older) accentuates the final crisis, **integrity versus despair**.
        i) If the major crises of earlier stages have been successfully resolved, the person experience integrity: a sense of completeness and fulfillment.
2) Major Life Events
    a) Another way to view adult social development is through the major life events that people experience.

v. Marriage and Family
1) Introduction
    a) Around the world, most people marry or form another type of family union at some point in their lives.
    b) The birth of a first baby dramatically alters the way couples spend their time.
    c) Over a broader age period, cross-sectional studies suggest a U-shaped relation between marital satisfaction and progression through major life events.
    d) Despite the stresses that accompany marriage and parenthood, studies around the globe find that married people experience greater subjective well-being than unmarried adults.

2) Cohabitation
    a) Some couples in committed relationships **cohabit** - that is, live together without being married.
    b) Couples may cohabit as a permanent alternative to marriage, but many more people do so as a trial marriage to determine if they are compatible before tying the knot.
3) Attachment Revisited
    a) The proportions of secure, avoidant, and resistant attachments styles are similar for adults and infants, at least for Canadian and American samples, and adult attachment styles are related to social relationships.
    b) Benoit and Parker's results suggest that the patterns of attachment are passed on from one generation to the next.
        i) However, along with attachment, difficult temperaments, poverty, and other factors may also be involved.

vi. Establishing a Career
1) Work provides an outlet for achievement, gives us structure, and is a significant source of social interactions.
2) From childhood through our mid-20s, we first encounter a **growth stage** of career interests in which we form initial impressions about the types of jobs we like or dislike.
    a) This stage is followed by a more earnest **exploration stage** in which we form tentative ideas about a preferred career and pursue the necessary education or training.
    b) From the mid-20s to mid-40s, people often enter an **establishment phase**, during which they begin to make their mark.
    c) Initially, they may experience some job instability, but eventually, careers tend to become more stable, and people enter a **maintenance stage** that continues into late adulthood.
    d) Finally, during the **decline stage**, people's investment in work tends to decrease, and they eventually retire.
3) Although this general model is useful, people's career paths vary, and this is especially true for women.
    a) Family responsibilities, which fall disproportionately on women, are a major cause of women's work gaps outside the home, of reductions to part-time work status, or of delayed entry into the workforce.

vii. Mid-Life Crisis: Fact or Fiction
1) Adults surely experience conflict, disappointment, frustration, and worry as they enter mid-life, but so do people of all ages.
2) There are major goals to achieve, crises to resolve, and rewards to experience in every phase of life.

viii. Retirement and the Golden Years
1) Older adults are the fastest-growing segment of the population in many countries, including Canada.
2) Most retired people do not become anxious, depressed, or dissatisfied with life because of retirement itself, although those who have strong work values are most apt to miss their jobs.
3) The decision to retire or keep working typically involves many factors, such as one's feelings about the job, leisure interests, physical health, financial security, and family relationships.
4) Whether in their 50s, 60s, or 70s, adults who are working or retired because this is what they prefer report higher life satisfaction and better physical and mental health than adults who are involuntarily working or retired.

ix. Death and Dying
1) Death can be viewed at several levels; it is an inevitable biological process, but one with important psychological and environmental components.
2) Elisabeth found that terminally ill patients often experienced five stages as

they coped with impending death.

a) **Denial** typically came first, as the person refused to accept that the illness was terminal.
b) Next, denial often gave way to **anger** and then to **bargaining**.
c) **Depression** ushered in the fourth stage, as patients began to grieve.
d) Finally, many experienced **acceptance** and a resigned sense of peacefulness.

3) It is essential to keep in mind that these stages do not represent a normal or correct way to face death, and that terminally ill patients reactions may not typify those people facing death under other circumstances.
4) Beliefs and customs concerning death vary across cultures and individuals.
    a) Death also means different things to people of different ages.

Chapter 12 Summary

January 28, 2018 10:33 PM

1. Prenatal Development
    a. Cross-sectional designs compare people of different age groups at a single point in time. A longitudinal design repeatedly tests the same age group as it grows older. A sequential design tests several groups at one point in time and then again when they are older.
    b. Prenatal development involves the zygote, embryonic, and fetal stages.
    c. The 23rd chromosome in a mother's egg cell always is an X chromosome. If the 23ed chromosome is the father's sperm cell is an X, the child will be genetically female (XX); if a Y, the child will be born genetically male (XY).
    d. Illness, drug use, and environmental toxins can cause abnormal prenatal development.
2. Infancy and Childhood
    a. Newborns have poor sensory acuity, but they can distinguish between different visual patterns, speech sounds, odors, and tastes. They display perceptual preferences, learn though classical and operant conditioning, and may have a primitive capacity for limitation.
    b. Sensory, perceptual, and motor abilities have several different developmental functions. Most rapidly improve during the first year of life. Some newborn perceptual-motor responses temporarily decline during the first few months after birth and then recover during the first year of life.
    c. The cephalocaudal principle reflects the tendency for development to proceed in a head-to-foot direction. The proximodistal principle states that development begins along the innermost parts of the body and continues toward the outermost parts.
    d. Experience is critical for normal development; sensory and motor development can be delayed or accelerated by experience.
    e. According to Piaget, cognitive development depends on processes of assimilation and accommodation, and occurs in four stages: sensorimotor, preoperational, concrete operational, and formal operational.
    f. Although the general cognitive abilities associated with Piaget's four stages occur in the same order across cultures, children acquire many cognitive skills at an earlier age than Piaget believed.
    g. Vygotsky emphasized that cognitive development occurs in a sociocultural context. Each child has a zone of proximal development, reflecting the difference between what a child can do independently and what a child can do with assistance from others.
    h. Information-processing capacities improve with age. Older children search for information more systematically, process it more quickly, and display better memory.
    i. Children begin to develop a theory of mind (beliefs about another person's knowledge, feelings, intentions, etc.) at around three to four years of age.
    j. Erikson proposed that personality development proceeds through eight major psychosocial stages. Each stage involves a major crisis, and the way we resolve it influences our ability to meet the challenges of the next stage.
    k. Temperament reflects a pattern of reacting emotionally and behaviourally to the environment. Temperament remains stable across in infancy and childhood.
    l. Infant-caretaker attachment develops in three phases, and infants experience periods of stranger and separation anxiety. Secure attachment is associated with better developmental outcomes in childhood and adolescence than insecure attachment. For most children, daycare does not disrupt attachment.
    m. Parenting styles vary along dimensions of warmth-hostility and restrictiveness-permissiveness. The children of authoritative parents generally display the best developmental outcomes. Gender identity begins to form early in childhood, and socialization influences children's acquisition of sex-role stereotypes.
    n. Divorce disrupts children's psychological adjustment in the short term and, for some children and adolescents, is associated with a long-term pattern of maladjustment.

o. Kohlberg proposed that moral reasoning proceeds through three levels. Preconventional moral judgments are based on anticipated rewards and punishments. Conventional morality is based on conformity to social expectations, laws, and duties. Postconventional moral judgments are based on well-thought-out moral principles. Critics argue that the model contains cultural and gender biases.
p. Moral behaviour is governed by many factors, including observational learning, temperament, attachment, and emotional development.

3. Adolescence and Adulthood
    a. Physical Development
        i. In Western cultures, puberty marks the onset of adolescence. Hormones that steer puberty also can affect mood and behaviour. Generally, early maturation is a more positive experience for boys than it is for girls.
        ii. During adolescence, neural restructuring is especially prominent in the prefrontal cortex and the limbic system, regions that play a key role in planning and coordinating behaviours that satisfy motivational goals, emotional urges, and moral decisions.
        iii. Young adults are at the peak of their physical, sexual, and perceptual functioning in their 20s.
        iv. Declines in physical processes (perception, bone density, basic metabolic rate, flexibility, etc.) begin in the 30s, and become more pronounced in late adulthood, but an active lifestyle, good nutrition, and a positive attitude can offset many age-related declines.
    b. Cognitive Development
        i. Improvements in information-processing processes (speed, memory) foster increases in abstract reasoning during adolescence. However, many teens and adults continue to struggle on formal operational tasks; while some people frequently use abstract reasoning, other rarely do.
        ii. Information-processing capacities decline steadily after reaching one's 30s. However, longitudinal data show that many intellectual abilities do not begin to decline reliably until late adulthood.
        iii. Remaining physically and cognitively active can maintain cognitive function with advanced age.
    c. Social-Emotional and Personality Development
        i. Erikson proposed that intimacy versus isolation, generativity versus stagnation, and integrity versus despair are the main crises of early, middle, and late adulthood.
        ii. Young adolescents often show egocentrism in their social thinking. The search for identity is a key task of adolescence. With age, teens who have not experienced an identity crisis become more likely to do so, and most resolve it successfully.
        iii. During adolescence, peer relationships become more important and intimate. Most teens maintain good relations with their parents.
        iv. In North America, the most important criterion for a transition into adulthood is becoming a responsible, independent person. In traditional cultures, marriage is a common marker of this transition.
        v. In general, married people tend to be happier and live longer.
        vi. For many couples, marital satisfaction tends to decline in the years following the birth of children, but it increases later in adulthood. Adult-mother attachment styles are related to social relationships and may be passed on from one generation to the next.
        vii. Work serves important psychological and social functions. Overall, women experience more career gaps and their career paths are more variable than men's. Most adults do not experience a full-blown "mid-life crisis". Similarly, most retired people do not become more anxious, depressed, or lonely because of retirement.
        viii. Many terminally ill patients experience similar psychological reactions as they cope with their impending death, but beliefs and feelings about death vary with culture and age, and there is no normal way to approach death.

4. Level of Analysis

a. Biological Level
    i. Newborn's reflexes and temperament are biologically based; our genetic blueprint guides the aging process.
    ii. Critical and sensitive periods occur during prenatal development and childhood.
    iii. Physical and motor development follow the cephalocaudal and proximodistal principles.
    iv. A surge in pituitary hormones during puberty speeds maturation of sex organs and produces secondary sex characteristics.
    v. Brain maturation is especially rapid during infancy and childhood. Many neural circuits are rewired during adolescence.
    vi. People generally achieve their physical and perceptual peak and greatest brain efficiency in young adulthood.
b. Environmental Level
    i. Teratogens cause abnormal prenatal development.
    ii. Different parenting styles are associated with different patterns of child development outcomes.
    iii. Prolonged social isolation and attachment deprivation pose developmental risks.
    iv. Cognitive development occurs in a social context; socialization influences the acquisition of a moral conscience and sex-role stereotypes.
    v. Peer relationships often take on increased importance during adolescence, and peers can strongly influence a teen's values and behaviour.
c. Psychological Level
    i. Newborns have perceptual preferences and basic learning capabilities.
    ii. The acquisition of new schemas and improved information-processing skills underlie cognitive development.
    iii. Compared with imprinting in some animals, infant-caregiver attachment in humans is more flexible; it involves periods of stranger and separation anxiety.
    iv. Children's ability to express and regulate their emotions improves with age; they acquire a gender identity and sex-role stereotypes.
    v. The capacity for abstract thinking and a focus on one's identity increase during adolescence.
    vi. The psychological transition from adolescence to adulthood is multifaceted and typically not based on attaining a particular age or social role.

Chapter 13 Behaviour in a Social Context

February 12, 2018 1:25 PM

1. Social Thinking and Perception
    a. Attribution: Perceiving the Causes of Behaviour
        i. Definition
            1) In everyday life, we often make **attributions**, judgments about the causes of our own and other people's behaviour and outcomes.
            2) Attribution influences our subsequent behaviour and emotions.
        ii. Personal Versus Situational Attributions
            1) Fritz Heider, a pioneer of attribution theory, maintained that our attempts to understand why people behave as they do typically involve either personal attributions or social attributions.
                a) **Personal (internal) attributions** infer that people's behaviour is caused by their characteristics.
                b) **Situational (external) attributions** infer that aspects of the situation cause a behaviour.
            2) According to Harold Kelley, three types of information determine the attribution we make: **consistency**, **distinctiveness**, and **consensus**.
                a) When consistency, distinctiveness, and consensus are all high, we are likely to make a situational attribution.
                b) When consistency is high and the other two factors are low, we make a personal attribution.
                c) At times, people do respond thoughtfully and take consistency, distinctiveness, and consensus information into account when making attributions, but at times, people take mental shortcuts and make snap judgments that bias their attributions.
            3) When people take situational information into consideration, the dorsolateral prefrontal cortex is involved, indicating more thoughtful top-down processing of the information.
                a) Dispositional attributions are more closely linked to the medial prefrontal cortex.
        iii. Attributional Biases
            1) We tend to make a **fundamental attribution error**: we underestimate the impact of the situation and overestimate the role of personal factors when explaining other people's behaviour.
            2) The fundamental attribution error applies to how we perceive other people's behaviour rather than our own.
                a) One reason for this is that we have more information about the present situation when making judgments about ourselves.
                b) Second, the perceptual principle of figure-ground relations comes into play.
                    i) When you watch others behave, they are the figure but we are not watching ourselves.
            3) When people have time to reflect on their judgments or are highly motivated to be careful, the fundamental attribution error is reduced.
            4) When it comes to explaining our own behaviour, we tend to protect our self-esteem by displaying a **self-serving bias**: making relatively more personal attributions for successes and more situational attributions for failures.
                a) The strength of the self-serving bias depends on various factors, ranging from one's psychological state to cultural norms.
        iv. Culture and Attribution
            1) Many studies suggest that the tendency to attribute other people's behaviour to personal factors reflects a Westernized emphasis on

individualism.
2) Culture also influence attributions for our own behaviour, like when modesty is highly valued in China's collectivistic culture.
3) Our cultural background also affect the way we go about making attributions.
a) East Asians, in general, tend to hold a more holistic view of the universe than Westerners, leading them to develop more complex views about the causes of behaviour.
b) Importantly, this relation between holistic thinking and the use of information was also found within each culture.

b. Forming and Maintaining Impressions
i. Primacy versus Recency: Are First Impressions More Important?
1) When forming impressions, the **primacy effect** refers to our tendency to attach more importance to the initial information that we learn about a person.
a) First, we tend to be more alert to information we receive first.
b) Second, initial information may shape how we perceive subsequent information.
2) Primacy effect decrease - and **recency effects**, giving greater weight to the most recent information, may occur - when we are asked to avoid making snap judgments, are reminded to carefully consider the evidence, and are made to feel accountable for our judgments.
ii. Mental Sets and Schemas: Seeing What We Expect to See
1) Our **mental set**, which is a readiness to perceive the world in a particular way, powerfully shapes how we interpret a stimulus.
a) **Schemas**, the mental frameworks that help us organize and interpret information, create our mental sets.
2) A **stereotype**, which is a generalized belief about a group or category of people, represents a powerful type of schema.
iii. Self-Fulfilling Prophecies: Creating What We Expect to See
1) A **self-fulfilling prophecy** occurs usually without conscious awareness, when people's erroneous expectations lead them to act toward others in a way that brings about the expected behaviours, thereby confirming the original impression.

c. Attitudes and Attitude Change
i. Definition
1) An **attitude** is a positive or negative evaluative reaction toward a stimulus, such as a person, action, object, or concept.
ii. Do Our Attitudes Influence Our Behaviour?
1) Decades of research indicate that attitudes do predict behaviour, but there are three factors that help to explain why the attitude-behaviour relationship is strong in some cases but weak in others.
2) First, attitudes influence behaviour more strongly when counteracting situational factors are weak.
a) According to the **theory of planned behaviour** and similar models, our intention to engage in a behaviour is strongest when we have a positive attitude toward that behaviour, when **subjective norms** (our perceptions of what other people think we should do) support our attitudes, and when we believe that the behaviour is under our control.
3) Second, attitudes have a greater influence on behaviour when we are aware of them and when they are strongly held.
4) Third, general attitudes are better at predicting general classes of behaviour, and specific attitudes are better at predicting specific behaviours.
iii. Does Our Behaviour Influence Our Attitude?
1) Self-Justification
a) According to Festinger's **theory of cognitive dissonance**, people strive

for consistency in their cognitions.
    i) When two or more cognitions contradict one another, the person experiences an uncomfortable state of tension that Festinger calls **cognitive dissonance**, and becomes motivated to reduce this dissonance.
    ii) The theory predicts that, to reduce dissonance and restore a state of cognitive consistency, people will change one of their cognitions or add new cognitions.
  b) Behaviour that is inconsistent with our attitudes is called **counter-attitudinal behaviour**, and it produces dissonance only if we perceive that our actions were freely chosen rather than coerced.
    i) Dissonance is maximized when the behaviour threatens our sense of self-worth or produces negative consequences that were foreseeable.
  c) Dissonance, however, does not always lead to attitude change.
    i) People can reduce dissonance by rationalizing their attitude or their behaviour wasn't important, by finding external justification, or by making other excuses.
  d) Despite the many ways to reduce dissonance, the theory has successfully inspired researchers to change people's attitudes by inducing them to engage in counterattitudinal behaviours.
2) Self-Perception
  a) According to Daryl Bem's **self-perception theory**, we make inferences about our own attitudes by observing how we behave.
  b) Both dissonance theory and self-perception theory appear to be correct but under different circumstances.

iv. Persuasion
1) Introduction
  a) Persuasion involves a **communicator** who delivers a **message** through a **channel** (e.g., in writing, verbally, or visually) to an **audience** within a surrounding context.
2) The Communicator
  a) **Communicator credibility** - how believable the communicator is - often is the key to effective persuasion.
    i) Credibility has two major components: **expertise** and **trustworthiness**.
  b) Communicators who are physically attractive, likable, and similar to us also may persuade us more effectively.
3) The Message
  a) The **two-sided refutational approach** is more effective.
  b) In general, a **moderate degree of discrepancy** is more effective.
  c) Messages that attempt to persuade by arousing fear can be effective under certain conditions.
    i) Overall, fear arousal works best when the messages evoke moderate fear and provides people with effective, feasible ways to reduce the threat.
4) The Audience
  a) There are two basic routes to persuasion.
    i) The **central route to persuasion** occurs when people think carefully about the message and are influenced because they find the arguments compelling.
    ii) The **peripheral route to persuasion** occurs when people do not scrutinize the message but are influenced mostly by other factors, such as a speaker's attractiveness or a message's emotional appeal.
    iii) Attitudes change that results from the central route tends to have a deeper foundation, lasts longer, and predicts future

behaviour more successfully.
iv) We tend to process a message more closely when it is personally relevant.
b) People differ in their **need for cognition**: some enjoy analyzing issues; others prefer not to spend much mental effort.
c) People differ in their approach to new information.
i) Those who are uncertainty-oriented look for information, particularly in situations that are new and unpredictable.
ii) Certainty-oriented individuals avoid such situations, particularly when the information is self-relevant.

2. Social Influence
   a. The Mere Presence of Others
      i. **Social facilitation** is an increased tendency to perform one's dominant response in the mere presence of others.
         1) First, The mere physical presence of another person (or member of the same species) increases our arousal.
         2) Second, as arousal increases, we become more likely to perform whatever behaviour happens to be our **dominant response** (i.e., our most typical response) to that specific situation.
            a) When a task is difficult and complex, and we are first trying to learn it, our dominant response is to make errors.
      ii. Social facilitation occurs in species ranging from cockroaches and fruit flies to rats and hens.
         1) Social facilitation produced small but reliable effects on human performance.
      iii. Social facilitation may be the most basic of all social influence processes, and it has an important practical implication: when learning complex tasks, minimize the presence of other people.
   b. Social Norms: The Rules of the Game
      i. Norms and Rules
         1) **Social norms** are shared expectations about how people should think, feel, and behave, and they are the cement that binds social systems together.
            a) Some norms are formal laws and regulations, but many are implicit and unspoken.
         2) A **social role** consists of a set of norms that characterize how people in a given social position out to behave.
            a) Because we may wear many hats in our daily life, **role conflict** can occur when the norms accompanying different roles clash.
         3) Norms and roles can influence behaviour so strongly that they compel a person to act uncharacteristically.
      ii. Culture and Norm Formation
         1) Whether at a cultural level or in small random groups, humans placed together seem to develop common standards for behaviour and judgment.
   c. Conformity and Obedience
      i. Introduction
         1) Without **conformity** - the adjustment of individual behaviours, attitudes, and beliefs to a standard - we would have social chaos.
      ii. Why Do People Conform?
         1) **Informational social influence** states that people follow the opinions or behaviour of other people because we believe they have accurate knowledge and what they are doing is right.
         2) **Normative social influence** holds that we may confirm to obtain rewards that come from being accepted by other people, while at times avoiding their rejection.
      iii. Factors That Affect Conformity
         1) **Group Size**: conformity increased from about 5 to 35 percept as group size increased from one to four or five confederates, but further increases in

group size did not increase conformity.
2) **Presence of a dissenter**: when someone else dissents, this person serves as a model for remaining independent from the group.
3) **Task Importance**: when the correct answer is obvious, conformity decreases when the consequences of going along with the group's erroneous judgment are made more costly, but when we are less sure of the right way to behave, conformity increases as the stakes become higher.
4) **Culture**: conformity in face-to-face situations tends to be greater among research participants from collectivist cultures, in which group harmony is valued more highly than in individualistic cultures.
5) **Gender Differences**: overall, gender differences in conformity have been weak or non-existent.

iv. Minority Influence
1) To maximize its influence, the minority must be highly committed to its point of view, remain independent in the face of majority pressure, and be consistent over time, yet appear to keep an open mind.
2) Dissenting information presented by the minority may cause majority members to change their view, at least on a private level.

v. Factors That Influence Destructive Obedience
1) **Remoteness of the victim**: obedience was greater when the learner was out of sight.
2) **Closeness and legitimacy of the authority figure**: obedience was highest when the authority figure was close and perceived as legitimate.
3) **Cog in a wheel**: obedience increases when someone else does the "dirty work".
4) **Personal Characteristics**: Differences were weak or non-existent, and gender was not consistently related to obedience rates as well.

vi. Lessons Learned: From the Holocaust to Airline Safety
1) By arranging the situation appropriately, most people - ordinary, decent citizens - can be induced to follow orders from an authority figure they perceive as legitimate, even when doing so contributes to harming innocent people.

vii. Detecting and Resisting Compliance Techniques
1) The power of **norm of reciprocity** involves the expectation that when others treat us well, we should respond in kind.
2) The **door-in-the-face technique** is when a persuader makes a large request, expecting you to reject it, and then presents a smaller request.
3) Using the **food-in-the-door technique**, a persuader gets you to comply with a small request first, and later presents a larger request.
4) With **lowballing**, a persuader gets you to commit to some action and then - before you actually perform the behaviour - he or she increases the cost of that same behaviour.

d. Crowd Behaviour and Deindividuation
i. **Deindividuation** is a loss of individuality that leads to disinhibited behaviour.
ii. The **anonymity to outsiders** is the key influence.
iii. Reducing anonymity - and thereby increasing public accountability - may be the most basic approach to counteracting deindividuation.

e. Group Influences on Performance and Decision Making
i. Social Loafing: Failing to Pull Your Own Weight
1) The tendency for people to expend less individual effort when working in a group than when working alone is called **social loafing**.
2) Steven Karau and Kipling Williams propose a **collective effort model**: on a collective task, people will put forth effort to contribute to obtaining a valued goal.
3) Social loafing may disappear when individual performance is monitored or when members highly value their group or the task goal.

ii. Group Polarization: Going to Extreme

1) **Group polarization** is when a group of like-minded people discuss an issue, whether face to face or through email, the average opinion of group members tends to become more extreme.
2) One reason of this is **normative social influence** as individuals who are attracted to a group may be motivated to adopt a more extreme position to gain the group's approval.
    a) A second reason, **informational social influence**, is that during group discussions people hear arguments supporting their positions that they had not previously considered.

iii. Groupthink: Suspending Critical Thinking

1) **Group thinking** is the tendency for group members to suspend critical thinking because they are striving to seek agreement.
2) Group thinking is most likely to occur when a group
    a) Is under **high stress** to reach a decision;
    b) Is **insulated** from outside input;
    c) Has a **directive leader** who promotes her or his personal agenda; and
    d) Has **high cohesion**, reflecting a spirit of closeness and ability to work well together.
3) Some Symptoms of groupthink
    a) Illusion of invulnerability (group overestimates itself)
    b) Direct pressure on dissenters
    c) Self-censorship
    d) Illusion of unanimity
    e) Self-appointed mind guards
4) Risks
    a) Incomplete survey of alternatives
    b) Incomplete survey of objectives
    c) Failure to examine risks of preferred choice
    d) Poor information search
    e) Failure to reappraise alternatives

3. Social Relations
    a. Affiliation and Interpersonal Attraction
        i. Why Do We Affiliate?
            1) Some theorists argue that over the course of evolution, individuals whose biological makeup predisposed them to affiliate were more likely to survive and reproduce than those who were reclusive.
            2) Psychologically, we affiliate for four basic reasons: to obtain positive stimulation, receive emotional support, gain attention, and permit social comparison.
                a) **Social comparison** involves comparing our beliefs, feelings, and behaviours with those of other people, which helps us determine whether our response are normal and enable us to judge the level of our cognitive and physical abilities.
            3) People differ in how strongly they desire to affiliate.
                a) People with high need for affiliation also show a stronger **psychological sense of community** - the feeling of being part of a larger collective and being engaged with others in pursuing common goals.
            4) Many situational factors affect our tendency to affiliate, like emergencies and fear.
        ii. Initial Attraction
            1) Proximity and Mere Exposure: Haven't I seen you somewhere?
                a) **Mere exposure effect** is that repeated exposure to a stimulus typically increases our liking for it.
                b) This effect occurs even when we are not consciously aware of the repeated exposure.
            2) Similarity: Birds of a feather

a) People most often are attracted to others who are similar to themselves.
b) For psychological attributes, similarity of attitudes, beliefs, and values seems matter the most.

3) Physical Attractiveness: Spellbound by beauty
a) In many studies, when men and women rate the desirability of hypothetical short-term dating partners, their judgments are influenced most strongly by how good-looking the person is.
b) One factor that motivates our desire to affiliate with attractive people may be the wide-spread stereotype that "what is beautiful is good"; we often assume that attractive people have more positive personality characteristics than unattractive people.
c) A **matching effect** is the fact that although we are attracted to beautiful people, we are most likely to have a dating partner or spouse whose level of physical attractiveness is similar to our own.

4) Facial Attractiveness: is average beautiful?
a) Consistently, people perceive moderately feminized faces as the most attractive.
b) In contrast, depending on the study, males faces that have be somewhat masculinized or feminized are rated as the most attractive.

iii. As Attraction Deepens: Close Relationship

1) **Self-disclosure** - the sharing of innermost thoughts and feelings - plays a key role.
a) In friendship, dating relationships, and marriages, more extensive and intimate self-disclosure is associated with greater emotional involvement and relationship satisfaction.

2) **Social exchange theory** proposes that the course of a relationship is governed by rewards and costs that the partners experience.
a) Rewards include companionship, emotional support, and the satisfaction of other needs.
b) Costs may include the effort spent to maintain the relationship, arguments, conflicting goals, and so forth.
c) The overall **outcome**, rewards minus costs, in a relationship can be positive or negative.

3) Outcomes are evaluated against two standards.
a) The first, called the **comparison level**, is the outcome that a person has grown to expect in relationships, and it influences the person's satisfaction with the present relationship.
b) The second standard, called the **comparison level for alternatives**, focuses on potential alternatives to the relationship, and it influences the person's degree of commitment.

iv. Sociocultural and Evolutionary Views

1) Overall, for both sexes, mutual attraction/love, dependable character, emotional stability, and a pleasing disposition emerged as the most highly rated of the 18 characteristics evaluated.
a) The importance attached to many qualities, however, varied considerably across cultures.

2) There are also remarkably consistent sex differences in mate preferences across cultures.
a) These sex differences reflect inherited predispositions, shaped by natural selection in response to different adaptive problems, shaped by natural selection in response to different problems that men and women have faced over the ages.
b) According to the **sexual strategies theory**, ancestral men who were predisposed to have se with a more children and passing on their genes.
c) **Social structure theory** proposes that most of these sex differences in

mating strategies and preferences occur because society directs men into more advantaged social and economic roles.

3) Sex differences exist, but cross-cultural differences tend to be stronger.

b. Love

i. Types of Love

1) **Passionate love** involves intense emotion, arousal, and yearning for the partner.

a) **Compassionate love** involves affection, deep caring about the partner's well-being, and a commitment to being there for the other.

2) Robert Sternberg proposes a **three-component triangular theory of love** that focuses on **intimacy** (closeness, sharing, and valuing one's partner), **commitment** (the decision to remain in the relationship), and **passion** (feelings of romance, physical attraction, and sexual desire).

a) **Liking**: intimacy alone
b) **Empty Love**: commitment alone
c) **Infatuation**: passion alone
d) **Romantic Love**: intimacy + passion
e) **Companionate love**: intimacy + commitment
f) **Fatuous Love**: passion + commitment
g) **Consummate Love**: intimacy + passion + commitment

ii. The Cognitive-Arousal Model: Why Does My Heart Pound?

1) According to the **cognitive-arousal model of love**, the passionate component of love has interacting cognitive and physiological components.

2) **Transfer of excitation** is the arousal due to one source is perceived ("misattributed") as being due to another source.

a) Primed with our beliefs and expectations about love, when we experience high arousal in the presence of someone whom we perceive as attractive and desirable.

3) The ventral tegmental area of the brain is triggered when you think about the person you love.

a) This results in the release of dopamine, which is related to pleasure.
b) Other neurotransmitters are affected as well.

c. Prejudice and Discrimination

i. Introduction

1) **Prejudice** refers to a negative attitude toward people based on their membership in a group.

2) **Discrimination** refers to overt behaviour: it involves treating people unfairly based on the group to which they belong.

ii. Overt and Covert Prejudice: Have Times Changed?

1) Although prejudiced attitudes truly seem to have faded a bit, in many ways modern racism, sexism, and other forms of prejudice have gone underground and are more difficult to detect.

2) Prejudice attitudes may surface when we are cued to think in negative ways.

iii. Cognitive Roots of Prejudice

1) Categorization and us-them thinking

a) Categorization leads to the perception of in-groups and out-groups, groups to which we do and do not belong, respectively.

b) First, we **display in-group favoritism**, a tendency to favor in-group members and attribute more positive qualities to us than to them.

i) **Out-group derogation** reflects a tendency to attribute more negative qualities to them than to us.

c) Second, people display an **out-group homogeneity bias**.

i) They generally view members of out-groups as being more similar to one another than are members of in-groups.

2) Stereotypes and Attributional Distortions

a) Categorization and in-group bias lead us to respond quickly to out-group members based on perceived group characteristics -

stereotypes - rather than based on their individual characteristics.

iv. Motivational Roots of Prejudice
    1) Competition and Conflict
        a) According to **realistic conflict theory**, competition for limited resources fosters prejudice.
        b) Originally, it was believed that a treat to one's personal welfare was the prime motivator of prejudice, but research suggests that prejudice is triggered more strongly by a **perceived threat to one's in-group**.
    2) Enhancing Self-Esteem
        a) According to **social identity theory**, prejudice stems from a need to enhance our self-esteem.

v. How Prejudice Confirms Itself
    1) Self-fulfilling prophecies are one of the most invisible yet damaging ways of maintaining prejudiced beliefs.
    2) **Stereotype threat** proposes that stereotypes create a fear and self-consciousness among stereotyped group members that they will live up to other people's stereotypes.

vi. Reducing Prejudice
    1) Introduction
        a) The best-known approach to prejudice reduction are based on a principle called **equal status contact**: prejudice between people is most likely to be reduced when they
            i) Engage in sustained close contact
            ii) Have equal status
            iii) Work to achieve a common goal that requires cooperation, and
            iv) Are supported by broader social norms
        b) Adopting a common identity is another factor that helps to reduce prejudice among group members.

d. Prosocial Behaviour: Helping Others
    i. Why Do People Help
        1) Social Learning and Cultural Influences
            a) Two social norms are specially relevant to helping behaviour.
                i) First, the **norm of reciprocity** states that we should reciprocate when others treat us kindly.
                ii) Second, the **norm of social responsibility** states that people should help others and contribute to the welfare of society.
            b) We are reinforced with approval when we adhere to these norms, receive disapproval when we do not, and observe that other people receive praise for conforming to these norms.
                i) Eventually, we internalize prosocial norms and values as our own, enabling powerful **self-reinforcement** such as pride, self-praise, and feelings of satisfaction to maintain prosocial behaviours even when external reinforcement is absent.
        2) Empathy and Altruism
            a) **Empathy-altruism hypothesis** proposes that altruism does exist, and it is produced by **empathy**, the ability to put oneself in the place of another and to share what that person is experiencing.
            b) The **negative state relief model** proposes that high empathy causes us to feel distress when we learn of others' suffering, so by helping them we reduce our own personal distress - a self-focused goal, and an altruistic one.
    ii. When Do People Help
        1) 5-Step Process of Bystander Intervention
            a) First, a bystander will not help unless she or he notices the situation.
            b) The second step involves whether this is an emergency.
                i) To answer this question, we often engage in **social comparison**: we look around to se how other people are responding.

c) The third step is assuming responsibility to intervene.
i) If others are present, there may be a **diffusion of responsibility**.
d) The fourth step is our **self-efficacy** (confidence) in dealing with the situation.
e) Finally, a bystander might decide not to intervene because of the perceived costs, including not just physical danger, but also negative social consequences such as appearing foolish by trying to help inappropriately.

2) Bystander Effect
a) **Bystander effect** is when the presence of multiple bystanders inhibits each person's tendency to help, largely because of social comparison or diffusion of responsibility.
b) This inhibition is more likely to occur when the bystanders are strangers rather than friends.

3) Other Factors
a) We are more likely to help when we are in a **good mood**.
b) **Pre-existing guilt** - feeling guilty about something we have recently done - also increases helping.
c) Observing a **helpful role model** increases prosocial behaviour.
d) Certain drugs such as MDMA may influence emotional empathy and thus result in increased helping.
e) Finally, we help more when there is a lock of time pressure and we are not in a hurry.

iii. Whom Do People Help

1) Three Prominent Factors of People We Help
a) **Similarity**: perceiving that a person is similar to us increases our willingness to provide help.
b) **Gender**: women are more likely to receive help than men if the bystander is male. Women are men are equally likely to be helped by female bystanders.
c) **Perceived responsibility**: people are more likely to receive help when their need for aid is viewed as being caused by factors beyond their control.

2) The Just World Hypothesis
a) The **just world hypothesis** holds that, because people want to view the world as fair, they perceive that people get what they deserve and deserve what they get.
b) This irrational blaming of victims may reduce people's feelings of responsibility to help.

iv. Increasing Prosocial Behaviour

1) Mandatory volunteerism is one approach to increase prosocial behaviour, but the results of this depend on the personal rewards that volunteers experience and their increased awareness of human needs.
2) Another approach, consistent with social learning theory, is to expose people to prosocial models.
3) Research suggests that developing feelings of empathy and connectedness with others also may make people more likely to help.
4) Finally, simply learning about factors that hinder bystander intervention may increase the tendency to help someone in distress.

e. Aggression: Harming Others

i. Biological Factor in Aggression

1) Humans do not display the rigid, reflexive aggressive response, but behaviour geneticists argue that heredity partly determines why some people are more aggressive than others.
a) A genetic predisposition toward aggression can be traced to evolutionary adaptation.

2) Different types of aggression - defending oneself, defending one's offspring,

predator aggression, establishing dominance, and so forth - may involve different neural circuits.

3) Aggression also involves activity of the frontal lobes, and the important role that the frontal lobes play in impulse control.
4) There is no one aggression chemical, but atypically low levels of serotonin activity may play a role in impulse aggression, as when people lash out for emotional rage.
5) In many species of mammals, higher testosterone levels contribute to greater **social aggression**: unprovoked acts that are designed to establish a dominance hierarchy among members of the same species.
    a) But in humans and other primates, the association between testosterone and aggression is weaker and less consistent.

ii. Aversive Environmental Stimuli: Beyond Frustration
1) Aggression is influenced not only by biology, but also by our present environment and past learning experiences.
2) The **frustration-aggression hypothesis** proposes that 1) frustration inevitably leads to aggression, and 2) all aggression is the result of frustration.
    a) Both of these sweeping assertions have since been disproved.
    b) People do not always respond to frustration by aggressing.
    c) Aggression can be increased not only by frustration, but also by exposure to a wide range of aversive stimuli.
3) **Crowding** can trigger aggression in many species.
4) **Heats** also increases the risk of aggression.

iii. Learning to Aggress: Reinforcement and Modelling
1) Non-aggressive animals can be trained to become vicious aggressor if conditions are arranged so that they are consistently victorious in fights with weaker animals.
    a) Reward affects human aggression in much the same way.
2) Aggression also can be learned by observing others.

iv. Psychological Factors in Aggression
1) Perceived Intent, Empathy, and Emotional Regulation.
    a) The **attribution of intentionality** affect how we respond to provocation.
    b) Our degree of **empathy** for someone also influences how we react to provocation.
    c) Whether we respond to provocation calmly or lash out depends on our **ability to regulate our emotions**.
2) Psychodynamic Processes
    a) Freud proposed that, in a never-ending cycle, aggressive impulses build up over time, eventually have to be released, and then build up again.
    b) His principle of **catharsis** stated that performing an act of aggression discharges aggressive energy and temporarily reduces our impulse to aggress.

Chapter 13 Summary

February 12, 2018 3:16 PM

1. Social Thinking and Perception
    a. Consistency, distinctiveness, and consensus information jointly influence whether we make a personal or situational attribution for a particular act.
    b. The fundamental attribution error is the tendency to attribute other people's behaviour to personal factors while underestimating the role of situational factors. The self-serving bias is the tendency to attribute one's successes to personal factors and one's failures to situational factors.
    c. Although our impressions of people may change over time, our first impression generally carries extra weight. Stereotypes and schemas create mental sets that powerfully shape our impressions.
    d. Through self-fulfilling prophecies, our initially false expectations shape the way we act toward someone. In turn, this person responds to our behaviour in a way that confirms our initially false belief.
    e. Attitudes are evaluative judgments. They predict behaviour best when situational influences are weak, when the attitude is strong, and when we consciously think about our attitude.
    f. Our behaviour also influences our attitudes. Counterattitudinal behaviour is most likely to create cognitive dissonance when the behaviour is freely chosen and has negative implications for our sense of self-worth or produces foreseeable negative consequences.
    g. To reduce dissonance, we may change our attitude to become more consistent with how we have behaved. In situations where our attitudes are weak and counterattitudinal behaviour doesn't threaten our self-worth, we may change our attitudes through self-perception.
    h. Communicator, message, and audience characteristics influence the effectiveness of persuasion. Communicator credibility is highest when the communicator is perceived as expert and trustworthy. Fear-arousing communications may be effective if they arouse moderate to strong fear and suggest how to avoid the feared result. The central route to persuasion works best with listeners who have a high need for cognition; for those with a low cognition need, the peripheral route works better.
2. Social Influence
    a. A social norm is a shared rule or expectation about how group members should think, feel, and behave. A social role is a set of norms that defines a particular position in a social system.
    b. People conform to a group because of informational social influence and normative social influence. The size of the majority and the presence or absence of dissenters influence the degree of conformity. Minority influence is strongest when the minority maintains a consistent position over time but does not too deviant.
    c. Milgram's obedience research raised strong ethical concerns and found unexpectedly high percentages of people willing to obey destructive orders. Such obedience is stronger when the victim is remote and when the authority figure is close by, legitimate, and assumes responsibility for what happens.
    d. People use special techniques to get us to comply with their requests. These compliance techniques include the norm of reciprocity, the door-in-the-face technique, the foot-in-the-door technique, and lowballing.
    e. Deindividuation is a temporary lowering of restraints that can occur when a person is immersed in a group. Anonymity to outsiders appears to be the key factor in producing deindividuation.
    f. Social loafing occurs when people exert less individual effort when working as group thank when working alone. Social loafing decreases when the goal or group member is valued highly and when people's performance within the group can be individually monitored.

g. When the members of a decision-making group initially share the same conservative or liberal viewpoint, the group's final decision often reflects a polarization effect and becomes more extreme than the average opinion of the individual members.
h. Cohesive decision-making groups that have directive leaders, are under high stress, and are insulated from outside input may display groupthink, a suspension of critical thinking to maintain cohesion and loyalty to the leader's viewpoint.

3. Social Relations
   a. Proximity, mere exposure, similarity of attitudes, and physical attractiveness typically enhance our attraction toward someone. Relationships deepen as partners self-disclose and exchanges between them become more intimate and broader. Social exchange theory analyzes relationships in terms of the rewards and costs experienced by each partner.
   b. The qualities that people find most attractive in a mate vary somewhat across cultures. Evolutionary theorists propose that gender difference in mate preferences reflect inherited biological tendencies, whereas sociocultural theorists believe that these differences result from socialization and gender inequities in economic opportunities.
   c. Partners are more likely to remain happily married when they understand each other and deal with conflicts by de-escalating their emotions and providing mutual support.
   d. Overt prejudice has decreased in some ways, but people may hide their prejudice or be unaware of subtle prejudices they harbor.
   e. Prejudice stems partly from our tendency to perceive in-groups and out-groups. People typically display in-group favoritism and an out-group homogeneity bias. Perceive threats to one's in-group and a need to enhance one's self-esteem can motivate prejudice.
   f. Prejudice often is reduced when in-group and out-group members work closely together, with equal status, on tasks involving common goals and under conditions of broader institutional support.
   g. Some theorists propose that through kin selection and reciprocal altruism, evolution has helped to shape a genetic predisposition toward prosocial behaviour among humans. Social learning theorists emphasize how social norms, modelling, and reinforcement shape prosocial attitudes and behaviour.
   h. The presence of multiple bystanders may decrease bystander intervention through social comparison processes and a diffusion of responsibility for helping. We are most likely to help others when we perceive that they are similar to us and not responsible for their plight.
   i. Prosocial behaviour can be increased by enhancing people's feelings of empathy for victims and providing prosocial models.
   j. Heredity influences the strength of an organism's tendency to aggress. The hypothalamus, amygdala, and frontal lobes play especially important roles in certain types of aggression.
   k. Provocation, heat, crowding, and stimuli that cause frustration or pain increase the risk of aggression. Learning experiences help to shape a tendency to behave more or less aggressively. People are more likely to aggress when they find ways to justify and rationalize their aggressive behaviour, perceive provocation as intentional, and have little empathy for others.
   l. Most research supports the social-cognitive theory prediction that watching movie and TV violence, and playing violent video games, increase the risk that children and adults will act aggressively.

Chapter 14 Personality

March 18, 2018 9:40 PM

1. What Is Personality?
    a. **Personality** is the distinctive and relative enduring ways of thinking, feeling, and acting that characterize a person's responses to life situations.
    b. The thoughts, feelings, and actions that are seen as reflecting an individual's personality typically have three characteristics.
        i. **Components of Identity**: First, they are seen as components of identity that distinguish that person from other people.
        ii. **Perceived Internal Cause**: Second, the behaviours are viewed as being caused primarily by internal rather than environmental factors.
        iii. **Perceived Organization and Structure**: Third, the person's behaviours seem to fit together in a meaningful fashion, suggesting an inner personality that guides and directs behaviour.
2. The Psychodynamic Perspective
    a. Freud's Psychoanalytic Theory
        i. Psychic Energy and Mental Events
            1) Instinctual drives generate **psychic energy**, which powers the mind and constantly presses for either direct or indirect release.
            2) Mental events may be conscious, preconscious, or unconscious.
                a) The **conscious mind** consists of mental events that we are presently aware of.
                b) The **preconscious mind** contains memories, thoughts, feelings, and images that we are unaware of at the moment but that can be called into conscious awareness.
                c) The **unconscious mind** is a dynamic realm of wishes, feelings, and impulses that lies beyond our awareness.
        ii. The Structure of Personality
            1) The ID
                a) The **id** exists totally within the unconscious mind.
                b) It is the innermost core of the personality, the only structure present at birth, and the source of all psychic energy.
                c) The id has no direct contact with reality and functions in a totally irrational manner.
                d) Operating according to the **pleasure principle**, it seeks immediate gratification or release, regardless of rational considerations and environmental realities.
            2) The Ego
                a) The **ego** functions primarily at a conscious level, and it operates according to the **reality principle**.
                b) It tests reality to decide when and under what conditions the id can safely discharge its impulses and satisfy its needs.
            3) The Superego
                a) **Superego** developed by the age of four or five, and was the repository for the values and ideals of society.
                b) These ideals are internalized by the child through identification with his or her parents, and by explicit training about what is right, what is wrong, and how the child should be.
                c) With the development of the superego, self-control takes over from the external controls of rewards and punishments.
                d) Like the ego, the superego strives to control the instincts of the id, particularly the sexual and aggressive impulses that are condemned by society.

i) Whereas the ego tries to delay gratification until conditions are safe and appropriate, the superego, in its quest for perfection, tries to block gratification permanently.

iii. Conflict, Anxiety, and Defence
   1) Theory
      a) When the ego confronts impulses that threaten to get out of control or is faced with dangers from the environment, anxiety results, serving as a danger signal and motivates the ego to deal with the problem at hand.
      b) In many instances, the anxiety can be reduced through realistic coping behaviours, but when realistic strategies are ineffective in reducing anxiety, the ego may resort to **defence mechanisms** that deny or distort reality.
      c) Some of the defence mechanisms permit the release of impulses from the id in disguised forms that will not conflict.
   2) Major Defense Mechanisms
      a) In **repression**, the ego uses some of its energy to prevent anxiety-arousing memories, feelings, and impulses from entering consciousness.
      b) **Sublimation** refers to display the thoughts in socially desirable behaviours.
      c) (real textbook for major defence mechanisms)

iv. Psychosexual Development
   1) Theory
      a) Freud proposed that children pass through a series of psychosexual stages during which the id's pleasure-seeking tendencies are focused on specific pleasure-sensitive areas of the body called **erogenous zones**.
      b) If there is either inadequate or excessive gratification at any of these stages, then fixation at that stage occurs and instincts stay focused, or fixated, on that stage's erogenous zone.
   2) Stages of Psychosexual Development

Stage	Approximate Age	Erogenous Zone	Key Task
Oral	0–2	Mouth	Weaning
Anal	2–3	Anus	Toilet training
Phallic	4–6	Genitals	Resolving Oedipus complex
Latency	7–puberty	None	Developing social relationships
Genital	puberty on	Genitals	Developing mature social and sexual relationships

v. Research on Psychoanalytic Theory
   1) Freud believed that careful observations of everyday behaviour and clinical phenomena were the best source of evidence.
      a) He opposed experimental research, believing that the complex phenomena he had identified could not be studied under controlled conditions.
   2) Most modern psychologists do not believe that clinical observations are sufficient proof of a theory.

vi. Freud's Legacy: Neoanalytic and Object Relations Approaches
   1) **Neoanalysts** were psychoanalysts who disagreed with certain aspects of Freud's thinking and developed their own theories.
      a) They believed that Freud did not give social and cultural factors a sufficiently important role in the development and dynamics of personality.
      b) The second major criticism was that Freud laid too much emphasis on the events of childhood as determinants of adult personality.

2) Alfred Adler insisted that humans are inherently social beings who are motivated by **social interest**, the desire to advance the welfare of others. They care about others, cooperate with them, and place general social welfare above selfish personal interests.
    a) Alder also postulated a general motive of **striving for superiority**, which drives people to compensate for real or imagined defects in themselves, the **inferiority complex** and to strive to be ever more competent in life.
3) Carl Jung proposed that humans possess not only a **personal unconscious** based on their life experiences, but also a **collective unconscious** that consists of memories accumulated throughout the entire history of the human race.
    a) These memories are represented by **archetypes**, inherited tendencies to interpret experience in certain ways.
4) **Object relations** theorists focus on the images or mental representations that people form of themselves and other people as a result of early experience with caregivers.
    a) Whether realistic or distorted, these internal representations of important adults become lenses, or working models through which later social interactions are viewed, and these relational themes exert an unconscious influence on a person's relationships throughout life.

b. Evaluating Psychoanalytic Theory
    i. Psychoanalytic theory has often been criticized on scientific grounds.
        1) One reason of that many of its specific propositions have not held up under the scrutiny of research.
        2) Another major problem with psychoanalytic theory is that it is hard to test, not because it doesn't explain enough, but because it often explains too much to allow clear-cut behavioural predictions.
    ii. Freud's emphasis on the unconscious was scorned by a Victorian society that emphasized rationality and was condemned as unscientific by generations of personality psychologists with a behaviorist orientation.

3. The Humanistic Perspective
    a. Introduction
        i. Humanistic theories emphasize the central role of conscious experience, as well as the individual's creative potential and inborn striving for **self-actualization**, the total realization of one's human potential.
    b. George Kelly's Personal Construct Theory
        i. People’s primary goal is to make sense out of the world, to find personal meaning in it.
            1) When they are unable to do so, they experience uncertainty and anxiety.
            2) To achieve understanding, they try to explain and understand the events of their lives, and they test this understanding in the same way scientists do: by attempting to anticipate, to predict.
        ii. People construct reality by their individual system of **personal constructs**, which are cognitive categories into which they sort the people and events in their lives, which is the primary basis for individual differences in personality.
        iii. Rather than evaluating alternative constructions according to whether or not they are true, Kelly examined the consequences of construing in particular ways.
            1) If the construction led to bad outcomes, then the task would be to find a more useful and heathier alternative construction.
        iv. In order to help clients experiment with new viewpoints and behaviours, Kelly developed a therapeutic technique called **fixed-role therapy**.
            1) He wrote role descriptions and behavioural scripts for his clients that differed from their typical views of themselves.
    c. Carl Rogers's Self Theory
        i. Introduction
            1) Rogers believed that the forces that direct behaviour are within us and that,

when they are not distorted or blocked by our environment, they can be trusted to direct us toward self-actualization.

ii. The Self
    1) **Self**, or **self-concept**, is an organized and consistent set of perceptions of and beliefs about oneself, playing a powerful role in guiding our perceptions and directing our behaviour.
    2) Self-concept develops in response to our life experience, though many aspects of it remain quite stable over time.
        a) There are also cultural influences on our self-concept.
    3) Once the self-concept is established, there is a tendency to maintain it, for it helps us understand ourselves in relation to the world.
        a) We therefore have needs for **self-consistency** (an absence of conflict among self-perceptions) and **congruence** (consistency between self-perceptions and experiences).
        b) Any experience we have that is inconsistent with our self-concept, including our perceptions of our behaviour, evokes threat and anxiety.
        c) To preserve their self-images, people not only interpret situations in self-congruent ways, but they also behave in ways that will lead others to respond to them in a self-confirming fashion.
    4) According to Rogers, the degree of congruence between self-concept and experience helps to define one's level of adjustment.
        a) The more inflexible people's self-concepts are, the less open they will be to their experience and the more maladjusted they will become.

iii. Self-Esteem
    1) **Self-esteem** refers to how positively or negatively we feel about ourselves, and it is a very important aspect of personal well-being, happiness, and adjustment.
    2) In adulthood, there are only small differences in overall self-esteem between men and women.
        a) However, during late adolescence, males report having higher self-esteem than females do.
        b) Levels of self-esteem tend to be stable across development from childhood to old age.
    3) Self-esteem is related to many positive behaviours and life outcomes.
        a) People with high self-esteem are less susceptible to social pressure, have fewer interpersonal problems, are happier with their lives, achieve at a higher and more persistent level, and are more capable of forming satisfying love relationships.
    4) While success bolsters the self-esteem of those already high in self-esteem, success generates self-doubt and anxiety among those low in self-esteem.
    5) Earlier work found that self-esteem has an impact on how people act to regulate their mood.
    6) Self-esteem is also linked to expressive behaviour, such as emotional expressivity and self-disclosure.
    7) Children develop higher self-esteem when their parents communicate unconditional acceptance and love, establish clear guidelines for behaviour, and reinforce compliance while giving the child freedom to make decisions and express opinions within those guidelines.
    8) Unstable or unrealistically high self-esteem may be even more dangerous to the individual and society than low self-esteem.
        a) When unstable or inflated self-esteem is threatened, individuals may react aggressively, even violently, to protect their self-esteem.
        b) The higher one's self-esteem, the greater the vulnerability to ego threats.

iv. The Need for Positive Regard
    1) Rogers believed that we are born with an innate **need for positive regard** - that is, for acceptance, sympathy, and love from others.

2) **Unconditional positive regard** communicates that the child is inherently worthy of love.
    a) **Conditional positive regard**, however, is dependent on how the child behaves.
3) People need positive regard not only from others but also from themselves, and a **need for positive self-regard** also develops.
4) Lack of unconditional positive regard from parents and other significant people in the past teaches people that they are worthy of approval and love only when they meet certain standards.
    a) This fosters the development of **conditions of worth** that dictate when we approve or disapprove of ourselves.

v. Fully Functioning Persons
1) As Rogers viewed them, **fully functioning persons**, or those people who had achieved self-actualization, do not hide in behand masks or adopt artificial roles.
2) Because they are fairly free of conditions of worth, they can accept inner and outer experiences as they are, without modifying them defensively to suit a rigid self-concept or the expectations of others.

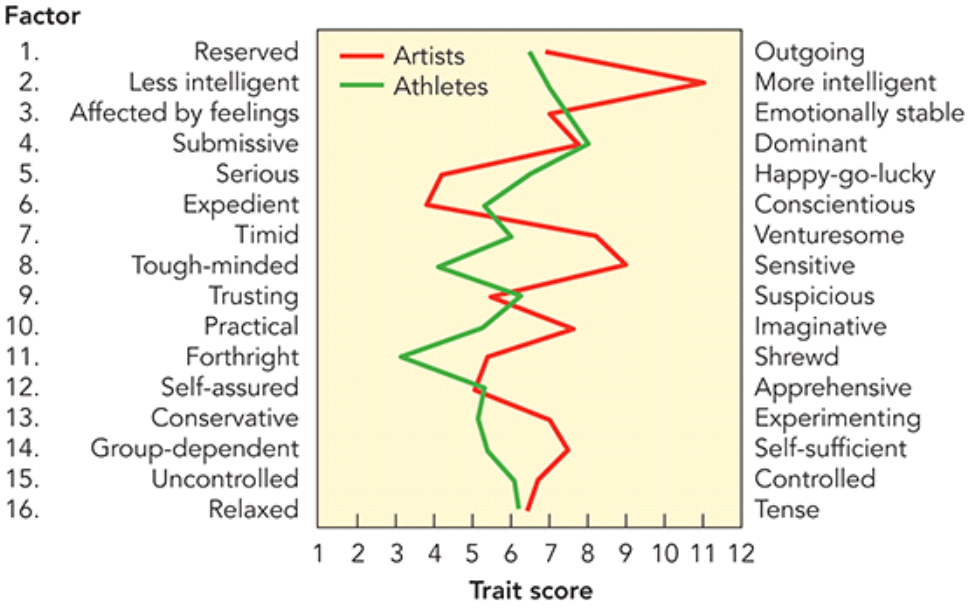
d. Research on the Self
i. Self-Verification and Self-Enhancement Motives
1) The need to preserve people's self-concept by maintaining self-consistency and congruence is called **self-verification**.
    a) People selectively attend to and recall self-consistent information.
    b) Self-verification needs are also expressed in people's tendency to seek out self-confirming relationships.
2) **Self-enhancement** refers to people's need to regard themselves positively.
    a) Positive illusions of oneself are the rule rather than the exception in well-adjusted people and that these self-enhancement tendencies contribute to their psychological well-being.

ii. Culture, Gender, and the Self
1) Culture provides a learning context in which the self develops.
2) Gender-role socialization provides us with **gender schemas**, organized mental structures that contain our understanding of the attributes and behaviours that are appropriate and expected for males and females.
    a) Within a given culture, gender schemas tell us what the typical man or woman should be like.

e. Evaluating Humanistic Theories
i. Humanistic theorists focus on the individual's subjective experiences, and what matters the most is how people view themselves and the world.
ii. Some critics believe that the humanistic view relies too much on individuals' reports of their personal experiences.
1) Some critics also believe that it is impossible to define an individual's actualizing tendency except in terms of the behaviour that is supposedly produces.

4. Trait And Biological Perspective
a. Cattell's Sixteen Personality Factors

i.

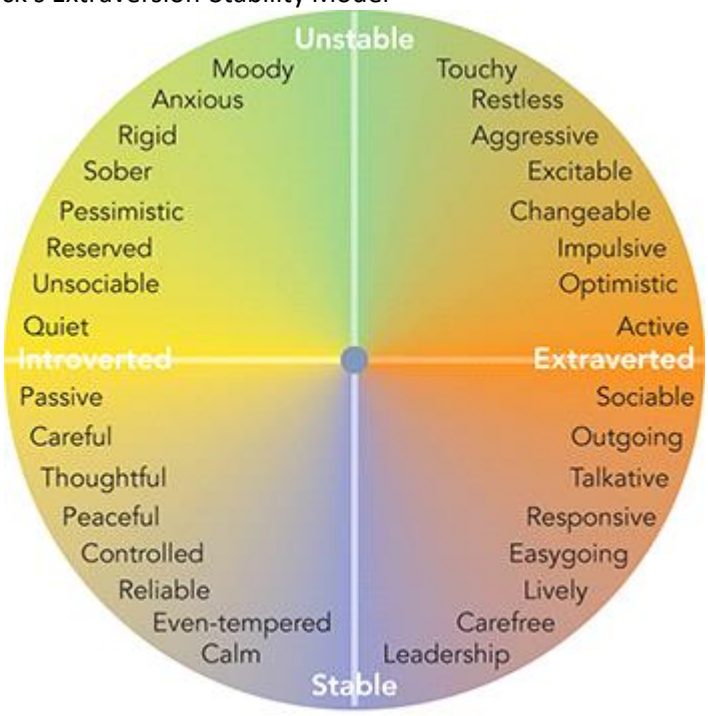


ii. Cattell developed a widely used personality test called the 16 Personality Factor Questionnaire (16PF) to measure individual differences on each of the dimensions and provide a comprehensive personality description.

iii. He was able to develop personality profiles not only for individuals, but also for groups of people.

b. Eysenck's Extraversion-Stability Model

i.



(b)

ii. Eysenck proposed only two basic dimensions, although he later added a third, calling his original basic dimensions of personality **Introversion-Extraversion** and **Stability-Instability** (or **Stability-Neuroticism**).

iii. The two basic dimensions intersect at right angles, indicating that these two dimensions are independent, or uncorrelated.

iv. Eysenck added a third dimension of **Psychoticism-Self Control**.

1) By **Psychoticism**, Eysenck meant someone who was creative and had a tendency toward nonconformity, impulsivity, and social deviance.

c. The Five Factor Model

i. Factor analytic studies suggest that five higher-order factors, each including several of Cattell's more specific factors, are all that needed to capture the basic

structure of personality.
    1) These theorists also believed that these Big Five factors may be universal to the human species, since the same five factors have been found consistently in trait ratings within cultures.
  ii. The **Big Fact** factors include OCEAN - openness, conscientiousness, extraversion, agreeableness, and Neuroticism.

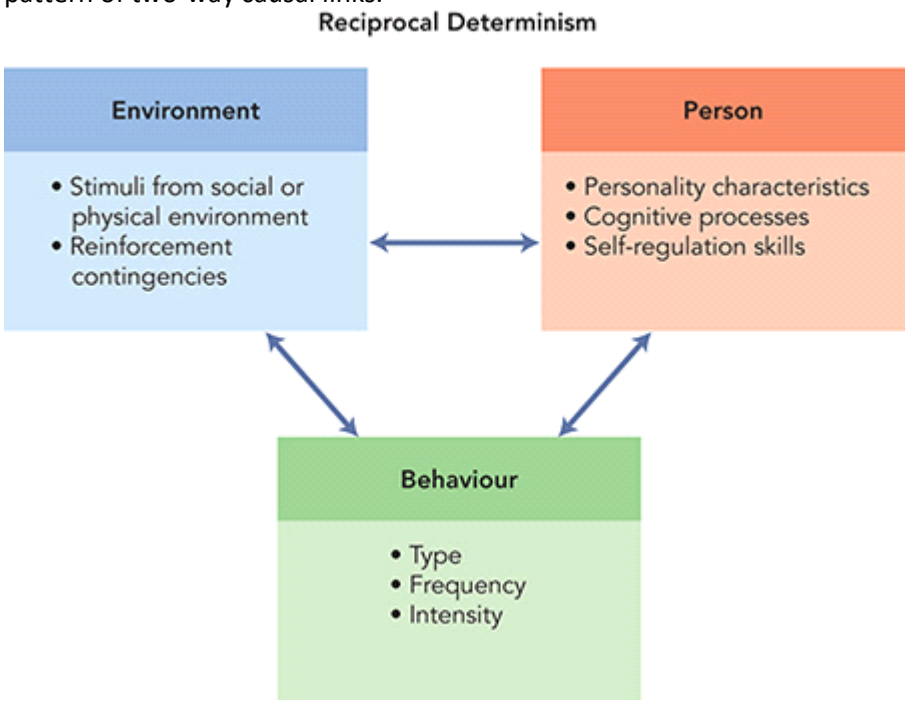
d. Traits and Behaviour Prediction
  i. Trait theorists try not only to describe the basic structure of personality, but also to predict real-life behaviour on the basis of a person's traits.
    1) The most important personality test to measure the Big Five is the NEO Personality Inventory (NEO-PI).
  ii. Research has found a powerful association between the Big Five personality traits and health, with different personality traits associated with an increased or decreased risk of a number of serious health problems.
    1) While personality traits clearly are risk or protective factors, the mechanisms involved are not well understood.
    2) The expectation is that different personality traits influence health by influencing lifestyle choices and specific behaviours, and then these behaviours have an impact on health.

e. Biological Foundations of Personality Traits
  i. Biological explanations for personality differences focus on three levels.
    1) Some researchers search for differences in the functioning of the nervous system.
    2) Genes make an important contribution to personality.
    3) Some psychologists have also used evolutionary principles to explain why these traits exist among humans.
  ii. Hans Eysenck linked Introversion-Extraversion and Stability-Instability to differences in individual's normal patterns of arousal within the brain.
    1) There is an optimal, or preferred, level of biological arousal in the brain.
    2) Extreme introverts are chronically overaroused: their brains are too electrically active, so they try to minimize stimulation and reduce arousal to get down to their optimal arousal level.
    3) Eysenck believed that the arousal patterns that underlie Introversion-Extraversion and Stability-Instability have genetic bases.

f. The Stability of Personality Traits
  i. Stability Over Time
    1) Personality traits are defined as enduring behavioural predispositions - they should thus show some degree of stability over time and across situations.
    2) Some personality dimensions tend to be more stable than others.
    3) Introversion-extraversion, temperamental traits such as emotionality and activity level, and the tendency to think optimistically or pessimistically tend to be quite stable.
  ii. Stability Across Situations
    1) When it comes to stability of behaviour across situations, personality again shows both a degree of stability and some capacity for change.
    2) Three factors make it difficult to predict on the basis of personality traits how people will behave in particular situations.
      a) First, personality traits interact with other traits as well as with characteristics of different situations.
      b) Second, the degree of consistency across situations is influenced by how important a given trait is for the person.
      c) Third, people differ in their tendency to tailor their behaviour to what is called for by the situation.
        i) This personality trait is called **self-monitoring**.
        ii) People who are high in self-monitoring are very attentive to situational cues and adapt their behaviour to what they think would be most appropriate.

g. Evaluating the Trait Approach
    i. Trait theorists have made an important contribution by focusing attention on the value of identifying, classifying, and measuring stable, enduring personality dispositions.
    ii. More attention must be paid to how traits interact with one another to affect various behaviours if we are to capture the true complexity of personality.

5. Social Cognitive Theories
    a. Introduction
        i. Social cognitive theorists have combined the behavioural and cognitive perspectives into an approach to personality that stresses the interaction of a thinking human with a social environment that provides learning experiences.
        ii. According to the social cognitive principle of reciprocal determinism, the person, the person's behaviour, and the environment all influence one another in a pattern of two-way causal links.
        iii.



    b. Julian Rotter: Expectancy, Reinforcement Value, and Locus of Control
        i. Factors of Expectancy and Reinforcement
            1) According to Rotter, the likelihood that we will engage in a particular behaviour in a given situation is influenced by two factors: expectancy and reinforcement value.
            2) **Expectancy** is our perception of how likely it is that certain consequences will occur if we engage in a particular behaviour within a specific situation.
            3) **Reinforcement** value is basically how much we desire or dread the outcome that we expect the behaviour to produce.
        ii. Locus of Control
            1) **Internal-external locus of control** is an expectancy concerning the degree of personal control we have in our lives.
                a) People with an internal locus of control believe that life outcomes are largely under personal control and depend on their own behaviour.
                b) People with an external locus of control believe that their fate has less to do with their own efforts than with the influence of external factors, such as luck, chance, and powerful others.
            2) Internal locus of control is positively related to self-esteem and feelings of personal effectiveness, and internals tend to cope with stress in a more active and problem-focused manner than do externals.
            3) Locus of control is called a **generalized expectancy** because it is thought to apply across many life domains.
    c. Albert Bandura: The Social Cognitive Perspective and Self-Efficacy

i. Human Agency
    1) A concept central to Bandura's work, and to social cognitive theory, is the idea of human agency, the idea that humans are active agents in their own lives.
    2) Human agency is a process, not a trait or a characteristic, and includes four aspects: intentionality, forethought, self-reactiveness, and self-reflectiveness.
        a) By **intentionality**, Bandura meant that we plan, modify our plans, and act with intention.
        b) We also show **forethought**; we anticipate outcomes, set goals, and actively choose behaviours relevant to those goals.
        c) **Self-reactiveness** refers to the process of motivating and regulating our own actions, the processes that we use when we modify our goals, monitor our progress toward those goals, and, when necessary, change strategies.
        d) With **self-reflectiveness**, we think about and evaluate our own motivations, values, and goals

ii. Self-Efficacy
    1) a key factor in the way people regulate their lives is their sense of self-efficacy, their beliefs concerning their ability to perform the behaviours needed to achieve desired outcomes.
    2) How to Enhance Self-Efficacy
        a) Set specific, behavioural, and measurable goals
        b) Set performance, not outcome, goals.
        c) Set difficult but realistic goals
        d) Set positive, not negative, goals
        e) Set short-range as well as long-range goals
        f) Set definite time spans for achievement
    3) Four important determinants create differences in self-efficacy.
        a) The most important is our previous **performance attainments** in similar situations, which shape our beliefs about our capabilities.
        b) A second source of information comes from **observational learning** - that is, observing others' behaviours and their outcomes.
        c) Third, self-efficacy can be increased or decreased by **verbal persuasion**: the messages we get from other people who affirm our abilities or downgrade them affect our efficacy beliefs.
        d) Finally, high **emotional arousal** that is interpreted as anxiety or fatigue tends to decrease self-efficacy.

d. Walter Mischel: The Consistency Paradox and If… Then… Behaviour Consistencies
    i. Mischel has formulated a personality theory, called the **cognitive-affective personality system (CAPS)**, in which both the person and the situation matter.
    ii. According to this view, there is a dynamic interplay between the characteristics that a person brings to the situation and the characteristics of the situation.
        1) It is this interaction that accounts for behaviour.
    iii. This view proposes what has been referred to as **if… then… behaviour consistencies**, which suggests that there is consistency in behaviour, but it is found within similar situations.

e. Evaluating Social Cognitive Theories
    i. A strength of the social cognitive approach is its strong scientific base.
        1) It brings together two perspectives, the behavioural and the cognitive, that have strong research traditions.
        2) The constructs of social cognitive theory can be defined, measured, and researched with considerable precision.
    ii. Another strength is its ability to translate insights derived from other perspectives into cognitive-behavioural concepts.
    iii. Social cognitive theory also helps to resolve an apparent contradiction between the central assumption that personality produces stability in behaviour and

research findings that people's behaviour is not very consistent across different situations.

6. Personality Assessment
    a. Interviews
        i. Interviewers can obtain information about a person's thoughts, feelings, and other internal states, as well as information about current and past relationships, experiences, and behaviour.
        ii. Structured interviews, frequently used to collect research data or make a psychiatric diagnosis, contain a set of specific questions that are administered to every participant.
        iii. The interview is valuable for the direct personal contact it provides, but it has some limitations.
            1) First, characteristics of the interviewer may affect how the person responds in ways that can affect the validity of the information.
            2) The validity of information obtained in an interview also depends on the interviewee's desire to cooperate, respond honestly, and report accurately what the interviewer is trying to assess.
    b. Behavioural Assessment
        i. In behavioural assessment, psychologists devise an explicit coding system that contains the behavioural categories of interest.
            1) Then they train observers until they show high levels of agreement (interjudge reliability) in using the categories to record behaviour.
        ii. Behavioural assessment can provide valuable information about how frequently and under what conditions certain classes of behaviour occur.
        iii. Behavioural assessment requires precision in defining the behaviours of interest and the conditions under which they occur.
    c. Remote Behaviour Sampling
        i. Through remote behaviour sampling, researchers and clinicians can collect samples of behaviour from respondents as they live their daily lives.
        ii. A tiny computerized device carried by respondents pages them at randomly determined times of the day. When the "beeper" sounds, respondents record their current thoughts, feelings, or behaviours, depending on what the researcher or therapist is assessing.
    d. Personality Scales
        i. Personality scales, or inventories, are widely used for assessing personality in both research and clinical work.
        ii. Personality scales are termed objective measures because they include standard sets of questions, usually in a true-false or rating scale format, that are scored by using an agreed-upon scoring key.
            1) Their advantages include the ability to collect data from many people at the same time, the fact that all people respond to the same items, and ease of scoring.
            2) Their major disadvantage is the possibility that some people will choose not to answer the items truthfully, in which case their scores will not be valid reflections of the trait being measured.
                a) To combat this threat to validity, some widely used tests have special validity scales that detect tendencies to respond in a socially desirable manner or to present an overly negative image of oneself.
        iii. The items on personality scales are developed in two major ways.
            1) In the rational approach, items are based on the theorist's conception of the personality trait to be measured.
            2) In a second approach to personality test development, known as the empirical approach, items are chosen not because their content seems relevant to the trait on rational grounds, but because previous research has shown that the items were answered differently by groups of people known to differ in the personality characteristic of interest.
    e. Projective Tests

i. The assumption underlying projective tests is that, when a person is presented with an ambiguous stimulus whose meaning is not clear, the interpretation attached to the stimulus will have to come partly from within.
ii. Thus, the person's interpretation may reflect the "projection" of inner needs, feelings, and ways of viewing the world onto the stimulus.

f. Rorschach Inkblots
    i. The Rorschach test consists of ten inkblots, five in black and white and five in colour. The person being tested is shown each one in succession and asked, "What does this look like? What might it be?"
g. Thematic Apperception Test
    i. The Thematic Apperception Test (TAT) consists of a series of pictures derived from paintings, drawings, and magazine illustrations. Although the pictures are more ambiguous than most photographs
        1) Respondents are asked to describe what is going on in each scene, what has led up to the current situation, what the characters are thinking and feeling, and what the outcome of the situation will be.
    ii. The TAT, like the Rorschach, has the problem of non-standardized or subjective interpretation of responses, which can result in different interpretations of the same stories.
h. Personality Theory and Personality Assessment
    i. Personality assessment is intimately related to theory. Theories provide us with a framework that specifies how thoughts, feelings, and bodily processes relate to one another and behaviour.
    ii. Assessment provides tools for measuring personality variables and testing the theory.

Chapter 14 Summary

March 18, 2018 11:59 PM

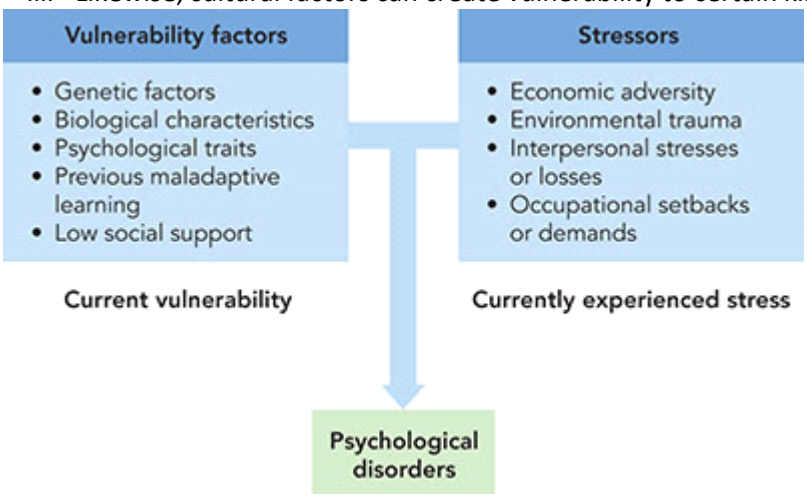
1. The Psychodynamic Perspective
    a. Freud's psychoanalytic theory views personality as an energy system. Personality dynamics involve modifications and exchanges of energy within this system. Mental events may be conscious, preconscious, or unconscious.
    b. Freud divided the personality into three structures: id, ego, and superego. The id is irrational and seeks immediate instinctual gratification on the basis of the pleasure principle. The ego operates on the reality principle, which requires it to test reality and mediate between the demands of the id, the superego, and reality. The superego is the moral arm of the personality.
    c. The dynamics of personality involve a continuous conflict between impulses of the id and counterforces of the ego and superego. When dangerous id impulses threaten to get out of control or when danger from the environment threatens, the result is anxiety. To deal with threat, the ego may develop defense mechanisms, which are used to ward off anxiety and permit instinctual gratification in disguised forms.
    d. Freud's psychosexual theory of personality development held that adult personality is basically molded by how children deal with instinctual sexual urges.
    e. Neoanalytic theorists modified and extended Freud's ideas in important ways, stressing social and cultural factors in personality development. Modern object relations theorists focus on the mental representations that people form of themselves, others, and relationships.
2. The Humanistic Perspective
    a. Humanistic theories emphasize the subjective experiences of the individual and thus deal with perceptual and cognitive processes. Self-actualization is viewed as an innate positive force that leads people to realize their positive potential, if not thwarted by the environment.
    b. George Kelly's theory emphasizes the subjective experiences of the individual and how we make sense out of the world and find personal meaning in it. He focused on the manner in which people differ in their construction of reality by the personal constructs they use to categorize their experiences.
    c. Carl Rogers's theory attaches central importance to the role of the self. Experiences that are incongruous with the established self-concept produce threat and may result in a denial or distortion of reality. Conditional positive regard may result in realistic conditions of worth that can conflict with self-actualization. Rogers described a number of characteristics of the fully functioning person.
    d. Rogers's theory helped to stimulate a great deal of research on the self-concept, including studies on the origins and effects of differences in self-esteem, self-enhancement and self-verification motives, and cultural and gender contributions to the self-concept.
3. Trait and Biological Perspectives
    a. Trait theorists try to identify and measure the basic dimensions of personality. They disagree about the number of traits needed to adequately describe personality. Cattell suggested 16 basic traits; other theorists insist that as few as five may be adequate. Eysenck posits three major dimensions, including extraversion and stability. Prediction studies indicate that a larger number of more-specific traits may be superior for prediction of behaviour in specific situations.
    b. Traits have not proved to be highly consistent across situations, and they also vary in stability over time. Individuals differ in their self-monitoring tendencies, and this variable influences the amount of cross-situational consistency they exhibit in social situations. Traits interact not only with situations but also with one another, thereby producing inconsistency.
    c. Biological perspectives on traits focus on differences in the nervous system, the

contribution of genetic factors, and the possible role of evolution in the development of universal human traits and ways of perceiving behaviour. Introversion-Extraversion, for example, has been linked to a person's level of brain arousal.

4. Social Cognitive Theories
    a. Social cognitive theories are concerned with how social relationships, learning mechanisms, and cognitive processes jointly contribute to behaviour. A key concept is reciprocal determinism, relating to two-way causal relations among personal characteristics, behaviour, and environment.
    b. Rotter's theory viewed behaviour as influenced by expectancies and the reinforcement value of potential outcomes. His concept of locus of control is a generalized belief in the extent to which we can control the outcomes in our life.
    c. Bandura's concept of self-efficacy relates to our self-perceived ability to carry out the behaviours necessary to achieve goals in a particular situation.
    d. According to Walter Mischel, behaviour results from relatively stable personal characteristics interacting with specific situational cues. Hence, a person's behaviour is consistent in similar situations but may not be consistent across different situations.
5. Personality Assessment
    a. Methods used by psychologists to assess personality include the interview, behavioural assessment, remote behaviour sampling, physiological measures, objective personality scales, and projective tests.
    b. The major approaches to constructing personality scales are the rational approach, in which items are written on an intuitive basis, and the empirical approach, in which items that discriminate between groups known to differ on the trait of interest are chosen.
    c. The MMPI-2 is the best-known test developed with the empirical approach. The NEO-PI, developed via the rational approach, measures individual differences in the Big Five factors.
    d. Projective tests present ambiguous stimuli to subjects. It is assumed that interpretations of such stimuli give clues to important internal processes. The Rorschach inkblot test and the Thematic Apperception Test are the most commonly used projective tests.

Chapter 16 Psychological Disorders

March 19, 2018 5:14 PM

1. The Scope and Nature of Psychological Disorders
    a. Three Judgement Criteria for Abnormality
        i. First, we are likely to label behaviours as abnormal if they are intensely distressing to the individual.
        ii. Second, most behaviours judged abnormal are dysfunctional either for the individual or for society.
        iii. The third criterion for abnormality is society's judgments concerning the deviance of a given behaviour.
    b. Summary
        i. We define **abnormal behaviour** as behaviour that is personally distressing, personally dysfunctional, and/or so culturally deviant that other people judge it to be inappropriate or maladaptive.
2. Historical Perspectives on Deviant Behaviour
    a. Throughout history, human societies have explained and responded to abnormal behaviour in different ways at different times, based on their values and assumptions about human life and behaviour.
    b. Today, many psychologists find it useful to incorporate these factors into a more general framework.
        i. According to the **vulnerability-stress model**, each of us has some degree of vulnerability for developing a psychological disorder, given sufficient stress.
        ii. The vulnerability can have a biological basis, personality factor, or previous environmental factors.
        iii. Likewise, cultural factors can create vulnerability to certain kinds of disorders.
    c. 

    d. In most instances, a predisposition creates a disorder only when a stressor—some recent or current event that requires a person to cope—combines with the vulnerability to trigger the disorder.
3. Diagnosing Psychological Disorders
    a. The DSM-5: Integrating Categorical and Dimensional Approaches
        i. The DSM-5 (and the DSM-IV-TR prior to May 2013) is the most widely used diagnostic classification system in North America.
        ii. The highly specific behavioural criteria in the DSM-IV-TR diagnostic categories clearly have improved reliability over earlier versions
            1) One trade-off, however, is that the criteria are so detailed and specific that many people—as many as 50 percent—don't fit neatly into the categories.
            2) Moreover, people who receive the same diagnosis may share only certain symptoms and look very different from one another.
            3) Finally, the categorical system does not provide a way of capturing the severity of the person's disorder, nor can it capture symptoms that are

adaptively important but not severe enough to meet the behavioural criteria for the disorder.

iii. An alternative (or supplement) to the categorical system is a dimensionalsystem, in which relevant behaviours are rated along a severity measure.
1) Such a system is based on the assumption that psychological disorders are extensions different in degree, rather than kind, from normal personality functioning.

b. Critical Issues in Diagnostic Labelling
i. Social and Personal Implications
1) Once a diagnostic label is attached to a person, it becomes all too easy to accept the label as an accurate description of the individual rather than of the behaviour.
2) It then becomes difficult to look at the person's behaviour objectively, without preconceptions about how he or she will act.
3) It also is likely to affect how we will interact with that person.

ii. Legal Consequences
1) Individuals judged to be dangerous to themselves or others may be involuntarily committed to mental institutions under certain circumstances.
a) When so committed, they lose some of their civil rights and may be detained indefinitely if their behaviour does not improve.
2) The law tries to take into account the mental status of individuals accused of crimes. Two particularly important legal concepts are competency and insanity.
a) Competency refers to a defendant's state of mind at the time of a judicial hearing (not at the time the crime was committed).
b) Insanity, a far more controversial issue, relates to the presumed state of mind of the defendant at the time the crime was committed.

4. Anxiety Disorders
a. Introduction
i. In **anxiety disorders**, the frequency and intensity of anxiety responses are out of proportion to the situations that trigger them, and the anxiety interferes with daily life.
ii. Anxiety responses have four components:
1) a **subjective-emotional component**, including feelings of tension and apprehension;
2) a **cognitive component**, including subjective feelings of apprehension, a sense of impending danger, and a feeling of inability to cope;
3) **physiological responses**, including increased heart rate and blood pressure, muscle tension, rapid breathing, nausea, dry mouth, diarrhea, and frequent urination; and
4) **behavioural responses**, such as avoidance of certain situations and impaired task performance
iii. Two statistics are commonly used in epidemiological research.
1) **Incidence** refers to the number of new cases that occur during a given period.
2) **Prevalence** refers to the number of people who have a disorder during a specified period of time

b. Phobic Disorder
i. **Phobias** are strong and irrational fears of certain objects or situations.
1) People with phobias make strenuous efforts to avoid the phobicsituation or object.
ii. Phobias can develop at any point in life, but many of them develop during childhood, adolescence, and early adulthood.
iii. The degree of impairment produced by a phobia depends in part on how often the phobic stimulus is encountered in the individual's normal round of activities.

c. Generalized Anxiety Disorder
i. **Generalized anxiety and worry disorder (GAD)** is a chronic state of diffuse, or

"free-floating," anxiety that is not attached to specific situations or objects.
        ii. In fact, our beliefs about worrying and control are highly correlated with the development GAD
        iii. Onset tends to occur in childhood and adolescence.
    d. Panic Disorder
        i. In contrast to generalized anxiety disorder, which involves chronic tension and anxiety, panic disorders occur suddenly and unpredictably, and they are much more intense.
        ii.
    e. Obsessive-Compulsive Disorder (OCD)
    f. Causal Factors in Anxiety Disorders and OCD
    g. Eating Disorders
5. Mood (Affective) Disorders
    a. Depression
    b. Bipolar Disorder
    c. Prevalence and Course of Mood Disorders
    d. Causal Factors in Mood Disorders
6. Somatic Symptom Disorders
7. Dissociative Disorders
8. Schizophrenia
    a. Characteristics of Schizophrenia
    b. Subtypes of Schizophrenia
    c. Causal Factors in Schizophrenia
9. Personality Disorders
    a. Antisocial Personality Disorder
    b. Borderline Personality Disorder
10. Disorders of Childhood and Old Age
    a. Childhood Disorders
    b. Dementia in Old Age

Chapter 16 Summary

March 19, 2018 7:54 PM

1. Diagnosing Psychological Disorders
    a. Abnormality is largely a social judgment. Behaviour that is judged to reflect a psychological disorder typically is (1) distressing to the person or other people; (2) dysfunctional, maladaptive, or self-defeating; and/or (3) socially deviant in a way that arouses discomfort in others and cannot be attributed to environmental causes.
    b. The major psychiatric classification system in North America is the DSM-5. Reliability (diagnostic agreement) and validity are important issues in diagnostic classification systems.
    c. Among the important issues in psychiatric diagnosis are the potential negative effects of labelling on social perceptions and self-perceptions. Legal implications of competency and insanity judgments are also receiving attention. Competency to stand trial means that the individual is in sufficient contact with reality to understand the legal proceedings. Insanity refers to an inability to appreciate the wrongfulness of one's act and to control one's behaviour at the time the crime was committed.
    d.
2. Anxiety Disorders
3. Mood (Affective) Disorders
4. Somatic Symptom Disorders
5. Dissociative Disorders
6. Schizophrenia
7. Personality Disorders
8. Disorders of Childhood and Old Age