Making Sense of the Environment

- **Attention**: Concentration on one aspect of environmental stimuli while ignoring or excluding other stimuli.
  - Q1. Provide a conceptual definition for selective attention, divided attention, the cocktail party effect, controlled processing, and automatic processing.
  - Q2. A collegiate basketball player makes a high percentage of his free-throw shots. He has repeated the same motion so many times, he now performs the task effortlessly and without much thought—an example of automatic processing. Which region of the brain is responsible for the motor learning exhibited by this basketball player? Update your BRAIN MAP accordingly.

- **Cognition**:
  - Information Processing Theory (a.k.a., Information Processing Model)
    - **Thinking**: Thinking includes perception of stimuli, encoding that stimuli, and storage of that information for later retrieval.
    - **Analysis of Stimuli**: As a part of decision-making, stimuli are altered and analyzed by the brain, not just responded to automatically.
    - **Situational Modification**: Stored decision-making and problem-solving experiences from the past can be extrapolated to solve new problems.
    - **Obstacle Evaluation**: An individual’s skill level in problem-solving does not depend solely on their cognitive development level, but largely on the nature and context of the problem/obstacle.
  - **Cognitive Development (CD)**
    - **Jean Piaget** = Considered to be the father of developmental psychology and a major contributor to Cognitive Theory.
      - **Schema** (Alternate plural form = Schemata): Piaget believed schemas were an important part of how we learn. You will hear about schemas not only from Piaget, but throughout Psychology. It is an important and yet slightly abstract concept—and thus something the MCAT is likely to test.
      - Q3. Provide a conceptual definition for the term schema, as used by psychologists. How do people use schemas to process new information? What generally happens when a person finds new information that does not fit within one of their existing schemas?
      - Q4. Provide two real-life examples of a case in which schemas are used to efficiently process new information in an unfamiliar situation. Provide two additional real-life examples of how the use of schemas could have undesirable results.
    - **Piaget’s Stages of CD (Cognitive Development)**
      1) **Sensorimotor**
      2) **Preoperational**
      3) **Concrete operational**
      4) **Formal operational**
        - Q5. Describe the age range, general characteristics, and developmental milestones associated with each of Piaget’s stages of CD.
Cognitive Changes in Late Adulthood

- **Age-Related Physical Changes**: The brain literally shrinks in size, and neural plasticity decreases. **Neural plasticity** is the brain’s ability to change structure and function to accommodate new memories, make new connections, create new motor skills, etc.

  - Loss of Neurons: The frontal lobe and corpus callosum lose neurons at the fastest rate; the cerebellum eventually loses about 25% of its neurons.

- **Age-Related Memory Changes**: Overall memory = Declines; Procedural memory = Stable; Working memory = Significant decline; **Semantic memory = Stable**.

Other Influences on CD

- CULTURE: Different expectations and traditions; different cultures will reward different behaviors because of different values.
- HEREDITY: Inheritance of genetic predispositions; inherited disorders such as Down’s Syndrome or Autism.
- ENVIRONMENT: Different parenting styles can reward different behaviors; exposure to environmental chemicals or toxins; fetal environment (e.g., fetal alcohol syndrome)
- BIOLOGY: Metabolic or other biological conditions can alter cognition or cause brain damage.

  - Problem Solving (PS) or Decision Making

- **Barriers to Effective PS (Problem Solving)**

  - **Mental Set**: Predetermined mental framework for approaching a problem; a tendency to rely on approaches and solutions that have worked in the past. Mental sets can lead to rigid thinking and a lack of cognitive flexibility.

  - **Functional Fixedness**: One example of a mental set in which, when solving a problem, we can only visualize using an object or tool in the ways we have seen it used previously.

    ◦ Q6. Explain Duncker’s candle problem and provide a conceptual definition for functional fixedness. Provide two additional real-life examples of functional fixedness.

  - **Cognitive Bias**: An error in thinking that leads to inaccuracy, illogical thought, a lack of objectivity, a failure to consider all available options or consequences, or prejudice toward one approach or outcome.

- **Approaches to PS**:

  1) **Trial and Error**: Try it out, test both or multiple options, and discover what works and what doesn’t. This is only effective when there are relatively few available options.

  2) **Algorithms**: Mathematical formulas or a step-by-step, flowchart-like approach.

  3) **Heuristics**: “Rules of Thumb.” Heuristics can be helpful in problem solving, but can also cause functional fixedness and a lack of cognitive flexibility.

    ◦ **Representative Heuristic**: Reliance on prototypes or stereotypes as a shortcut to making a decision or judgment.

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**IMPORTANT NOTE**

As you age, you lose working memory and rote memory, but semantic memory—the memory of the meaning of things, understanding, and concept-based knowledge—remains relatively stable. Notice how directly the science ties into the Altius program design, and how much YOU personally benefit from following it. If you try to memorize everything, you are going to forget it the minute you walk out of the testing center. But if you follow our repeated admonition to **conceptualize, don’t memorize**, you will not only get a better MCAT score, but you’ll get to keep what you learned for life!
Availability Heuristic = Favoring the most easily recalled or imagined solution as a shortcut to making a decision or judgment.

Anchoring and Adjustment Heuristic = Giving higher priority to the very first piece of information received and/or framing subsequent information around it.

4) Intuition = One’s “gut feeling.” Often based on previous experience, in which case, it is an example of unconsciously applying a heuristic, or mental set.

5) Deductive Reasoning = Conclusions are based on assumed premises; also referred to as “Top-Down Processing.”

6) Inductive Reasoning = Making generalizations from specific observations; also referred to as “Bottom-Up Processing.”

Q7. Label the following as examples of inductive or deductive reasoning. Justify your answers.
)a) Some people believe dogs are more intelligent than cats. My dog can play fetch, but my cat cannot. Therefore, dogs are smarter than cats.
b) The veterinarian visited all of the horses in the county last week. All of the horses the veterinarian visited were brown. Therefore, all of the horses in the county are brown.

Q8. Provide a conceptual definition for the following types of bias: confirmation bias, overconfidence, belief perseverance, and base rate fallacy. Propose your own real-life example to illustrate each bias.

Sample MCAT Question

1) Suppose it is discovered that the kidney has a hormone function that was previously unknown and is currently the subject of further investigation. A researcher exhibiting functional fixedness is likely to favor which new kidney function?

A) Secretion of gonadotropins
B) Secretion of oxytocin
C) Regulation of aldosterone levels
D) Regulation of triiodothyronine levels

Solution: The functional fixedness bias suggests that a person has a hard time visualizing a tool or object as having a use or application different from the one with which they are accustomed. Applied to kidney function, researchers would be biased toward a new kidney function that is closely related to what they normally expect the kidney to do. Answer C is therefore correct, because it involves a hormone that acts on the kidney. Answers A, B and D are false because these hormones are unrelated to the kidney (based on current understanding) and therefore researchers would have a hard time considering them in an unbiased way as possible new functions.
o Intellectual Functioning

- **Theories of Intelligence**

  - **Gardner** = Often called “Gardner’s Theory of Multiple Intelligences.” Gardner identified eight types of intelligence. His theory challenged the concept that all students learn in the same way, or that numerical measures of intelligence are sufficient. Gardner noted that IQ tests examine only the last two intelligences, and that Western cultures favor the last two over the previous six. MCAT-2015 would be most likely to give you an example or scenario and ask you to identify it as an illustration of one of the eight types of intelligences.

  1) Visual-Spatial
  2) Bodily-Kinesthetic
  3) Musical
  4) Interpersonal
  5) Intrapersonal
  6) Naturalistic (added by Gardner later, some texts report only seven intelligences)
  7) **Linguistic**
  8) **Logical-Mathematical**

  - **Galton** = Argued that individual heritable characteristics contributed to intelligence as much as any gene contributes to physical traits. Although he introduced “genetic intelligence,” he also pioneered the *nature vs. nurture* debate (he coined the actual phrase) by conducting the first twin studies involving monozygotic and dizygotic twins. Galton was the first to use the questionnaire/survey as an experimental tool. Finally, Galton introduced the concept of “correlation” and the method of calculating statistical correlations.

  - Galton’s Genetic Bias and Eugenics: When you see GALTON THINK: **Nature, NOT Nurture**. Despite his twin studies providing groundbreaking evidence for nurture, Galton leaned toward a stronger genetic component. In fact, this bias led him to be a strong proponent of eugenics.

  - **Eugenics** = Any belief, method, or practice designed to improve the genetic makeup of the human race, usually by preventing the birth, reproduction rate, or survival of individuals deemed to have "less-desirable" genes. Today, eugenics is almost universally considered unethical by scientists and non-scientists alike.

  - **Spearman** = Introduced the concept of **General Intelligence**—often called the “g factor” and assigned a lowercase variable, \( g \). Spearman argued that general intelligence was the bedrock intellect from which all other forms of intelligence are developed.

  - **Binet** = First to develop an intelligence scale, the **Binet-Simon Intelligence Scale**, and the concept of mental age vs. chronological age. Binet’s purpose was to identify children who needed extra educational help or attention in school. Adapted by a Stanford professor to create the Stanford-Binet IQ Test widely in use today.

- **Variations in Intellectual Ability**: Intelligence follows a **Normal Distribution** (a.k.a., Gaussian)

  - **STANFORD-BINET IQ TEST (S-B)**: IQ stands for Intelligence Quotient and is given by the formula below. The mean \( M \) is 100 and the standard deviation \( SD \) is 15. S-B tests linguistic intellect and logical-mathematical intellect. S-B is considered a best practice for evaluating differences in intellectual ability. However, the test, and IQ testing generally, is not without criticism. An IQ test measures only certain types of intellect and should NOT be interpreted as implying that IQ is fixed and unchangeable.

  \[
  IQ = \frac{\text{mental age}}{\text{chronological age}} \times 100
  \]

  - **IQ Correlations**: IQ is positively correlated with the following, and negatively correlated with the opposite, or lack thereof. As usual, intelligence is influenced by both genetic and environmental factors.

    - High level of parental expectation
    - Higher socioeconomic status
    - Early educational intervention
    - Adequate nutrition
Q9. Michael can solve algebra problems more quickly than his little brother, Alan. Michael also has a larger vocabulary. However, on a recent administration of the Stanford-Binet IQ test, Alan scored higher than Michael. Assuming there were no errors or bias in the test, how is this possible?

- **Consciousness:**
  - States of Consciousness = Alertness, Sleep, Dreaming, Hypnosis, Meditation, and Drug-Altered.
  - Brain Waves: Level of consciousness is associated with different brain wave patterns on an electroencephalograph (EEG): alpha, beta, theta, and delta. **Wave frequency decreases according to:** beta (14-40 Hz) > alpha (9-13 Hz) > theta (4-8 Hz) > delta (0.5-3.9 Hz). This is important to note because it does not follow the alphabetic trend implied by the names.
    - Alpha = Very relaxed, or meditating
    - Beta = Awake and alert
    - Theta = Light sleep
    - Delta = Deep sleep
  - ALERTNESS: State of consciousness in which a person is awake, responsive, and capable of processing information.
    - Neural Pathway: The reticular formation of the brain stem stimulates the prefrontal cortex to maintain alertness. **Loss of this function = Coma.**
    - Q10. Update your BRAIN MAP to indicate the regions of the brain that are responsible for maintaining conscious alertness.
  - SLEEP: A regular state of rest and reduced consciousness deemed physiologically necessary at approximate 24-hour intervals (i.e., **circadian rhythms**). Cortisol levels are higher when a person is awake and alert and lower during sleep. The hormone melatonin is released by the pineal gland, at least in part due to decreasing levels of light.
    1) Stages of Sleep:
      - **Stage One** = Falling asleep, EEG is a mix of alpha and theta waves.
      - **Stage Two** = Deeper sleep, EEG is theta waves mixed with sleep spindles and K complexes.
      - **Stage Three** = Transitional, EEG is mostly theta waves, but delta waves begin to appear.
      - **Stage Four** = Deep sleep, often called “delta sleep” because the EEG contains slow (low frequency) delta waves.
      - **Rapid-Eye Movement Sleep (REM):** REM is an intervillic period of sleep denoted by rapid or random eye movements and a heightened sense of alertness that is greater than any of the sleep stages. It occurs in between the other stages of sleep, with several periods of REM happening throughout the night. The first REM period are shorter and the longest REM period usually occurs in the morning right before waking. **Most vivid dreams are thought to occur during REM sleep.**
        - **Paradoxical Sleep** = Phrase used to describe the ironic fact that during REM sleep alertness, heart rate, breathing, and EEG patterns are nearly that of wakefulness, and yet one’s muscles are paralyzed.
      - Q11. Draw a graph of brain wave frequency vs. time for a person progressing from a state of alertness, to a state of deep relaxation, and then through the four stages of sleep, in order, from 1 to 4.
    - Sleep-Wake Disorders
      - **Physiological Effects of Chronic Sleep Deprivation** = Positively correlated with decreased cognitive functioning, depression, and multiple chronic diseases including: heart disease, high blood pressure, obesity, and diabetes.
      - **Dyssomnias** = Difficulty falling asleep, staying asleep, or avoiding sleep.
        - Insomnia: Difficulty falling asleep or staying asleep.
        - Sleep Apnea: Difficulty breathing while asleep.
- **Narcolepsy** = Chronic neurological disorder caused by autoimmune attack of the neurons that release hypocretin—a hormone that normally regulates sleep-wake cycles. Symptoms include cataplexy (defined below) and inappropriate daytime sleep. Patients experience daytime sleepiness similar to that described by normal adults after 24-48 hours of sleep deprivation. During narcolepsy episodes the individual enters REM sleep after 5 minutes or less, when REM is normally reached after 90-120 minutes.
  - Cataplexy = Sudden, transient periods of muscle weakness or paralysis during which the patient remains fully conscious and aware.

- **Parasomnias** = Abnormal movements, behavior, perceptions, or emotions during sleep.
  - Sleepwalking (a.k.a., somnambulism)
  - Night Terrors (a.k.a., pavor nocturnus) = Experience of severe anxiety, dread, or terror during the first few hours of Stages 3-4 (non-REM) sleep. Most common in children. Associated with screaming, thrashing, or suddenly sitting up in bed, and hyperstimulation of the sympathetic nervous system.

**Q12. Suppose a patient is taking an experimental steroid-derived drug suspected to be a steroid antagonist. The patient complains of difficulty sleeping at night and difficulty staying awake during the day. A medical student suggests the drug may be interfering with the normal action of melatonin. Is the student’s suggestion a plausible explanation for these observations? Why or why not?**

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**Sample MCAT Question**

2) A recent study reported that compared to the children of upper class families, children from families of government-defined low socioeconomic status are twice as likely to report night terrors. This suggests that the children of:

A) wealthy parents are more likely to experience nighttime elevations in blood pressure.
B) wealthy parents are less likely to experience nighttime elevations in blood pressure.
C) poor parents are more likely to have constricted pupils when they awake from a night terror.
D) poor parents are less likely to have dilated pupils when they awake from a night terror.

**Solution:** The children of wealthy parents are less likely to have night terrors. Night terrors are characterized by hyperstimulation of the sympathetic nervous system, so night terrors would be associated with elevated blood pressure and dilated pupils. Combining this information, we see that A cannot be true because children of wealthy parents are less likely to have night terrors. Answer C is false because children of poor parents are more likely to have terrors, and therefore more likely to have dilated pupils. Answer D is false because children of poor parents are actually more likely to have dilated pupils, not less. Answer B is the correct answer because children of wealthy parents are less likely to have terrors and therefore less likely to experience elevated nighttime blood pressure.
DREAMING: Several theories have been proposed to explain the phenomenon of dreaming.

- **Psychoanalytic Theory** (Freud) = Dreams are expressions of unconscious desires, thoughts and motivations. Dreams can serve as a virtual form of wish fulfillment.

- **Cognitive Theory** (Hall) = Dreams are a conceptualization of our experiences; they are visualizations of our thoughts and perceptions about five concepts: our self, others, the world around us, morals, and conflict.

- **Information Processing Theory** = Memories and information accumulated during the day are consolidated during sleep. Dreaming is the cerebral cortex associating images or meaning with this consolidation process.

- **Problem-Solving Theory** = Dreams are a way for the mind to solve problems encountered while awake. Some proponents suggest the unconscious dreaming mind is better suited or more capable of solving problems than the awake mind—unrestricted by reality or more sensitive to subtle clues.

- **Activation-Synthesis Theory** = The limbic system is randomly active during sleep, mimicking incoming stimuli. Dreams are an attempt by the cerebral cortex to synthesize and interpret this activity in a logical way.

HYPNOSIS: A trance-like state under which a person becomes highly suggestible. It is induced by a therapist and can serve to recall repressed memories, control pain, or stop undesirable behavior (e.g., weight loss, addictions).

MEDITATION: An intentionally altered state of consciousness intended to improve focus or overall well-being. Meditation is a part of many religious beliefs. It is not well defined scientifically, but it has been shown to be associated with a relaxed, slower wave state of arousal reproducible on an EEG.

DRUG-ALTERED STATE OF CONSCIOUSNESS:

- **Drug Types:**
  1) **DEPRESSANTS** = Alcohol, barbiturates, benzodiazepines
  2) **STIMULANTS** = Amphetamines, cocaine, ecstasy.
  3) **HALUCINAGENS** = LSD (lysergic acid diethylamide) peyote, mushrooms
  4) **PAIN KILLERS** = Opiates, opioids
  5) **MARIJUANA** = Listed separately because it can be categorized as a stimulant, depressant, or hallucinogen based on its various effects.

  - **Q13.** Describe the general physiological and psychological effects of the following drugs: alcohol, amphetamines, ecstasy, marijuana, cocaine, opioids/opiates, and barbiturates/benzodiazepines.

  - **Q14.** Alcohol is known to increase the activity of the inhibitory neurotransmitter GABA in the brain. If GABA binds a membrane receptor that allows Cl- ions to flow through the axon membrane into the nerve cell, what is the likely effect of alcohol on: a) the voltage difference across the axon membrane? Will it be more negative compared to resting potential or more positive? and b) the magnitude of the stimulus required to initiate an action potential? Will the neuron require a stronger stimulus to reach threshold potential, or will it reach threshold under a weaker stimulus?
• Drug Addiction and Reward Pathway in the Brain: **Drug addiction stimulates a dopamine-based reward pathway in the limbic system of the brain.**

• Q15. Update your BRAIN MAP to indicate the approximate location of the dopaminergic pathway associated with drug addiction.

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**Sample MCAT Question**

3) The LD50 value is the amount of a drug in milligrams that results in the death of 50% of lab animals administered that dosage. Large doses of a benzodiazepine, a barbiturate, and gamma-hydroxybutyric acid (GHB), a drug used to treat narcolepsy, were administered to rats. If GHB has the lowest LD50 of the three drugs, and the benzodiazepine used has the highest LD50:

A) GHB is safer than the barbiturate or the benzodiazepine at supra-therapeutic doses.
B) GHB is more dangerous than the barbiturate or the benzodiazepine at supra-therapeutic doses.
C) Benzodiazepine is more dangerous than the barbiturate or GHB at supra-therapeutic doses.
D) Benzodiazepine is more dangerous than GHB at supra-therapeutic doses, but more information is necessary to rank the relative safety of the barbiturate.

**Solution:** A high LD50 value is desirable for a therapeutic drug. This indicates that a large amount of the drug would need to be taken to cause death. A low LD50 means relatively less drug can cause death. GHB is therefore the most dangerous of the three drugs because it has the lowest LD50. This makes answers A, C, and D all false because they all suggest that GHB is safer than the other drugs listed in the stem. Therefore, B must be the correct answer.

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**Language:**

- Theories of Language Development
  - **Learning** (a.k.a., environmental, behaviorist, nurture)
  - **Nativist** (a.k.a., biological or nature)
  - **Interactionist**
    - Q16. Provide a conceptual definition for the following terms: pragmatics, semantics, syntax, morphology, and phonology.
    - Q17. Briefly describe the major components of the three theories of language development listed above: learning, nativist, and social interactionist.

- Influence of Language on Cognition
- Brain Regions that Control Language and Speech
  - **Broca’s Area** = **Motor aspects of speech** (e.g., moving your mouth and tongue)
  - **Wernicke’s Area** = **Language comprehension**
    - Broca’s Area and Wernicke’s Area communicate via a bundle of axons called the arcuate fasciculus. This connection allows integration of language comprehension and speech.
  - **Primary Auditory Cortex**
    - Q18. Update your BRAIN MAP with the brain regions that control language and speech: Broca’s Area, Wernicke’s Area, and the primary auditory cortex.
Responding to the Environment

- **Emotion**: A complex psychological state of mind involving one’s mood, feelings, and reactions to circumstances.
  - **Components of Emotion**: Most texts cite three primary components of emotion.
    - **Subjective Experience** (a.k.a., Cognitive Response) = The subjective interpretation of the mood or feeling experienced by the individual.
    - **Physiological Response** = Physiological changes in heart rate, blood pressure, breathing, and skin temperature observed in the individual experiencing the emotion.
    - **Behavioral Response** = Facial expressions or body language that accompany the expression of emotion.
  - **Universal Emotions**: Aside from subjective differences between individuals, most emotions are thought to be universal states experienced and understood across cultures. Ekman proposed seven universal emotions.
    - Fear
    - Anger
    - Happiness
    - Surprise
    - Joy
    - Disgust
    - Sadness

- **THE ADAPTIVE ROLE OF EMOTION**: Darwin proposed that emotion, like all other traits, evolved via natural selection. Possible support for this theory lies in the fact that some emotions are tied to evolutionarily older parts of the brain, indicating they may have evolved earlier in our ancestral history. The facial expressions associated with some emotions appear to have functional advantages that could logically be selected during evolution. For example, the universal emotion of disgust includes a scrunching of the nose and mouth, which would limit the intake of foul odors. Similarly, the expression of fear usually involves widening of the eyes, which would allow in more light and visual information for identification of a perceived threat.

- **Theories of Emotion**
  - **James-Lange**
  - **Cannon-Bard**
  - **Schachter-Singer**
    - Q19. Compare and contrast the three major theories of emotion: James-Lange, Cannon-Bard, and Schachter-Singer. What are the key elements of each theory? What are potential weaknesses of each theory?

- **Brain Regions Involved in the Experience of Emotion**
  - **Emotional Memory**: An emotional memory has two components, one implicit and one explicit. The explicit portion is the CONSCIOUS memory of having experienced the emotion. The implicit portion is the UNCONSCIOUS encoding and storage of the actual feeling. This implicit memory may be retrieved, and the emotion “felt again,” when one encounters a similar experience, or during explicit recall of the original event.
• **The Limbic System = Region of the brain most directly tied to the emotion.** The ventral prefrontal cortex is also involved. Research suggests the LEFT prefrontal cortex processes positive emotions and the RIGHT prefrontal cortex processes negative emotions.

  • When you see LIMBIC SYSTEM THINK: **Limbic System = Emotion and Motivation**

  • COMPONENTS OF THE LIMBIC SYSTEM: Be generally familiar with the functions of each component, but keep it simple.
    - Amygdala (implicit emotional memory)
    - Thalamus
    - Hypothalamus
    - Hippocampus (explicit emotional memory)
    - Corpus Callosum
    - Fornix
    - Septal Nuclei
    - Cingulate Gyrus

  □ Q20. Update your BRAIN MAP to reflect the major parts of the limbic system: thalamus, hypothalamus, amygdala, hippocampus, corpus callosum, fornix, septal nuclei, and cingulate gyrus. (Note: You may choose to draw a separate, larger diagram due to the small size of some limbic features).

• **Emotion and the Autonomic Nervous System (ANS):** Physiological Markers of Emotion

  • Skin Temperature = Lower during fear; higher during anger
  • Skin Conductivity = Indicator of general stimulation of the sympathetic nervous system
  • Heart Rate = Higher during anger or fear; lower during happiness
  • Blood Pressure = Higher during anger, fear, sadness AND happiness

➢ **Stress:**
  - The Nature of Stress
    ▪ Appraisal: How an individual cognitively appraises a potentially stressful situation.
      ▪ **Primary Appraisal** = Initial evaluation of the potential threat. It is suggested that we judge the potential threat to be either: irrelevant (unimportant), benign-positive (good), or stressful (bad).
      ▪ **Secondary Appraisal** = If the threat is determined to be stressful, the individual next judges whether he or she has the resources to cope with the stress.

  • **Distress vs. Eustress:** Stress can arise from both positive/pleasant aspects of life (eustress; e.g., graduating, getting married, landing a new job) AND negative/unpleasant aspects of life (distress; e.g., poor performance in school, losing your job, divorce).

  • Stressor = An external event, condition, or stimulus that leads to stress.
    - Catastrophes = Animal attacks, severe weather, war, etc.
    - Life Events = New job, being late, traffic, increased responsibility, social expectations, etc.
    - Daily Hassles = Poor phone connection, waiting in traffic, a long to-do list, etc.

  • Effects of Stress on Psychological Functions: Correlations between stress and psychological problems.
    ▪ **Childhood Stressors:** [Abuse, neglect, exposure to violence] → avoidance of intimacy, attachment problems, poor school performance, and increased risk of major psychological disorders. [Divorce/marital conflict] → increased life stress as an adult, more family conflict, lack of social support networks, increased propensity for learned helplessness. [war/terrorism] → Post-Traumatic Stress Disorder PTSD, depression.
Response to Stressors (a.k.a., Stress Outcomes)
- Physiological: Initial response = Stimulation of the sympathetic nervous system. Chronic stress → ulcers, decreased immune response, increased risk of heart disease, high blood pressure, etc.
- The General Adaptation Syndrome describes three stages in one’s response to stress:
  1) Alarm Stage
  2) Resistance Stage
  3) Exhaustion Stage
- Q21. During the alarm stage of an individual’s response to an acute stressor, which physiological changes are most likely? a) dilated pupils, b) constricted pupils, c) increased heart rate, d) decreased heart rate, e) increased blood pressure, f) decreased blood pressure, g) increased blood flow to the digestive organs, h) decreased blood flow to the digestive organs, i) increased glucose production, j) decreased glucose production, k) increased peristalsis, l) decreased peristalsis.
- Emotional: Stress → negative moods and emotions (fear, anger, moodiness, irritability, etc.)
- Behavioral: Stress → negative behavior (increased substance abuse, social withdrawal, aggression, mental health problems).

Managing Stress
- Problem-Solving Approach: Find solutions, obtain help, stress prevention plan, etc.
- Emotional Approach: Change how you feel about the stressor through positive thinking, taking personal responsibility, internal locus of control, etc.
- Proven Tools for Stress Management = Exercise, relaxation, spirituality.

Motivation
- Theories of Motivation:
  - Instinct Theory = Behavior is motivated by evolutionary instincts.
  - Arousal Theory = Behavior is motivated by a desire to maintain an optimum level of physiological arousal. That optimum level varies among individuals. People seek new interests, action, or stimuli when arousal is low to increase arousal. When arousal is too high (hyperstimulation) they reduce activity or seek more relaxing activities to reduce the level of arousal.
- Q22. Which portion of the brain is primarily responsible for arousal?
- Q23. Compare and contrast the Instinct and Arousal theories of motivation. Propose two real-life examples that illustrate each theory.
- Q24. Draw, label, and explain the graph used to illustrate the Yerkes-Dodson Law of arousal-based performance. Draw a second trend line that differentiates between simple tasks and difficult tasks.
- Drive Reduction Theory = Behavior is motivated by the desire to reduce or eliminate an uncomfortable or undesirable internal state.
- Q25. Differentiate between primary and secondary drives and provide three examples of each.
- Needs-Based Theories = Behavior is motivated by the drive to satisfy one's most urgent needs.
  - Maslow’s Hierarchy of Needs
    - Q26. Draw and label Maslow’s Hierarchy of needs. Provide at least five examples of needs that pertain to each category.
  - ERG Theory: An adaptation and categorization of Maslow’s Hierarchy of Needs.
    - Q27. Explain the ERG Theory and how it relates to Maslow’s Hierarchy of needs. What do the two approaches share in common and how do they differ?
Self-Determination Theory = A third needs-based theory emphasizing the motivational importance of three basic needs:

- Autonomy (i.e., a sense that one is in control of one’s own life choices)
- Competence (i.e., feeling capable at a task; the ability to excel at something)
- Relatedness (i.e., a sense of being accepted in social settings or relationships)

Incentive Theory = Behavior is motivated by a desire to obtain rewards or to avoid punishments.

Cognitive Theory = Behavior is motivated by thinking; including plans, goals, expectations, perceptions and attributions.

Intrinsic vs. Extrinsic Sources of Motivation

- Intrinsic Motivation = Purpose or drive to act based upon personal, internal, often unseen motives.
- Extrinsic Motivation = Purpose or drive to act based upon external rewards or stimuli.

Q28. Label the following as examples of extrinsic or intrinsic motivation: a) a person works hard at their job to avoid being fired, b) a student studies diligently for the MCAT to earn a good score, c) a student works hard as a volunteer because they enjoy the work and hope to earn a permanent position, d) a person reads a book to relax at the end of a long day at work, e) a professor increases a student’s grade from an A- to an A because of the hard work he has seen the student invest throughout the semester.

Expectancy-Value Theory: An aspect of Cognitive Motivational Theory. The magnitude of one’s motivation to engage in a behavior is a function of an interplay between an individual’s 1) expectation of success and 2) perception of the relative value of the rewards associated with success.

Q29. Use Expectancy-Value Theory to rank the following behaviors according to increasing level of motivation: a) purchasing a lottery ticket to win $10,000,000, b) winning a cereal-box sweepstakes among millions of entrants to claim the grand prize of a Secret Decoder Ring c) winning a golf tournament playoff against one opponent for the grand prize of $1,000,000, d) beating your co-worker one-on-one in basketball, having agreed that the loser will buy lunch.

Sample MCAT Question

4) Which perspective is most relevant for illustrating the relationship between a lack of adequate financial resources and an urgent and primary motivation to obtain employment?

A) Arousal theory
B) Maslow’s hierarchy of needs.
C) Instinct theory
D) Drive-reduction theory

Solution: Arousal theory suggests we are motivated by a desire to maintain relatively high arousal levels. Perhaps one could seek a job because one is bored, but the stem specifies it is the lack of resources initiating job-seeking behavior, making Answer A unlikely. Answer C is false because Instinct theory focuses on evolutionary advantage as a source of motivation. Answer B could be correct; Maslow would rate financial security as his second-most important level of need. Because the stem states that job-seeking is “urgent and primary,” Answer D is the better answer. The person referenced in the stem is seeking employment to reduce the discomfort caused by inadequate resources—an example of drive-reduction theory.
Biological and Sociocultural Motivators: Some motivations are self-explanatory, but are the root of many behaviors we exhibit on a regular basis.

- Hunger
- Sex Drive
- Substance Addiction
  - **Opponent-Process Theory**
    1. Q30. Provide a conceptual definition for Opponent-Process Theory and explain how it can be used to explain addictive behaviors.

Attitude

- **Attitude**: *A learned tendency to evaluate things in a certain way.* This can be a tendency to be positive, negative, biased, or neutral. It is possible to be uncertain or unclear of one’s attitudes—something colloquially described as having “mixed feelings.”

  - **Three Primary Components of Attitude**
    - Cognitive = How you THINK about something or somebody.
    - Affective (Emotional) = How you FEEL about something or somebody.
    - Behavioral = How you BEHAVE toward, or with respect to, somebody or something.

  - **Functional Attitudes Theory**: A theory asserting that attitudes serve three positive functions:
    - Knowledge: Attitudes give us valuable information about other people, events, and the likelihood of outcomes.
    - Ego-Expressive: Attitudes are one route through which we express our self-identity.
    - Adaptive: Socially-acceptable attitudes provide an adaptive advantage in society much like certain random mutations provide an evolutionary advantage.

The Link Between Attitude and Behavior:

- Attitude Influences Behavior: **Absent any strong external influences, attitude generally guides behavior. The more strongly held the attitude, the more directly and quickly it will determine behavior.**

- BEHAVIOR INFLUENCES ATTITUDE: Our behavior can change our attitudes significantly. People tend to have a positive attitude toward behaviors they exhibit themselves, or toward things in which they personally participate. Clearly, the behavior of others impacts our attitudes about them.
  - **Self-Perception Theory**: Suggests that actions influence attitudes because people infer their attitudes by observing their own behavior.
  - **Foot-in-door Phenomenon**: People are more likely to agree to a larger or more difficult request if they first agree to a smaller request. In this case, the behavior of the person making the request changes the attitude of the person being asked to do something.
    - Q31. Using the Foot-in-door Phenomenon, propose a method for each of the following: a) obtaining a large loan for $10,000 from your reluctant father, and b) borrowing your roommate’s brand-new car.

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**IMPORTANT NOTE**

Some students confuse affective with effective, or assume it is derived from the word affect (verb); which means to influence something (e.g., Smoking can affect your health). It is easy to do, especially for non-psych majors who may not even know that “affect” is also a noun, denoting a person’s observable facial expression or display of emotion. A “flat affect” is a symptom of some psychological disorders, such as schizophrenia. This comes from the word “affective,” which means: of or relating to one’s psychological affect.
• **Role-playing Effects:** A person acting out a role is likely to internalize the attitudes associated with that role. In this case, one’s own behavior (acting a part) directly impacts, almost determines, the attitudes they will hold.

• **Zimbardo Prison Study:** A psychologist staged interactions between two groups of college students, one group playing the role of prison guards, and the other the role of prisoners. Within only six days, the attitudes of the “guards” had become so harsh and domineering, and the attitudes of the “prisoners” had become so despondent, defiant, or depressed, that Zimbardo ended the study prematurely on ethical grounds.

  o **Cognitive Dissonance Theory** = A state of unpleasant psychological tension experienced when one holds two attitudes or beliefs that are in conflict with one another. A person is likely to ease the tension by changing their attitude or belief to remove the conflict. This case illustrates that our behaviors are often in conflict with our attitudes.

• Research indicates that people are most likely to behave in a way that matches their attitudes (i.e., no cognitive dissonance) when a person:
  - Holds the attitude as the result of personal experience
  - Is an expert in the subject
  - Frequently expresses the attitude
  - Expect a favorable (i.e., positive) outcome
  - Has a risk of gaining or losing something based on the outcome

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**Theories of Attitude and Behavior Change:** The foot-in-door technique and role-playing effects are two examples of how attitudes can be changed through behavior. There are also four formal theories of attitude change.

  o **Learning Theory of Attitude Change:** Attitudes can be changed by learning. This includes classical conditioning (associating positive feelings with the target attitude or object), operant conditioning (reinforcing the desired attitude or punishing the undesirable one), and observational learning (modeling the desirable attitude can lead to change).

  o **Dissonance Theory of Attitude Change:** People change their attitudes because they feel cognitive dissonance, as a method to reduce that discomfort.

  o **Elaboration-Likelihood Model of Attitude Change**
    - Q32. Provide a conceptual definition for the Elaboration-Likelihood Model, central-route processing and peripheral-route processing.

  o **Social Cognitive Theory of Attitude Change:** Although often listed as a separate theory, social-cognitive theory essentially predicts that attitudes will change because of observational learning experienced by the person doing the changing. That is why observational learning was included in the discussion above of the Learning Theory of Attitude Change. It is important to note, however, that social-cognitive theory is not ONLY about modeling. Alfred Bandura suggested it was about how observation, personal factors (perceptions, expectations), and environment (reinforcement, social influences) interact with one another to produce learning—and thereby change.

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**Factors that Affect Attitude Change:**

  o **CHANGING BEHAVIOR:** Because attitudes reflect and often mirror behavior, one is more likely to have a new attitude if they have a new behavior, or more likely to retain old attitudes if their behavior remains constant. The foot-in-door technique illustrates that if you can get someone to behave in a certain way, you can often mold their attitudes.

  o **Characteristics Model:** Carl Hovland proposed that attitude change is best accomplished when we consider the characteristics of the target, the source, the message, as well as cognitive routes.
    - **Target** = Person receiving/processing the message. Higher intelligence = Less likely to be persuaded by shallow or one-side messages, more likely to respond to reason and logic. Moderate self-esteem = Most likely to be persuaded. High/Low self-esteem = Less likely to be persuaded. Mood and mind-frame of the target alters the likelihood of persuading them.
- **Source** = Person or source delivering the message. Attractiveness, expertise, and trustworthiness = Increased likelihood of persuading target. Credibility = Strong positive correlation with successful target persuasion.

- **Message** = The actual words, images, or other information presented to the target. Balance (presentation of both sides of an issue) = Increased likelihood of persuasion.

- **Cognitive Routes** = The nature of the approach to persuasion. Main Route = Presentation of data/information to target and asking them to change their mind after evaluating the information. Peripheral Route = Suggesting the target ignore data/information and decide based upon the reliability of the source (Celebrity endorsements utilize this approach).

- **SOCIAL FACTORS**: Social norms can either direct or inhibit attitude change because people generally seek to align themselves with socially acceptable attitudes and behavior. If an attitude change requires rejecting social norms, it will be more difficult to achieve. The tendency of individuals in a group to avoid conflict and seek harmony (i.e., Groupthink; discussed in the Sociology chapters) may influence them to change an attitude or behavior they otherwise would not. Social roles are an important factor because they lend credibility, or a lack thereof, to the person doing the persuasion. For example, in a culture that upholds patriarchy, fathers may have strong influence over their children, while in a culture that values feminism, fathers may have less influence.

**Self-Concept, Self-Identity, and Social Identity**

- **The Self**: Social scientists use several terms related to the self, many of which are easy to confuse, or are misused in common speech. Be sure you understand each concept and how it differs from the others.

  - **Self-Esteem** = A person’s overall sense of self-worth or personal value. Relatively stable and enduring.
    - Different from other “self-terms” because it is a valuation judgment of one’s worth: “I feel good about being a fast runner. Being a fast runner makes me feel like an important person.”
    - Answers the questions: “How do I feel about myself?”; “Why am I of worth?”
    - **THINK: MY VALUE**

  1) Q33. Provide a conceptual definition of the following terms: actual self, ought self, ideal self. How do these three terms relate to the concept of self-esteem?

  - **Self-Image** = A persistent mental picture of one’s appearance and personality, including observable traits (height, weight, hair color, gender, etc.) and self-knowledge derived from experience or internalization of the judgments of others (e.g., people think I’m fat; people think I’m handsome; people think I’m nice).
    - Different from other “self-terms” because it is my mental picture of my own personal characteristics: “I am a young, attractive, athletic woman.”
    - Answers the questions: “How do I see myself?”; “How do others see me” (In ways I’ve internalized); “How do I perceive that others see me?”
    - **THINK: MY APPEARANCE**

  - **Self-Identity** = Those descriptive characteristics, qualities, and abilities that people use to define themselves.
    - Different from other “self-terms” because it is how I define myself: “I am a fast runner. I am a future doctor.”
    - Answers the question: “Who do I think that I am?”
    - **THINK: MY IDEA OF WHO I AM**
Identity = Those descriptive characteristics, qualities, and abilities that make a person unique or different relative to others, especially in relation to, or within, social contexts.

- Identity = Self-identity + Group Identities (e.g., national identity, racial identity, cultural identity)
- Different from other "self-terms" because it is how I am defined by myself, by others, AND in various situations: "I am a leader. I am a pre-med student. I am a native Pacific Islander."
- Answers the questions: "Who am I?"; "Who am I in various social roles or settings?"
- THINK: WHO I AM

Self-Schemas = A pre-existing, organized pattern of thought (i.e., cognitive framework) about oneself that is used to categorize or process information. Self-schemas, like schemas generally, can be helpful, but can also result in bias or omission of information.

- Different from other "self-terms" because it is my cognitive framework about myself: "I am an athlete; therefore, I make friends who are also athletic."
- Answers the questions: "What does this mean [based on my schemas]?" "How will I act [based on my schemas]."
- THINK: HOW MY IDEAS OF WHO I AM ARE USED TO CATEGORIZE NEW INFORMATION.

Self-Efficacy = The strength of a person’s belief in their own abilities.

- Different from other "self-terms" because it is a self-evaluation of one’s ability: "I am confident I can accomplish anything." "I usually fail."
- Answers the question: "What am I capable of doing?"
- THINK: MY ABILITY

Self-Concept = A collection of beliefs and self-perceptions about one’s own nature, unique qualities, and typical behavior.

- Different from other "self-terms" because it is a collective mental picture of oneself: "I am a tall, young, attractive, athletic male."
- Answers many questions: "Who am I?"; "Who do others think I am?"; "What are my strengths?"; "What is my nature?"; "How do I behave?"
- THINK: MY TOTAL CONCEPTION OF MYSELF

Carl Rogers proposed one of the more popular ways of thinking about self-concept, noting that it has three components:

1) Self-Image
2) Self-Esteem
3) The Ideal Self = Who I wish I could be.

Locus of Control

- Locus of Control plays an important role in self-esteem and self-concept. Persons with an external locus of control tend to be more prone to low self-esteem, and even depression. Those with an internal locus of control tend to be happier and have higher self-esteem.

- Q34. Are the following individuals evaluating their behavior using an internal or an external locus of control? a) A premedical student received a subpar score on the MCAT. He is quick to point out that he was asked to work extra hours at work the week before his exam and the exam room was too cold; b) Another premedical student, who took the Altius MCAT Course, earns a subpar score. She remembers being shown the correlation graph between program adherence and MCAT score. She opines, "I should have studied harder and done more of the program requirements"; c) After losing a basketball game the coach is interviewed and states the following: "I should have had our players ready and I did not. We need to practice harder this week and improve our free-throw percentage"; d) Another coach is interviewed following a loss and complains that poor refereeing gave their opponent an unfair disadvantage.
Identity Formation

- **Theories of Identity Development:**
  - Gender
  - Moral: **Kohlberg’s Theory of Moral Development**
    - Stages
      1) **Pre-conventional Morality** (pre-adolescence) = Obedience, Self-Interest
      2) **Conventional Morality** (adolescence to adulthood) = Conformity, Law and Order
      3) **Post-conventional Morality** (adulthood, if achieved) = Social Contract, Universal Human Ethics

- Q35. According to Kohlberg’s theory, assign a stage of moral development to the following reasons for paying one’s taxes: a) If no one paid their taxes, society would not be able to provide necessities such as roads, military protection, and emergency services, b) Not paying my taxes would be wrong, c) I pay my taxes so that I will qualify for tax rebates and refunds, d) It is immoral for one citizen to benefit from the contributions of his neighbors without contributing his fair share, e) If I do not pay my taxes, I will go to jail, f) All Americans have a right to live in a free society. I pay my taxes so that the federal government can afford to protect and secure individual rights.

- Social: **Erickson’s Theory of Psychosocial Development**
  - Each stage presents a different conflict between personal needs and social demands.
    1) **Trust vs. Mistrust**
    2) **Autonomy vs. Shame & Doubt**
    3) **Initiative vs. Guilt**
    4) **Industry vs. Inferiority**
    5) **Identity vs. Role Confusion**
    6) **Intimacy vs. Isolation**
    7) **Generativity vs. Stagnation**
    8) **Integrity vs. Despair**

- Q36. For each of Erickson’s stages of psychosocial development, identify the following: a) the age associated with that stage, b) the favorable outcome of a positive resolution to the conflict, c) the negative outcome of a failure to resolve the conflict.

- Psychosexual: **Freud’s Theory of Psychosexual Development**
  - Stages:
    1) Oral
    2) Anal
    3) Phallic
    4) Latency
    5) Genital

- Q37. Provide a conceptual definition for each of Freud’s stages of psychosexual development.

- Q38. Freud’s theories have many critics. The following individuals would disagree most strongly with which stage of Freud’s Theory of Psychosexual Development? Explain your answer. a) A woman who rejects the notion of penis envy, b) a gay rights activist, c) a psychologist who argues that an unusual focus on maintaining order is a positive trait rather than a neurosis.

- Social: **Social Identity** = A person’s sense of who they are based on the groups to which they belong. This is very closely related to “Identity” as defined above, except that the term identity INCLUDES one’s social identity but is not exclusively one’s group-based identity. Identity by itself defines what makes a person unique relative to others. Social identity is that portion of our self-identity derived specifically from group membership.
- **Social Identity Theory** = A theory suggesting that individuals derive significant pride and self-esteem from their group memberships. As a result, individuals always strive to INCREASE the status of the group to which they belong (i.e., their IN-GROUPS), and will discriminate and hold prejudices against other groups to which they do not belong (i.e., their OUT-GROUPS).

- **Influence of Social Factors on Identity Formation:**
  - **Influence of Individuals on Identity Formation**
    - **Imitation**: Especially in children, modeling and imitation of others influences identity formation.
    - **Role-Taking** = Adopting and acting out a particular social role. This could be as simple as a child playing “cops and robbers,” or the more complex types of role-taking that help adults feel empathy for others (i.e., “put yourself in someone else’s shoes”).
    - **Looking-glass Self** = A theory suggesting that a person’s self-concept is largely determined by how they believe others see them. From this perspective, the self is not a function of what we are, but what others think we are.
  - **Influence of Groups on Identity Formation:**
    - **GROUP MEMBERSHIP**: One’s identity is tightly associated with the groups to which one belongs. Religion, nationalism, and ethnicity all directly favor the creation of an identity that matches other members of one’s group.
    - **CULTURE AND SOCIALIZATION**: The expectations and norms of one’s culture, along with the socialization processes to which one is subject, provide a strong driving force during identity formation. Certain identities may be encouraged, or discouraged by different cultures.
    - **Reference Group** = Any group to which a person usually compares him or herself.

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**Sample MCAT Question**

5) A researcher examines the Looking-glass Self Theory by asking subjects what they think others believe about them, and comparing this to a self-concept inventory. This an example of which study design?

A) cause-effect  
B) correlational  
C) meta-analysis  
D) experimental

**Solution**: Comparing subject self-reports to an inventory would be a correlational study (Answer B). The investigator is not directly manipulating the independent variable, and has no control, so it is not a true experimental design (Answer D). A meta-analysis combines results from multiple studies. Cause and effect is not a recognized psychological study method.