

Arousal States and Learning

Attention and Action

Arousal states: Levels of alertness

- Asleep
- Drowsy
- Quiet alert
- Active alert
- Fussy
- Agitated

Are intelligence and cognition the same?

- Intelligence is the ability to learn
 - Theoretical- definitions and domains vary
 - Evidence based on tests designed to compare performance if verbal and motor tasks to norms
 - Capacities static, set for life at birth
- Cognition is the process of learning
 - Neurological
 - Evidence based on MRIs, PET scans, behavior
 - Process dynamic, skills develop experientially

How do cognitive skills develop?

- Quantity
 - Billions of sensory experiences required
 - In first year of life, weight of brain doubles
- Quality
 - Experiences must have appropriate characteristics
 - Emotional tone (arousal states)
 - Pacing/Repetition
 - Sensory attributes (accessibility)

What skills develop?

- Sensorimotor (0-2 years)
 - Object exploration schemes, object permanence and search, imitation, cause and effect, means/ends, spatial relationships
- Preoperational (2-11 years)
 - Symbol use, abstract concepts, schemas
- Operational (11 and up)
 - Logic, reasoning, analysis, evaluation

How does cognition work?

- Acquisition (take in information)
- Storage (commit to memory)
- Retrieval (call to mind from memory)
- Use (apply information)

Acquisition

- Sensory information about the external world integrated with sensory information about the body

Sensory information

- External senses
 - Touch
 - Hearing
 - Vision
 - Smell
 - Taste
- Internal senses
 - Proprioceptive
 - Vestibular

Processing sensory information

- Reception
 - Specialized cells in parts of the body that respond to certain kinds of input from the environment
- Transmission
 - Dedicated nerves that carry electrical impulses generated by receptor cells through the spinal column to the brain
- Interpretation (reticular, limbic, cortical)
 - Neuronal activity that integrates, routes, and organizes electrical activity from receptors

Reticular

- Filters sensations, most important ascend
- Directly influenced by pain, light touch, head movements, sounds
- Stimulates fight and flight responses

Limbic

- Hypothalamus and amygdala generate emotional responses to sensation
 - Production of hormones: stress and pleasure
- Hippocampus initiates memory
- Activity ascends and descends
 - Ascends to cortex if attractive
 - Descends to reticular formation if aversive

Cortical

- Attention is required: concentrating on one thing while ignoring others
 - Frontal cortex
 - Modulates production of stress hormones
 - Uses reasoning and logic to predict potential outcomes
 - Sensory cortex
 - Associates new sensations with memories
 - Hippocampus links new sensations with specific area of cortex
 - Stress hormones damage ability of hippocampus to inhibit reticular formation and link with sensory cortex
 - Motor cortex
 - Coordinates body movements related to attention

Regulation

Reducing activity at the reticular and limbic processing levels so that attention at the cortical level is possible

Types of regulation

- Neural regulation: Automatic adjustments to the operation of multiple organ systems (sweating, etc.)
- Self-regulation: Behaviors initiated by an individual to reduce neural stress (a tired infant sucks his thumb)
- Modulation: Providing sensory input that helps an individual focus on events that support performance (Singing to a fussy baby so it can go to sleep)

Attention and action required for learning

- Extended states
 - Asleep and Agitated: attention absent, no external learning
 - Drowsy and fussy: attention intermittent, learning inefficient
- Alert states
 - Quiet alert: attention is passive; cortex is active; associative memory is engaged
 - Active alert: attention is active; entire cerebrum is fully engaged in learning; concepts are developing

Facilitating alert states

- Make sure physical needs are taken care of
 - Comfort
 - positioning
 - feeding
 - hydrating
 - elimination

Facilitating alert states

- Make sure you have established a relationship based on trust
 - Predictable and consistent
 - Responsive
 - Positive

Facilitating alert states

- Remove sensory barriers that interfere with attention
 - Environmental complexity
 - Aversions
- Provide highly attractive learning media that motivates interaction

Facilitating alert states

- Provide sensory input that calms or alerts
 - Calming when fussy or agitated
 - Deep touch, slow movement, slow speech/music, pastel colors
 - Alerting when drowsy
 - Light touch, rapid movement, rapid speech/music, bright colors

Facilitating alert states

- Get help from an occupational therapist with sensory modulation training when
 - Regulation is needed very frequently
 - The strategies listed above are not effective

References

- Guess, D., Siegal-Causey, E., Roberts, S., Ruess, J., Thompson, B., Siegal-Causey, D. (1990). Assessment and analysis of behavior state and related variables among students with profoundly handicapping conditions. *Journal of the Association of Individuals with Severe Handicaps*, 15, 211-230.
- Smith, M. (2005). *SLK guidebook and assessment forms: Using the sensory learning kit*. Louisville, KY: American Printing House for the Blind.
- Williams, M. S., & Schellenberger, S. (1996). *How does your engine run?: A leaders guide to the alert program*. Albuquerque, NM: Therapy Works Inc.