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Cognitive Processes

Psychology

Attention, perception, intelligence, learning, memory, forgetting, thinking, reasoning, problem-solving and aptitude.

For educational purposes only.

CHAPTER 06: COGNITIVE PROCESSES

Subject: Applied Psychology Course: B.Sc. Nursing

1. Introduction

Cognition refers to the mental processes involved in acquiring, processing, storing and using information.

Cognitive processes enable individuals to understand their environment, learn new information, remember experiences, make decisions and solve problems.

Major Cognitive Processes

- Attention
- Perception
- Intelligence
- Learning
- Memory
- Thinking
- Reasoning
- Problem-solving
- Aptitude

2. Attention

Definition

Attention is the process of selectively focusing mental resources on particular stimuli, activities or information.

Characteristics

- Selective
- Limited in capacity
- Influenced by motivation and interest
- May be voluntary or involuntary
- Changes according to environmental conditions

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Types of Attention

Type	Meaning
Voluntary attention	Deliberately focusing on a stimulus
Involuntary attention	Automatically attending to a stimulus
Habitual attention	Attention influenced by established habits or interests
Selective attention	Focusing on relevant information while ignoring distractions
Sustained attention	Maintaining concentration over time
Divided attention	Distributing attention across multiple tasks
Alternating attention	Shifting attention between tasks

Determinants of Attention

External factors:

- Intensity
- Size
- Movement
- Novelty
- Contrast
- Repetition
- Environmental stimulation

Internal factors:

- Interest
- Motivation
- Emotional condition
- Previous experiences
- Needs
- Fatigue
- Physical health

Duration and Degree of Attention

Duration: Length of time an individual can maintain attention.

Degree: Intensity or concentration of attention.

Span of attention: Amount of information that can be attended to within a limited period.

These vary according to task demands and individual circumstances.

Alterations in Attention

- Distractibility
- Reduced concentration
- Excessive fixation on particular stimuli
- Difficulty sustaining attention
- Impaired ability to shift attention

Nursing Applications

- Reduce environmental distractions.
- Give short and clear instructions.
- Provide information in manageable sections.
- Assess acute changes in attention.
- Allow adequate rest during patient education.

Acute inattention with fluctuating awareness may indicate delirium and requires prompt assessment.

3. Perception

Definition

Perception is the mental process of organizing and interpreting sensory information to understand the environment.

Process of Perception

Stimulus -> Sensory reception -> Neural processing -> Organization -> Interpretation.

Sensation vs Perception

Sensation	Perception
Detection of stimuli	Interpretation of stimuli
Begins at sensory receptors	Involves central nervous system processing
Example: Detecting a sound	Example: Recognizing the sound as a voice

Gestalt Principles of Perception

Principle	Meaning
Figure-ground	Separating an object from its background
Proximity	Grouping nearby objects together
Similarity	Grouping similar objects
Closure	Perceiving incomplete figures as complete

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Continuity	Perceiving continuous patterns
Common fate	Grouping objects moving together

Perceptual Constancy

The tendency to perceive objects as relatively stable despite changes in sensory input.

Types:

- Size constancy
- Shape constancy
- Colour constancy
- Brightness constancy

Factors Affecting Perception

- Previous experiences
- Expectations
- Motivation
- Emotional state
- Cultural background
- Attention
- Sensory functioning
- Environmental conditions

Alterations in Perception

Illusion: Misinterpretation of an existing external stimulus.

Example: Mistaking a hanging coat for a person in dim lighting.

Hallucination: A perception-like experience occurring without a corresponding external stimulus.

Types include auditory, visual, tactile, olfactory and gustatory hallucinations.

Agnosia: Difficulty recognizing familiar stimuli despite sufficient basic sensory functioning.

Depersonalization: Feeling detached from one's own self or experiences.

Derealization: Experiencing surroundings as unreal or unfamiliar.

Nursing Responsibilities

- Assess sensory functioning.
- Maintain adequate lighting and a safe environment.
- Communicate clearly.
- Acknowledge distress without reinforcing false perceptions.
- Assess safety when hallucinations occur.

- Report sudden perceptual abnormalities.

4. Intelligence

Definition

Intelligence is the ability to learn, reason, solve problems, understand complex information and adapt to changing circumstances.

Characteristics

- Involves learning and understanding.
- Supports problem-solving.
- Helps individuals adapt to situations.
- Is influenced by genetics and environmental experiences.
- Includes multiple cognitive abilities.

Determinants of Intelligence

- Genetic inheritance
- Nutrition
- Brain development
- Education
- Environmental stimulation
- Physical and psychological health
- Socioeconomic circumstances
- Learning opportunities

Genetic influence does not mean that intellectual development is fixed or unaffected by the environment.

5. Theories of Intelligence

Spearman's Two-Factor Theory

Charles Spearman proposed:

- General factor (g): Broad cognitive ability contributing to performance across different tasks.
- Specific factor (s): Ability required for a particular task.

Thurstone's Primary Mental Abilities

Seven major abilities were proposed:

1. Verbal comprehension
2. Word fluency
3. Number ability
4. Spatial visualization

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5. Associative memory
6. Perceptual speed
7. Reasoning

Cattell's Theory

Fluid intelligence: Ability to reason and solve unfamiliar problems.

Crystallized intelligence: Knowledge and skills acquired through education and experience.

Gardner's Multiple Intelligences Theory

Howard Gardner proposed several forms of intelligence:

- Linguistic
- Logical-mathematical
- Spatial
- Musical
- Bodily-kinesthetic
- Interpersonal
- Intrapersonal
- Naturalistic

This framework is educationally influential, although the proposed abilities are not all established as independent intelligences by psychometric research.

Sternberg's Triarchic Theory

Robert Sternberg proposed:

- Analytical intelligence
- Creative intelligence
- Practical intelligence

6. Measurement of Intelligence

Intelligence Quotient (IQ)

IQ is a standardized score representing performance on selected cognitive tasks relative to an appropriate reference population.

Historical IQ Formula

IQ = Mental age Chronological age x 100.

Example: Mental age of 12 years and chronological age of 10 years gives a historical ratio IQ of 120.

Modern intelligence tests generally use age-standardized deviation IQ scores rather than this historical formula.

Illustrative IQ Score Classification

IQ score	Approximate description
130 and above	Very high
120-129	High
110-119	High average
90-109	Average
80-89	Low average
70-79	Very low or borderline range
Below 70	Extremely low range

Terminology and score boundaries vary between instruments. Scores must be interpreted with measurement uncertainty and clinical context.

Common Intelligence Tests

- Stanford-Binet Intelligence Scales
- Wechsler Adult Intelligence Scale (WAIS)
- Wechsler Intelligence Scale for Children (WISC)
- Raven's Progressive Matrices
- Malin's Intelligence Scale for Indian Children (MISIC)

Intellectual Disability

Intellectual disability involves significant limitations in intellectual functioning and adaptive functioning, beginning during the developmental period.

Adaptive functioning includes:

- Conceptual skills
- Social skills
- Practical daily living skills

Severity Levels

- Mild
- Moderate
- Severe
- Profound

Severity is determined primarily through adaptive functioning and support needs, not solely by IQ.

The historical terms mental retardation and mental deficiency are outdated and should be replaced by respectful, contemporary terminology.

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Nursing Responsibilities

- Identify developmental and learning difficulties.
- Use accessible communication.
- Encourage independence.
- Adapt patient education to individual abilities.
- Support families and caregivers.
- Facilitate specialized assessment and rehabilitation.

7. Learning

Definition

Learning is a relatively enduring change in knowledge, skills or behaviour resulting from experience, practice or training.

Characteristics

- Influenced by experience.
- May occur intentionally or unintentionally.
- May modify knowledge and behaviour.
- Can occur throughout life.
- Is influenced by motivation and reinforcement.

8. Types and Theories of Learning

A. Classical Conditioning

Associated with Ivan Pavlov.

Learning occurs when one stimulus becomes associated with another stimulus.

Pavlov's experiment:

Component	Example
Unconditioned stimulus (UCS)	Food
Unconditioned response (UCR)	Salivation in response to food
Neutral stimulus	Tone before conditioning
Conditioned stimulus (CS)	Tone after association with food
Conditioned response (CR)	Salivation in response to tone

Important Concepts

- Acquisition
- Extinction

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- Spontaneous recovery
- Stimulus generalization
- Stimulus discrimination

Nursing application: A patient may develop anxiety towards clinical settings after repeated unpleasant procedures.

B. Operant Conditioning

Associated particularly with B. F. Skinner.

Behaviour is influenced by its consequences.

Process	Effect on behaviour
Positive reinforcement	Adding a desirable consequence increases behaviour
Negative reinforcement	Removing an unpleasant condition increases behaviour
Positive punishment	Adding an aversive consequence decreases behaviour
Negative punishment	Removing a desirable consequence decreases behaviour

Important: Negative reinforcement is not punishment. Both positive and negative reinforcement increase behaviour.

Use ethical, supportive reinforcement rather than coercive approaches in nursing care.

C. Trial-and-Error Learning

Associated with Edward Thorndike.

Learning occurs through repeated attempts, with successful responses becoming more likely.

Thorndike's Classical Laws

- Law of readiness: Motivation and readiness influence learning.
- Law of exercise: Practice may strengthen learning.
- Law of effect: Satisfying consequences tend to strengthen responses.

D. Insight Learning

Associated with Wolfgang Kohler.

Learning involves recognizing relationships within a problem and developing a solution through understanding.

E. Observational Learning

Associated with Albert Bandura.

Individuals learn by observing other people's behaviour and its consequences.

Four Processes

1. Attention
2. Retention

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3. Reproduction
4. Motivation

Example: A nursing student learns a clinical procedure by observing an instructor and practising under supervision.

F. Other Forms of Learning

- Verbal learning
- Motor learning
- Concept learning
- Discrimination learning
- Problem-solving learning
- Experiential learning

9. Factors Influencing Learning

- Motivation
- Attention
- Previous knowledge
- Physical health
- Emotional condition
- Interest
- Teaching methods
- Feedback
- Practice
- Reinforcement
- Learning environment
- Adequate rest

10. Learning Process

1. Identify the learning need.
2. Establish objectives.
3. Maintain motivation and attention.
4. Acquire information or skills.
5. Practise and receive feedback.
6. Retain and apply learning.
7. Evaluate performance.

11. Habit Formation

A habit is a learned pattern of behaviour that may become relatively automatic through repetition in stable circumstances.

Habit Formation Cycle

Cue -> Behaviour -> Consequence or reward -> Repetition.

Methods of Developing Healthy Habits

- Set realistic behavioural goals.
- Identify reliable cues.
- Practise consistently.
- Modify the environment.
- Use appropriate reinforcement.
- Monitor progress.
- Adjust strategies when necessary.

There is no universal fixed number of days required to form a habit.

12. Memory

Definition

Memory is the cognitive process through which information is encoded, stored and retrieved.

Stages of Memory

1. Encoding: Processing information into a form that can be retained.
2. Storage: Maintaining information over time.
3. Retrieval: Accessing previously stored information.

13. Types of Memory

Sensory Memory

Brief retention of incoming sensory information.

- Iconic memory: Visual sensory memory.
- Echoic memory: Auditory sensory memory.

Short-Term Memory

Temporary retention of a limited amount of information.

Working Memory

Active maintenance and manipulation of information during ongoing mental tasks.

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Long-Term Memory

Retention of information over extended periods.

Classification of Long-Term Memory

Type	Meaning	Example
Episodic	Memory of personal experiences	Remembering a clinical posting
Semantic	Knowledge and facts	Remembering anatomy terminology
Procedural	Memory supporting learned skills	Performing a practised procedure
Priming	Previous exposure influences later processing	Faster recognition of a familiar word
Conditioning-related memory	Learned associations	Anxiety associated with a clinical stimulus

Episodic and semantic memory are commonly classified as explicit memory. Procedural memory and priming are forms of implicit memory.

14. Factors Influencing Memory

- Attention
- Motivation
- Meaningfulness of information
- Repetition and retrieval practice
- Organization
- Emotional state
- Sleep
- Age
- Neurological health
- Medication effects

15. Methods to Improve Memory

- Spaced repetition
- Active recall
- Retrieval practice
- Mnemonics
- Chunking
- Association
- Visualization
- Meaningful organization

- Practice questions
- Adequate sleep
- Teaching information to others

Example of Mnemonics

OCEAN for the Big Five personality traits.

16. Forgetting

Definition

Forgetting refers to difficulty retaining, accessing or retrieving previously learned information.

Causes and Theories of Forgetting

Cause or theory	Explanation
Encoding failure	Information was not adequately learned
Trace decay	Some memory representations weaken over time
Interference	Other learning disrupts retrieval
Retrieval failure	Appropriate retrieval cues are unavailable
Motivated forgetting	Cognitive or emotional processes reduce accessibility
Neurological impairment	Disease or injury affects memory functioning

Types of Interference

Proactive interference: Earlier learning interferes with new learning.

Retroactive interference: New learning interferes with previously learned information.

Ebbinghaus Forgetting Curve

Hermann Ebbinghaus demonstrated that memory retention may decline rapidly after learning, particularly without review, followed by a slower decline.

The rate of forgetting varies according to material, learning conditions and individual differences.

17. Alterations in Memory

Alteration	Description
Anterograde amnesia	Difficulty forming new long-term memories after onset
Retrograde amnesia	Loss or impairment of memories formed before onset
Hypomnesia	Reduced memory ability
Hypermnesia	Unusually increased recall under certain circumstances
Confabulation	Unintentional production of inaccurate memories without deliberate deception

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Sudden memory disturbances require assessment for neurological, metabolic, medication-related and other possible causes.

18. Thinking

Definition

Thinking is the mental process of manipulating information, concepts, images and ideas to understand situations and make decisions.

Types of Thinking

Type	Meaning
Concrete	Thinking about specific objects and experiences
Abstract	Thinking about concepts and hypothetical situations
Logical	Thinking based on relationships and reasoning
Critical	Evaluating evidence and arguments
Creative	Producing original or useful ideas
Convergent	Identifying a single best solution
Divergent	Generating multiple possible solutions
Reflective	Reviewing experiences and judgments

19. Levels of Cognitive Thinking

The revised Bloom taxonomy describes six educational cognitive levels:

1. Remember
2. Understand
3. Apply
4. Analyze
5. Evaluate
6. Create

Nursing application: A student progresses from remembering symptoms to evaluating patient findings and developing an appropriate care plan.

20. Reasoning

Reasoning is the mental process of using information and evidence to reach conclusions.

Types of Reasoning

Deductive reasoning: Applying general principles to specific cases.

Inductive reasoning: Developing general conclusions from specific observations.

Analogical reasoning: Applying similarities between situations to understand or solve a problem.

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Abductive reasoning: Identifying a plausible explanation for available observations.

Nursing Application

Clinical reasoning involves interpreting assessment findings, identifying possible problems, evaluating risks and selecting appropriate nursing interventions.

Conclusions must be reassessed as new clinical information becomes available.

21. Problem-Solving

Definition

Problem-solving is the cognitive process of identifying a difficulty and developing an effective solution.

Steps

1. Identify the problem.
2. Collect relevant information.
3. Analyze contributing factors.
4. Generate possible solutions.
5. Evaluate available alternatives.
6. Select an appropriate solution.
7. Implement the solution.
8. Evaluate the outcome.

Problem-Solving Methods

- Trial and error
- Algorithms
- Heuristics
- Insight
- Brainstorming
- Critical analysis

Common Barriers

- Functional fixedness
- Mental set
- Confirmation bias
- Emotional stress
- Insufficient information
- Time pressure

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Nursing Application

Problem-solving is central to assessment, nursing diagnosis, planning, implementation and evaluation.

22. Aptitude

Definition

Aptitude refers to an individual's potential or capacity to acquire particular skills or perform certain activities following learning and training.

Types of Aptitude

- Verbal aptitude
- Numerical aptitude
- Mechanical aptitude
- Spatial aptitude
- Clerical aptitude
- Artistic aptitude
- Musical aptitude
- Scientific aptitude
- Psychomotor aptitude

Factors Influencing Aptitude

- Genetic predispositions
- Education
- Previous experiences
- Motivation
- Opportunities
- Practice
- Physical and psychological health

Aptitude vs Intelligence vs Achievement

Concept	Meaning
Intelligence	Broad cognitive abilities
Aptitude	Potential to learn or perform specific skills
Achievement	Knowledge or skills already acquired
Interest	Preference for particular activities

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Aptitude Tests

- Differential Aptitude Tests (DAT)
- General Aptitude Test Battery (GATB)
- Specific verbal, numerical and spatial aptitude tests

Aptitude tests provide estimates of performance potential rather than guarantees of future success.

23. Psychometric Assessment of Cognitive Processes

Assessment area	Examples
General intelligence	Stanford-Binet, Wechsler scales
Nonverbal reasoning	Raven's Progressive Matrices
Cognitive screening	MMSE, MoCA
Attention and executive function	Digit Span, Trail Making Test
Memory	Wechsler Memory Scale
Aptitude	Differential Aptitude Tests

Appropriate training, permissions, standardized procedures and population-specific norms are required.

Cognitive screening scores do not independently establish a medical or psychiatric diagnosis.

24. Alterations in Cognitive Processes

Alteration	Description
Delirium	Acute, fluctuating disturbance in attention and awareness
Dementia	Acquired cognitive decline interfering with independent functioning
Aphasia	Acquired impairment of language
Apraxia	Difficulty performing learned purposeful actions
Agnosia	Difficulty recognizing familiar sensory information
Amnesia	Significant impairment of memory
Executive dysfunction	Difficulties in planning, organization or inhibition
Disorganized thinking	Disturbance in the organization of thoughts

Nursing Responsibilities

- Assess baseline cognitive functioning.
- Monitor changes in orientation, attention and memory.
- Identify possible reversible causes.
- Reduce environmental distractions.
- Provide simple, individualized instructions.

- Support patient safety.
- Maintain accurate documentation.
- Arrange urgent assessment for sudden cognitive changes.

25. Nursing Applications of Cognitive Psychology

- Patient education
- Clinical decision-making
- Neurological assessment
- Cognitive screening
- Rehabilitation
- Medication education
- Improving treatment understanding
- Supporting patients with cognitive impairment
- Preventing communication errors
- Enhancing nursing students' clinical learning

26. Important Examination Questions

Long Answer Questions

1. Define attention and explain its types, determinants and alterations.
2. Describe perception and the Gestalt principles.
3. Explain intelligence, its theories and measurement.
4. Define learning and describe major theories of learning.
5. Explain memory, its types and methods of improvement.
6. Define forgetting and explain its causes.
7. Explain thinking, reasoning and problem-solving.
8. Discuss aptitude and its assessment.

Short Answer Questions

1. Selective and sustained attention.
2. Illusion and hallucination.
3. Spearman's two-factor theory.
4. Fluid and crystallized intelligence.
5. Classical conditioning.
6. Operant conditioning.
7. Observational learning.
8. Habit formation.

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9. Short-term and long-term memory.
10. Proactive and retroactive interference.
11. Ebbinghaus forgetting curve.
12. Deductive and inductive reasoning.
13. Intellectual disability.
14. Cognitive screening.
15. Alterations in cognitive processes.

27. Quick Revision

Concept	Key examination point
Attention	Selective mental focus
Perception	Interpretation of sensory information
Intelligence	Learning, reasoning and adaptation
Spearman	General and specific intelligence factors
Pavlov	Classical conditioning
Skinner	Operant conditioning
Thorndike	Trial-and-error learning
Kohler	Insight learning
Bandura	Observational learning
Memory	Encoding, storage and retrieval
Ebbinghaus	Forgetting curve
Reasoning	Drawing conclusions
Aptitude	Potential for specific learning or performance
Delirium	Acute, fluctuating inattention and altered awareness

Conclusion

Cognitive processes form the foundation of learning, memory, perception, reasoning and intelligent behaviour. Understanding cognition helps nurses provide effective education, recognize abnormalities, support rehabilitation and make safe clinical decisions.

Practice questions

Choose one best answer. The answer key and explanations follow the questions.

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1. Removing an unpleasant condition to increase behaviour is:

A. Positive punishment

B. Negative punishment

C. Negative reinforcement

D. Extinction

2. Active maintenance and manipulation of information is a feature of:

A. Sensory memory

B. Working memory

C. Retrograde amnesia

D. Trace decay

3. Which sequence describes the main memory processes?

A. Retrieval -> encoding -> storage

B. Storage -> perception -> reasoning

C. Encoding -> storage -> retrieval

D. Attention -> aptitude -> reinforcement

4. A nursing student practises a procedure several times with feedback and later performs it more accurately. Which learning approach best explains the improvement?

A. Reading once without attempting the skill

B. Active practice with reinforcement and correction

C. Avoiding feedback to reduce anxiety

D. Memorising unrelated information

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Answer key and explanations

1. C - Negative reinforcement

Negative reinforcement removes an unpleasant condition and increases behaviour.

2. B - Working memory

Working memory actively maintains and manipulates information during mental tasks.

3. C - Encoding -> storage -> retrieval

The chapter identifies encoding, storage and retrieval as the main memory processes.

4. B - Active practice with reinforcement and correction

Practice, feedback and reinforcement support learning and skill retention. Repetition is most useful when errors are identified and corrected.

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