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Topic No. 126

Operant Conditioning

- Called Operant conditioning because response operates on the environment
- Operant condition = learning about consequence
- Instrumental conditioning- because response is instrumental in bringing about a consequence such as a reward or a punishment
- The connection or association is between response and consequence
- Earliest examples of study of operant or instrumental conditioning are those by Skinner and Thorndike
- The primary datum of interest in the study of operant conditioning is the rate at which some response occurs.
- The primary responses that have been studied are lever pressing by rats and key pecking by pigeons in operant-conditioning apparatuses (Skinner boxes).
- A **Skinner box** is simply a small, well-lit box with a lever or key that can be depressed and a place for dispensing food.



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Topic No. 127

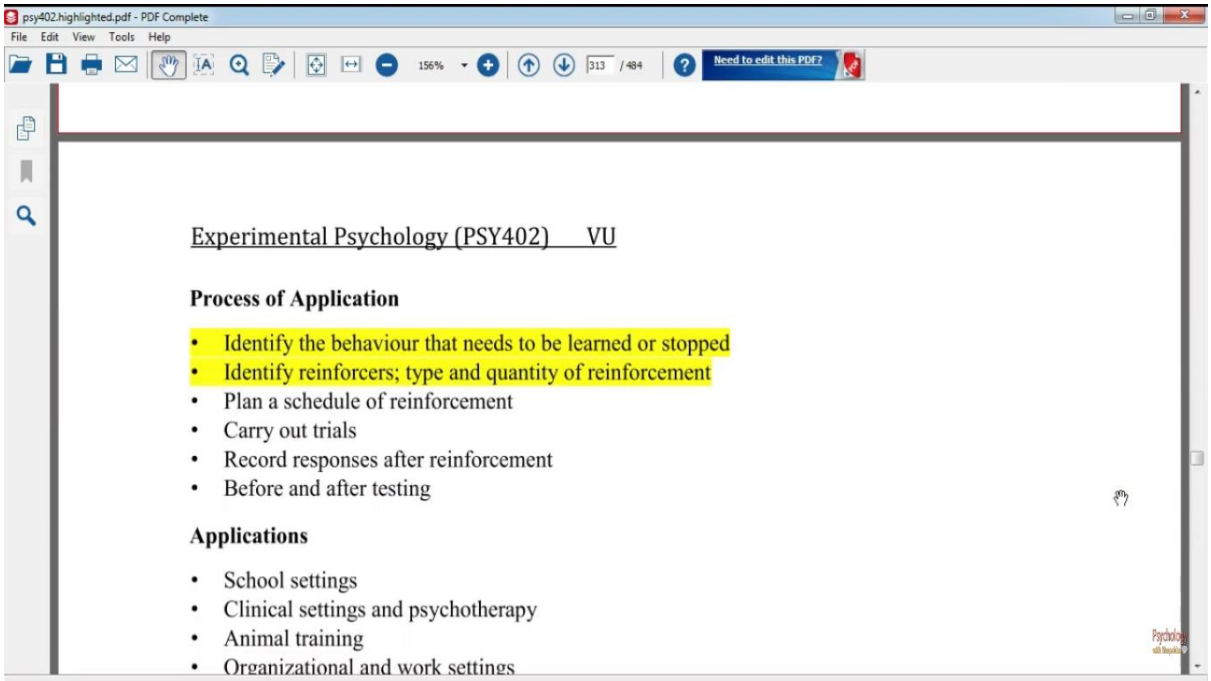
Operant Conditioning; Applications

Consequences

- Desirable, positive = food, pleasant sensation
- Undesirable, negative = shock, no food, puff of air
- Desirable consequences are called rewards; called reinforcement because they strengthen the response
- Undesirable = punishment
- Rewards and reinforcements are mostly used for teaching a behaviour
- Punishments to stop a behaviour
- Due to powerful nature of consequences and relevance to human and animal real experiences operant conditioning has important implications
- They also have wider applications for learning and behaviour
- The principles of operant and instrumental conditioning have been used frequently in many settings and situations

Examples in Real Life

- Child takes first step, everyone claps
- Child says salam he receives praise



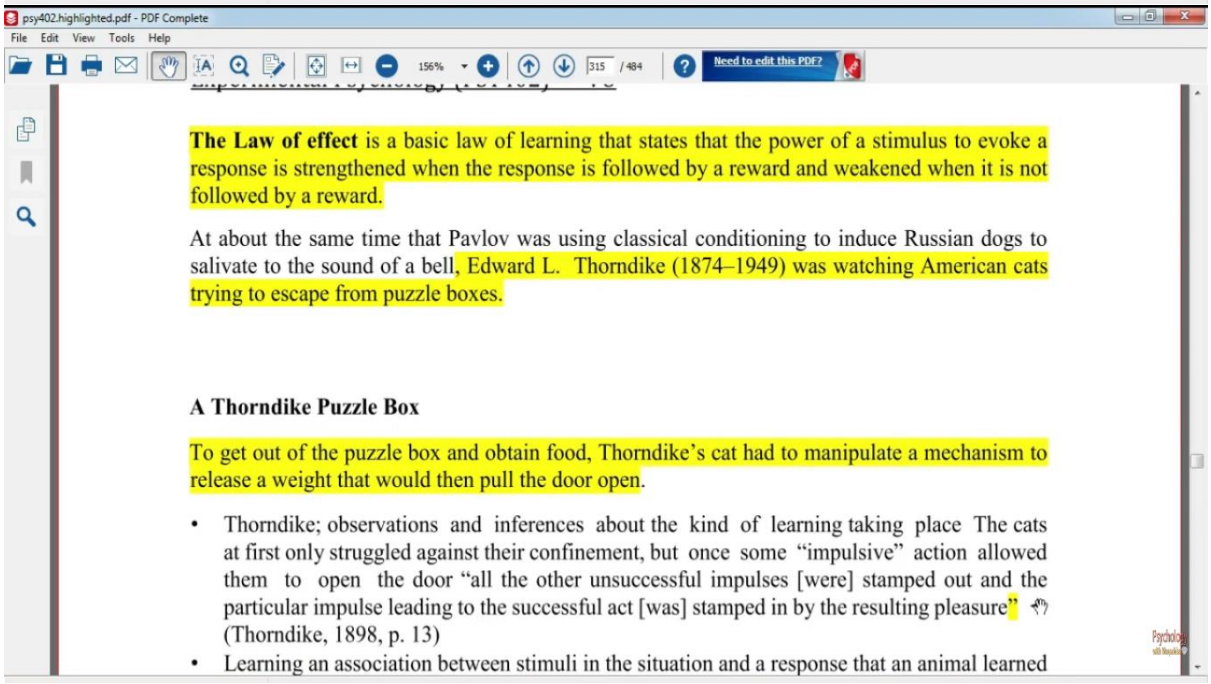
Experimental Psychology (PSY402) VU

Process of Application

- Identify the behaviour that needs to be learned or stopped
- Identify reinforcers; type and quantity of reinforcement
- Plan a schedule of reinforcement
- Carry out trials
- Record responses after reinforcement
- Before and after testing

Applications

- School settings
- Clinical settings and psychotherapy
- Animal training
- Organizational and work settings



The Law of effect is a basic law of learning that states that the power of a stimulus to evoke a response is strengthened when the response is followed by a reward and weakened when it is not followed by a reward.

At about the same time that Pavlov was using classical conditioning to induce Russian dogs to salivate to the sound of a bell, Edward L. Thorndike (1874–1949) was watching American cats trying to escape from puzzle boxes.

A Thorndike Puzzle Box

To get out of the puzzle box and obtain food, Thorndike's cat had to manipulate a mechanism to release a weight that would then pull the door open.

- Thorndike; observations and inferences about the kind of learning taking place The cats at first only struggled against their confinement, but once some "impulsive" action allowed them to open the door "all the other unsuccessful impulses [were] stamped out and the particular impulse leading to the successful act [was] stamped in by the resulting pleasure" (Thorndike, 1898, p. 13)
- Learning an association between stimuli in the situation and a response that an animal learned

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a response that is followed by dissatisfying consequences becomes less probable

Topic No. 129

Experimental Analyses of Behaviour; Skinner's Experiments

- B. F. Skinner agreed with Thorndike's view that environmental consequences exert a powerful effect on behavior.
- Skinner outlined a program of research to discover, by systematic variation of stimulus conditions, the ways that various environmental conditions affect the likelihood that a given response will occur

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- A natural datum in a science of behavior is the probability that a given bit of behavior will occur at a given time. An experimental analysis deals with that probability in terms of frequency or rate of responding.
- The task of an experimental analysis is to discover all the variables of which probability of response is a function (Skinner, 1966, pp. 213–214).
- Being an experimenter and empiricist, Skinner designed Operant procedures to manipulate consequences of an animal's behavior to observe how these affected subsequent behaviour
- An operant is any behavior that is emitted by an organism and can be characterized in terms of the observable effects it has on the environment; operant means affecting the environment, or operating on it.
- **Operants** are not elicited by specific stimuli as classically conditioned behaviors are
- Pigeons peck, rats search for food, babies cry and coo, some people gesture while talking, and others stutter; the probability of these behaviors occurring in the future can be increased or decreased by manipulating the effects they have on the environment.
- For example, a baby's coo prompts desirable parental contact, the baby will coo more in the future.
- Operant conditioning, then, modifies the probability of different types of operant behavior as a function of the environmental consequences they produce.
- An apparatus to manipulate the consequences of behavior, the operant chamber. When, after having produced an appropriate behavior defined by the experimenter, a rat presses a lever, the mechanism delivers a food pellet.

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Lecture 30

REINFORCEMENT

Topic: 130-134

Topic No. 130

Reinforcement Contingencies

- A reinforcement contingency is a consistent relationship between a response and the changes in the environment that it produces
- For example, an experiment in which a pigeon's pecking a disk (the response) is generally followed by the presentation of grain (the corresponding change in the environment)
- This consistent relationship, or reinforcement contingency, will usually be accompanied by an increase in the rate of pecking
- For delivery of grain to increase only the probability of pecking, it must be contingent only on the pecking response—the delivery must occur regularly after that response but not after other responses, such as turning or bowing

Based on Skinner's work modern behavior analysts seek to understand behavior in terms of

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Based on Skinner's work modern behavior analysts seek to understand behavior in terms of reinforcement contingencies. These are applied in ○ Behaviour modification therapies ○ Trainings ○ Management of behavior

A **reinforcer**, any stimulus that—when made contingent on a behavior—increases the probability of that behavior over time.

Reinforcement is the delivery of a reinforcer following a response.

Based on Skinner's work modern behavior analysts seek to understand behavior in terms of reinforcement contingencies. These are applied in ○ Behaviour modification therapies ○ Trainings ○ Management of behavior

A **reinforcer**, any stimulus that—when made contingent on a behavior—increases the probability of that behavior over time.

Reinforcement is the delivery of a reinforcer following a response.

Reinforcers are always defined empirically, in terms of their effects on changing the probability of a response.

Individual differences in reinforcers

Positive and Negative Reinforcers

- Positive, Neutral, Negative
- Positive = Appetitive(we want them)
- Negative = aversive, want to avoid them
- A behavior followed by the delivery of an appetitive stimulus, is positive reinforcement
- A response followed by removal of an aversive stimulus = negative reinforcement



Topic No. 131

Properties of Reinforcement

- Your pet rat will turn circles if a consequence of circle turning is the delivery of desirable food
- humans will tell jokes if a consequence of their joke telling is a type of laughter they find pleasurable
- Child will stop crying if she is picked up or given a candy
- Each one of these are consequences of behaviour and act as reinforcers
- Consequences are learnt fast and serve to strengthen the behaviour or response
- but not each reinforcer is positive and comes with a cost
- Sometimes a child needs comfort
- But if we console each time a child throws a tantrum or is disruptive, it becomes reinforcer for that behaviour
- Cost; they learn that crying is only way to get attention or comfort

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- A mother gets sick and gets her way
- A behaviour we want to stop is being reinforced

Two types of learning circumstances where negative reinforcement applies

- In escape conditioning, animals learn that a response will allow them to escape from an aversive Stimulus
- You learn to use an umbrella to escape the aversive stimulus of getting wet
- In avoidance conditioning, animals learn responses that allow them to avoid aversive stimuli before they begin
- car buzzer if not buckle seat belt
- Both positive reinforcement and negative reinforcement increase the probability of the response that precedes them
- Positive reinforcement increases response probability by the presentation of an appetitive stimulus following a response
- Negative reinforcement does the same in reverse, through the removal, reduction, or prevention of an aversive stimulus following a response
- Reinforcers are the power brokers of operant conditioning: they change or maintain behavior
- have a number of interesting and complex properties
- can be learned through experience rather than be biologically determined

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- can be learned through experience rather than be biologically determined
- can be activities rather than objects
- In some situations, even ordinarily powerful reinforcers may not be enough to change a dominant behavior pattern (in this case, we would say that the consequences were not actually reinforce

Primary and Conditioned Reinforcers

- Handful of primary reinforcers, such as food and water, whose reinforcing properties were biologically determined
- Over time neutral stimuli have become associated with primary reinforcers and now function as conditioned reinforcers for operant responses
- Secondary reinforcers; money, cheques, valuables
- a great deal of human behavior is influenced less by biologically significant primary reinforcers than by a wide variety of conditioned reinforcers
- Social reinforcers; Grades, smiles of approval, gold stars, and various kinds of status symbols
- Virtually any stimulus can become a conditioned reinforcer by being paired with a primary reinforcer
- In one experiment, simple tokens were used with animal learners.

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Schedules of Reinforcement

Operant Extinction

- If reinforcement is withheld operant extinction occurs
  if a behavior no longer produces predictable consequences, it returns to the level it was at before operant conditioning-it is extinguished
- Example; putting coins in machine to get a cola, machine does not deliver, after trying few times, you stop putting coins- response extinguished

Spontaneous Recovery

- You may come back later or kick the machine to try after some time
- Pigeon no longer recieves grain when he pecks at the green light in skinner box- he stops pecking
- next time the pigeon is put back in the apparatus with the green light on, the pigeon would likely spontaneously peck
- Spontaneous recovery occurs but response rate is less and stops very quickly

Punishers

- Another technique for decreasing the probability of a response- punishment
- A punisher is any stimulus that-when it is made contingent on a response-decreases the probability of that response over time

- You may come back later or kick the machine to try after some time
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- A punisher is any stimulus that-when it is made contingent on a response-decreases the probability of that response over time
- Punishment is the delivery of a punisher following a response
- When a behavior is followed by the delivery of an aversive stimulus, the event is called positive punishment (positive because something is added to the situation); touching a hot stove, pain, next time not likely to touch the stove
- When a behavior is followed by the removal of an appetitive stimulus, the event is referred to as negative punishment(negative because something is subtracted from the situation)a parent withdraws a child's allowance when hits her baby brother.

A way to remember

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Type	Positive Adds something	Negative Remove something
Reinforcement	candy, pizza, cold drink, praise, smile	headache, pain, loud noise, criticism
Punishment	physical punishment, scolding,	Pocket money, TV time, video , play activity Concept of time out

- A time out is "the contingent
- withholding of the opportunity to earn reinforcement . . . from rewarding stimuli including attention from the parent, as a consequence of some form of misbehavior" (Morawska & Sanders, 2011, p. 2)
- Be sure time out is punishing not enjoyable; Children may learn this is a way to escape a task they don't wont to do
  Make request again after time ends
- Effective for children 3-7 years

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- **Fixed-Ratio Schedules**: In fixed-ratio (FR) schedules, the reinforcer comes after the organism has emitted a fixed number of responses
- Many salespeople are on FR schedules: They must sell a certain number of units before they can get paid
- In a **variable-ratio** (VR) **schedule**, the average number of responses between reinforcers is predetermined
- A VR-10 schedule means that, on average, reinforcement follows every 10th response, but it might come after only 1 response or after 20 responses. Variable-ratio schedules generate the highest rate of responding and the greatest resistance to extinction, especially when the VR value is large
- On a **fixed-interval** (FI) **schedule**, a reinforce is delivered for the first response made after a fixed period of time
- For **variable-interval (VI) schedules**, the average interval is predetermined; on a VI-20 schedule, reinforcers are delivered at an average rate of 1 every 20 seconds, generates a moderate but very stable response rate
- Extinction under VI schedules is gradual and much slower than under fixed-interval schedules

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○ A pigeon pecked 18,000 times during the first 4 hours after reinforcement stopped and required 168 hours before its responding extinguished completely (Ferster & Skinner, 1957) ○ A professor, who gave occasional, irregularly scheduled quizzes; do you study your notes all the time.

Topic No. 134

Schedules of reinforcement; Applications and Interventions

B. F. Skinner agreed with Thorndike's view that environmental consequences exert a powerful effect on behavior. Skinner outlined a program of research to discover, by systematic variation of stimulus conditions, the ways that various environmental conditions affect the likelihood that a given response will occur.

A natural datum in a science of behavior is the probability that a given bit of behavior will occur at a given time. An experimental analysis deals with that probability in terms of frequency or rate of responding.

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○ **Continuous Reinforcement**; each response is rewarded, pigeon gets food after each peck ○

Partial reinforcement; reward, food is delivered on some occasions and not on others

Partial reinforcement can be after a certain number of responses, or an interval schedule, after the first response following a specified interval of time. In each case, there can be either a constant, or

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- Different schedules of reinforcement in; when you raise your hand in class, the teacher sometimes calls on you and sometimes does not
- Some slot machine players continue to put coins in the one-armed bandits even though the reinforcers are delivered only rarely
- FI schedule when you reheat a slice of pizza. Suppose you set the oven's timer for 2 minutes. You probably won't check very much for the first 90 seconds, but in the last 30 seconds, you'll peek in more often
- Gambling would seem to be under the control of VR schedules. The response of dropping coins in slot machines is maintained at a high, steady level by the payoff, which is delivered only after an unknown, variable number of coins has been deposited. VR schedules leave you guessing when the reward will come—you gamble that it will be after the next response, not many responses later
- A thought; waiting for good deeds to be rewarded in hereafter- is it reinforcement delayed but yet effective?

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Lecture 31

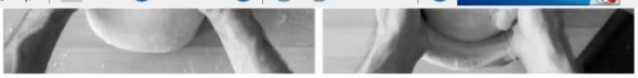
SHAPING

Topic: 135-139

Topic No. 135 Shaping

A desired behaviour is developed by first rewarding any behaviour that approximates it. Gradually, through selective reinforcement of behaviour more and more closely resembling the desired behaviour, the final behaviour is shaped. This technique is sometimes called successive approximation.

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For example, Ali never does his math homework. You would like to have him complete his homework on a daily basis. You realize that if you wait for him to complete his homework before you reinforce him in some way, you may never (or infrequently) have the opportunity to administer a positive consequence. Therefore, you decide to break down the desired behaviour into sub-steps that are progressively more demanding. These steps might be

1. Will write his name at the top of the worksheet.
2. Complete one problem of his choice.
3. Five problems of his choice.
4. Complete either all the odd numbered problems or all the even numbered problems.
5. Complete all problems except one.
6. Will complete all problems

Chaining is the processes of adding small behaviors together to create a larger, more complex and sophisticated behavior.

For example, if you are attempting to teach someone to tie their shoes, you are attempting to build a chain by reinforcing the different acts that we complete in tying a shoe

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For example, if you are attempting to teach someone to tie their shoes, you are attempting to build a chain by reinforcing the different acts that we complete in tying a shoe

- Differential reinforcement sets the occasion for behaviour
- Increases the probability that a previously reinforced behaviour will occur
- Each step in the chain serves a differential reinforce for the next step
- Each step in the chain serves as a conditioned reinforce to the preceding step, conditioned from the final reinforce

There are two chaining procedures: forward and backward.

As the name implies **forward**—start at beginning of chain (often similar to shaping) **backward**–start near end of chain (More frequent chaining technique).

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Topic No. 136 Shaping

- To train new or complex behaviors, you will want to use a method called shaping by successive approximations—in which you reinforce any responses that successively approximate and ultimately match the desired response
- Pigeon turns his body, looks towards the light, goes near the light, raises head to look at light; each step is reinforced
- Once he Pecks then reward is only given at desired ultimate response- pecking at light

Prompts are events that help initiate a response

Allow response to occur and be reinforced **Examples:**

a. Physical guidance

b. Instruction

c. Pointing

d. Planned visual cues

e. Modeling

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Prompts are events that help initiate a response

Allow response to occur and be reinforced **Examples:**

a. Physical guidance

b. Instruction

c. Pointing

d. Planned visual cues

e. Modeling

Fading

- Gradual removal of a prompt
- Provide prompt less frequently
- Provide prompt at a lower level of intensity
- Modify prompt to be more like naturally occurring cues
- If fading is too quick, rate of responding will drop

Experimental Psychology (PSY402) VU

Prejudiced Attitudes are learned; An experiment in Pakistan

- Original Study; Staats and Staats, 1976,1977
- Nonsense syllables were presented with some adjectives
- Some syllables are paired with positive adjectives like sweet, nice, fragrant, kind
- Some are paired with negatives ones like mean, smelly, ugly, stingy
- Hypothesis; the nonsense syllables paired with positive words will be liked more than those paired with negative words
- based on association principle in classical conditioning; result confirmed their assumption
- They suggested that prejudice for certain nationalities could be learned the same way- association of a name with a bad word usually through both appearing together in media

An Experiment in Pakistan

Exp.1; Nonsense syllables

CET fresh

An Experiment in Pakistan

Exp.1; Nonsense syllables

CET	fresh
QEH	smelly
SUF	prickly
GOJ	sweet
JAV	rough
MIP	fragrant

Result

Meaningless syllables paired with Positive words average rating = 7

Syllables paired with negative adjectives, average rating = 4

Rating means liking

- Can we learn dislike or prejudice for some nations through association process shown in this experiment
- Problem with names of nations;

- Can we learn dislike or prejudice for some nations through association process shown in this experiment
- Problem with names of nations;
- American , German, Afghan, Chinese, Indian, ……many nationalities are familiar for us and may hold previous associations so our experiment will be confounded
- We found unfamiliar nationalities and tested for familiarity and previous associations; Peruvian, Swedish, Morrocan, Bolivian, Finnish
- Paired with good or bad adjectives
- Kind, Mean, Cruel, Neurotic, Dirty
- Liking rating; nations paired with good words were liked more than those paired with negative words
- Though the difference was not as significant as for syllables
- Conclusion; we learn to dislike some nations or groups through process of association

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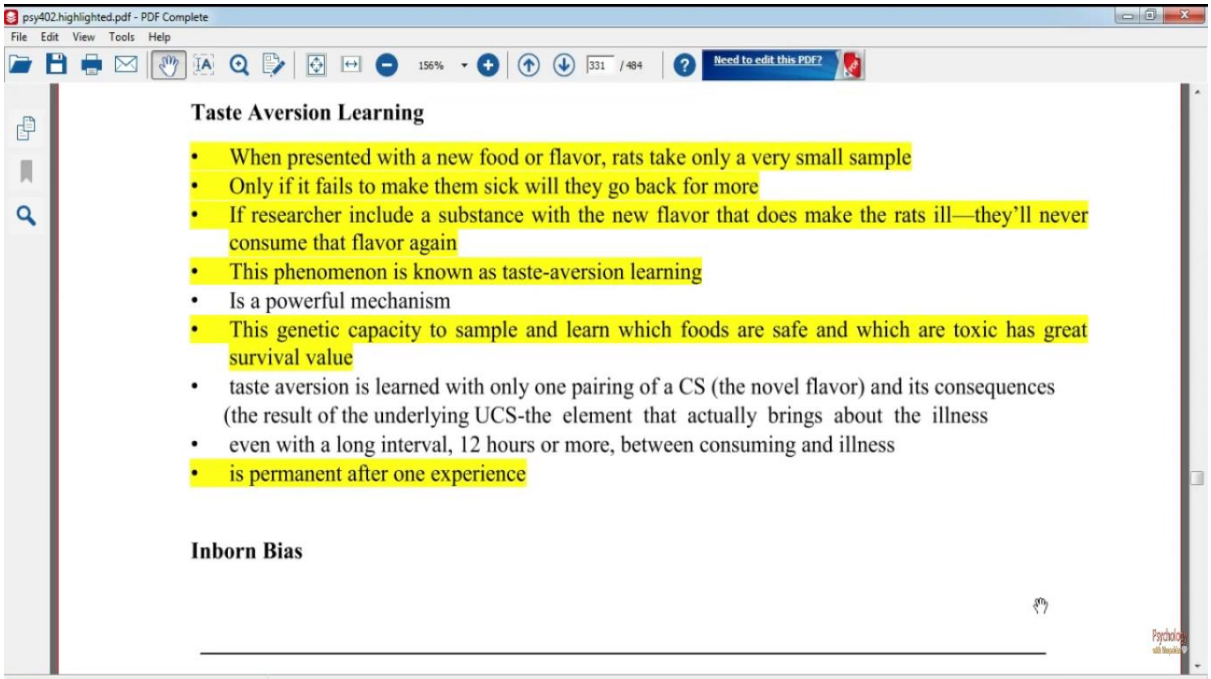
Word Association Method

- Say the first word that comes to mind as I say; Politician, Mother–in-Law, step mother, Muslim, Hindu
- Interesting associations were revealed
- Politician- corrupt, Hindu- scheming ○ Now that association is changing
- Mother-in-Law mixed associations; monster, friend, amie
- Step mother- churail, helpful, trouble
- Individual experience or media driven?

Topic No. 138

Biological constraint on learning

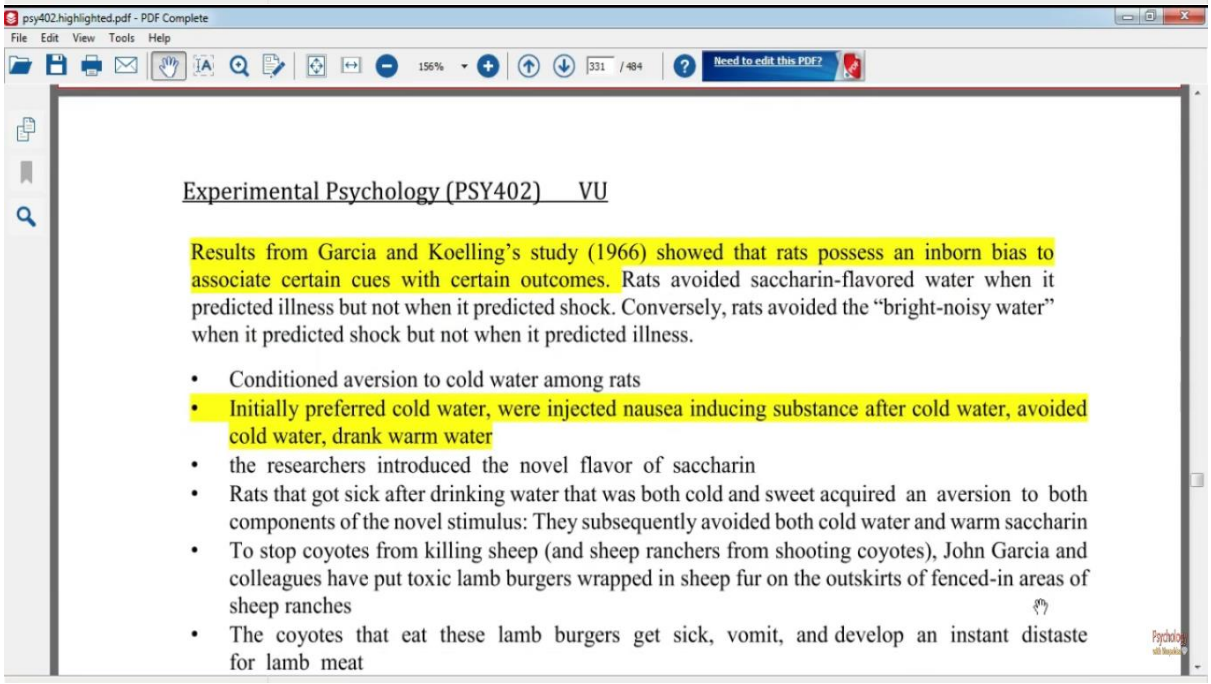
- Some instances of conditioning not only on the relationship between stimuli and behaviour but also on the way an organism is genetically predisposed toward stimuli in its environment
- Animals appear to have encoded, within their genetic inheritance, the types of sensory cues—taste, smell, or appearance—that are most likely to signal dimensions of reward or danger
- Instinctual drift; the tendency for learned behavior to drift toward instinctual behavior over time
- Biological preparedness: a particular species members require less learning experience than



Taste Aversion Learning

- When presented with a new food or flavor, rats take only a very small sample
- Only if it fails to make them sick will they go back for more
- If researcher include a substance with the new flavor that does make the rats ill—they'll never consume that flavor again
- This phenomenon is known as taste-aversion learning
- Is a powerful mechanism
- This genetic capacity to sample and learn which foods are safe and which are toxic has great survival value
- taste aversion is learned with only one pairing of a CS (the novel flavor) and its consequences (the result of the underlying UCS-the element that actually brings about the illness
- even with a long interval, 12 hours or more, between consuming and illness
- is permanent after one experience

Inborn Bias



Results from Garcia and Koelling's study (1966) showed that rats possess an inborn bias to associate certain cues with certain outcomes. Rats avoided saccharin-flavored water when it predicted illness but not when it predicted shock. Conversely, rats avoided the "bright-noisy water" when it predicted shock but not when it predicted illness.

- Conditioned aversion to cold water among rats
- Initially preferred cold water, were injected nausea inducing substance after cold water, avoided cold water, drank warm water
- the researchers introduced the novel flavor of saccharin
- Rats that got sick after drinking water that was both cold and sweet acquired an aversion to both components of the novel stimulus: They subsequently avoided both cold water and warm saccharin
- To stop coyotes from killing sheep (and sheep ranchers from shooting coyotes), John Garcia and colleagues have put toxic lamb burgers wrapped in sheep fur on the outskirts of fenced-in areas of sheep ranches
- The coyotes that eat these lamb burgers get sick, vomit, and develop an instant distaste for lamb meat

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- The coyotes that eat these lamb burgers get sick, vomit, and develop an instant distaste for lamb meat
- Their subsequent disgust at the mere sight of sheep makes them back away from the animals instead of attacking

Topic No. 139

Comparing Classical and Operant Conditioning

Both classical and operant conditioning rely on process of association.

However there are many differences in how the association takes place and between which two things.

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		reinforcement
Biological constraints	Natural predispositions constrain what stimuli and responses can easily be associated	Organisms best learn behaviour similar to their natural behaviour; unnatural behaviour instinctively drift back towards natural ones

- There are some examples of learning where we see combined effects of classical and operant conditioning
- In classical conditioning response after the stimulus
- In operant conditioning experimenter awaits response before they can reinforce
- Sometimes training required to carry out experiment in lab for example pigeons learn to eat in Skinner box food chamber and have to be deprived to learn
- In real life applications both are used for various purposes-both have limitations
- Beyond association, model of expectation
- Latent learning; a learning that wasn't demonstrated till reinforcement was given
- Guthrie model showed that learning wasn't dependent upon reinforcement, performance was
- Beyond reinforcement, Intrinsic reinforcement

Lecture 32

COGNITIVE APPROACHES TO LEARNING

Topic: 140-141

Topic No. 140

Cognitive Approaches to Learning

- Cognition is any mental activity involved in the representation and processing of knowledge, such as thinking, remembering, perceiving, and language use
- Researcher have studied aspects of learning that could not be explained by simple stimulus and response associations

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- Is there evidence that some forms of learning may require more complex or cognitive type of processes ?

Cognitive Maps

Edward C. Tolman (1886–1959) pioneered the study of cognitive processes in learning by inventing experimental circumstances in which mechanical one-to-one associations between specific stimuli and responses could not explain animals' observed behavior.

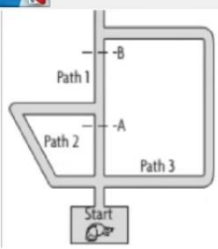
- When an original goal path is blocked in a maze, a rat with prior experience in the maze will take the shortest detour around the barrier, even though that particular response was never previously reinforced (Tolman & Honzik, 1930)
- Rats behaved as if they were responding to an internal cognitive map representing overall lay out of the maze rather than exploration of the maze through blind trial and error

Use of Cognitive Maps in Maze Learning

Subjects preferred the direct path (Path 1) when it was open. With a



block at A, they preferred Path 2. When a block was placed at B, the rats usually chose Path 3. Their behaviour seemed to indicate that they had a cognitive map of the best way to get the food



- Tolman's results showed that conditioning involves more than the simple formation of associations between sets of stimuli or between responses and reinforcers. It includes learning and representing other facets of the total behavioral context
- Spatial memory among humans, birds, bees, rats and other animals is impressive

Spatial memory is used to:

- Recognize and identify features of environment
- Find goal objects in environment
- Plan route to navigate or reach a destination in environment
- Birds hide and store seeds during summer and can find these seeds using spatial memory in winter many months later
- They change places so seeds are not stolen by other animals
- Cognitive maps have to be accurate

Topic No. 141

- Importantly, this pecking behaviour also transferred to a new set of colors, for which they hadn't received explicit training; the pigeons had acquired the concept of same versus different colours
- Pigeons learned to peck the new colours: the colour not yielding reinforcement previously
- Instead of responding to each individual color, the pigeons had acquired the higher-order concept of color change

Observational Learning

- **Vicarious Reinforcement** and **Vicarious Punishment**
- We use our cognitive capacities of memory and reasoning to learn from others' experiences, change our behaviour in light of others' experience
- Much of social learning occurs through observing others being reinforced or even others telling us about their adverse or good experiences; "food from that place is excellent"
- Saves trial and error, time, useful

Human observational learning

- After watching adult models punching, hitting, and kicking a large plastic BoBo doll, the children in the experiment later showed a greater frequency of the same behaviour than did children in control conditions who had not observed the aggressive models (Bandura et al., 1963).
- Children imitated behaviour of characters even if they were filmed or cartoon characters.
- Both prosocial (helping) and antisocial (hurting) behaviour can be learned through observation of

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Steps of Observational Learning

1) **Attention**; the observer must pay attention to the model's behaviour and its consequences, perceived similarities between the model and the observer
2) **Retention**; a representation of the model's behaviour stored in memory
3) **Reproduction**; physical or mental ability to reproduce the model's behaviour
4) **Motivation**; the observer must have a reason to reproduce the model's behaviour for example the model's behaviour could be seen as having reinforcing consequences

Television and Violence

MEMORY

Topic: 142-147

Topic No. 142

Memory

Definition of Memory

Memory is the capacity and processes involved in retaining, retrieving, and using information about stimuli, images, events, ideas, and skills after the original information is no longer present. Memory is a type of information processing that involves receiving, processing, retaining and storing and bringing up the stored content.

What experiences can you recall from your year in the eighth grade? Think of them for a moment. You learned many facts there; lots of things happened to you. Probably you will never recall even a small fraction of the facts you learned or experiences you had then. What has happened to these

the eighth grade, it would probably be similarly brief. This leads to an interesting question: How can we study memories that cannot be recalled? If a person cannot recall an experience, can we assume that the memory trace representing that experience has vanished?

Ebbinghaus's contribution—when memory was young

The experimental investigation of human memory was begun by a German psychologist, Hermann Ebbinghaus. He was a true scientific pioneer. He believed, unlike his famous contemporary, Wilhelm Wundt , that experimental psychology could be developed to study the higher mental processes and not just sensory processes. His main achievement was demonstrating how empirical research could answer interesting questions about memory. This research was published in 1885 in a remarkable book, *Memory: A Contribution to Experimental Psychology.* One of the first questions Ebbinghaus faced was the one we have been considering: how to measure memory. Ebbinghaus served as the only subject in all his experiments; the materials he invented to be memorized are called **nonsense syllables.** He typically used meaningless syllables that contained a vowel sandwiched between two consonants (therefore called CVC syllables), such as ZOK, VAP, and so on. By using these syllables, he hoped to minimize the influence of linguistic associations that would have been present had he used words, sentences, or (as he sometimes did) passages of poetry as materials to be remembered. (Later research has shown that "nonsense" syllables is a misnomer, because a few items he used were words. Also, in learning even nonsense words, people imbue them with meaning.)

research. However, his findings have been replicated many times with larger groups of subjects and are still considered valid.

What do we use memory for?

As a first look at memory, let's see what do we use memory for?

Below is just a brief list of functions that memory serves

- Material ; *exam notes, recipes, operating instructions*
- Daily schedule
- Names
- Phone numbers
- Directions to places
- Remembering to do things in future; prospective memory
- Retrieving learned material
- Past events

Also very important ….

We need memory for labeling familiar objects and for having conversations (keeping track of flow of

Varieties of Memory

The term *memory* is quite broad and covers many different kinds of skills and abilities. All have in common the properties that something is learned, retained over time, and then used in some particular situation, but beyond that, types of memory may differ considerably (see Roediger, Marsh, & Lee, 2002, for a summary). You have probably had an experience like this: You are introduced to three people and utterly forget the first person's name by the time you shake the third person's hand. This spectacularly fast forgetting seems quite different from the slower forgetting studied by Ebbinghaus. Remembering information such as a telephone number over a brief interval reflects **short term** or working memory, and some psychologists believe that it has different properties from **long-term memory** (the kind Ebbinghaus studied) and that it should properly be considered a distinct memory system or store. One way of defining short-term memory is the recovery of information shortly after it has been perceived, before it has even left conscious awareness (James, 1890). Long-term memory, then, refers to retrieval of memories that have disappeared from consciousness after their initial perception.

This general definition of long-term memory today seems too broad to most psychologists, who make further distinctions among types of memory. These are discussed more fully later, when we illustrate how memory is studied in different ways. One basic distinction that guides much research today is explicit memory versus implicit memory (Graf & Schacter, 1985; Schacter, 1987).

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Explicit memory (sometimes called **episodic memory**) refers to the conscious recollection of events (or episodes) in one's life. People may be asked to recall what they learned in a particular time or place or to distinguish things that happened to them from plausible distractors. Examples would be answering the question of what you did last Saturday night, what you learned in your introductory psychology course, or what you have done thus far today. Tasks typically used to measure both short-term and long-term memory would be classified as explicit memory tests, because people are explicitly told to retrieve information from their past.

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Implicit memory, on the other hand, refers to the expression of past learning in which a person need not make any conscious effort to retrieve information from the past (Roediger & McDermott, 1993; Schacter, 1990). It just happens, more or less automatically. For example, when you bend over to tie your shoelaces, you need not say to yourself, "How do I do this? When did I learn to do this? Can I remember how?" Instead, the behavior occurs relatively effortlessly, and if you stop to reflect on exactly how you are doing it, you may actually do worse. Of course, information expressed implicitly was learned, but the crux of the distinction is that, unlike explicit remembering, implicit expressions of memory do not require people consciously to retrieve information from their past. In fact, as we shall see later in the chapter, patterns of performance on explicit and implicit tests of memory are often quite different (Roediger, 1990).

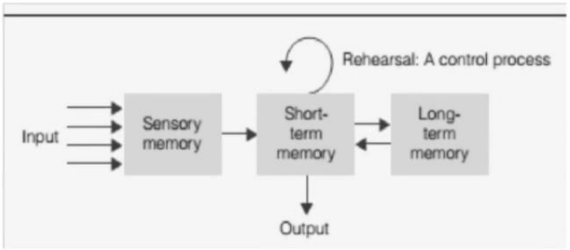
Models of Memory

Many models have been proposed to explain memory but the most prominent model among all is **Atkinson and Shiffrin's model of memory (1968).**



Models of Memory

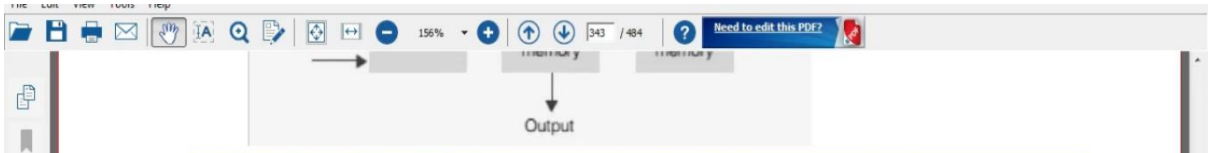
Many models have been proposed to explain memory but the most prominent model among all is **Atkinson and Shiffrin's model of memory (1968).**



This is also called **modal model of memory** because it included many of the features of memory models being proposed in the 1960s. This model became extremely influential and shaped research on memory for many years. The stages in the model are called the structural features of the model.

Structural Features

1. **Sensory memory**; an initial stage, holds all incoming information for seconds or fractions of a second



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Structural Features

1. **Sensory memory**; an initial stage, holds all incoming information for seconds or fractions of a second
2. **Short-term memory** (STM) holds 5–7 items for about 15–30 seconds
3. **Long-term memory** (LTM) can hold a large amount of information for years, decades or life time control processes, are active processes that can be controlled by the person and may differ from one task to another.

Control Processes

- **Rehearsal**- repeating a stimulus over and over, a telephone number in order to hold it in your mind
  • Strategies to make an information more memorable, selective attention
- **Encoding**; The process of storing the number in long-term memory Retrieval; remembering information stored in long-term memory.
- Memory components work together not in isolation.

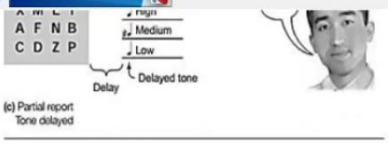
Topic No. 144

Experiments on Sensory Memory

Sensory memory is the retention, for brief periods of time, of the effects of sensory stimulation and it retains a perception of the sparkler's light for a fraction of a second that is the persistence of vision.

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report: Person saw all 12 letters, as before, but immediately after they were turned off, a tone indicated which row the person was to report. (c) **Delayed partial report**: Same as (b), but with a short delay between extinguishing the letters and presentation of the tone.

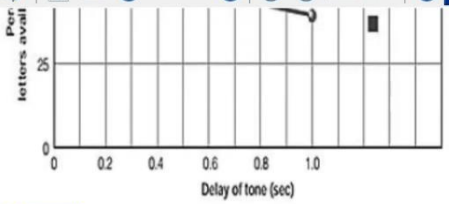


Results of Sperling's (1960) partial report experiments

The decrease in performance is due to the rapid decay of iconic memory (sensory memory in the modal model) 82 percent in partial method without delay. The explanation is that they saw all but as they reported initial letters, others faded.

Sperling concluded from these results that a short-lived sensory memory registers all or most of the information that hits our visual receptors, but that this information decays within less than a second. This brief sensory memory for visual stimuli is called iconic memory or the visual icon (icon means "image"), and corresponds to the sensory memory stage of Atkinson and Shiffrin's model.

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Echoic Memory

Echoic Memory sounds also persist in the mind. This persistence of sound, which is called echoic memory, lasts for a few seconds after presentation of the original stimulus (Darwin et al., 1972).

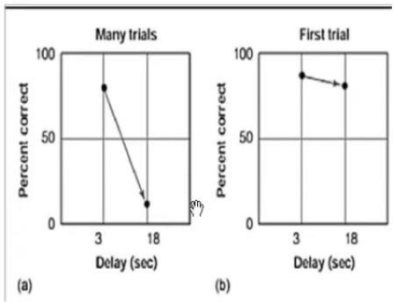
Topic No. 145

Short-term memory (STM)

STM is the system involved in storing small amounts of information for a brief period of time (Baddeley et al., 2009). Whatever you are thinking about right now, or remember from what you have just heard is in your short-term memory. Most of this information is eventually lost, only some of it reaches the more permanent store of long-term memory (LTM). Because of the brief duration of STM, it is easy to downplay its importance compared to LTM

Peterson and **Peterson** found that their participants were able to remember about 80 percent of the letters after counting for 3 seconds but could remember an average of only 12 percent of the three-letter groups after counting for 18 seconds.

Interpretation; participants forgot the letters because of decay, their memory trace decayed because of the passage of time after hearing the letters. Note falloff in just one trail and number of trials.



Keppel and Underwood suggested that the drop-off in memory was due not to decay of the memory trace but to proactive interference (PI)-interference that occurs when information that was learned previously interferes with learning new information. In daily life, events follow one after another, thus needing attention, they interfere with each other. The effective duration of STM, when rehearsal is prevented, is about **15–20 seconds**.

Topic No. 146

Recap on STM

- Short term memory is our window on to the present moment
- Brief, immediate memory for material that you are currently processing
- Listening to this sentence, holding in memory
- Organizes cognitive activities
- Holds visual and spatial information; plans strategies
- Has a short duration of 15-20 seconds

Capacity of short term memory

Not only the information is lost quickly, there is a limit to how much we can hold in STM. One measure for capacity of STM is provided by the Digit Span- the number of digits a person can remember.

Chunking

Miller proposed that people engage in internal mental processes in order to convert stimuli into a manageable number of chunks small units (like words) can be combined into larger meaningful units, like phrases, sentences, paragraphs, or stories. Chunk is defined as a collection of elements that are strongly associated with one another but are weakly associated with elements in other chunks.

Chunking in terms of meaning increases our ability to hold information in STM. We can recall a sequence of 5 to 8 unrelated words, but arranging the words to form a meaningful sentence so that the words become more strongly associated with one another increases the memory span to 20 words or more (Butterworth et al., 1990). In example below, chunks of digits are easier to remember because they are meaningful under a category such as a city code or a certain mobile provider code.

- 0333, 0300, 0321
- 92, 042, 051, 046….216

Country code, city code, actual number

In example below words can remembered also in meaningful pairs or chunks.

Child, ticket, monkey, lock, jump, zoo, banana, look

- 92, 042, 051, 046….216

Country code, city code, actual number

In example below words can remembered also in meaningful pairs or chunks.

Child, ticket, monkey, lock, jump, zoo, banana, look

Topic 147

Encoding

Coding refers to the way information is represented in mind. **Encoding** is the process of coding
It makes the processing and storing of information possible by organizing it according to meaning or some other feature of information.

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Types of Coding

- Physiological approach to coding- pattern of firing of neurons
- Mental approach to coding-how a stimulus or an experience is represented in the mind
- Memory of this lecture includes; image or face of instructor, voice of instructor and remembering meanings and topic. These represent three types of coding.

Type of Coding	Example
Auditory	Sound of the person's voice
Visual	Image of a person

- Memory of this lecture includes; image or face of instructor, voice of instructor and remembering meanings and topic. These represent three types of coding.

Type of Coding	Example
Auditory	Sound of the person's voice
Visual	Image of a person
Semantic	Meaning of what the person is saying

Auditory coding involves representing items in STM based on their sound. In early experiments by R. Conrad, in 1964 the participants saw target letters briefly on a screen, were told to write down the letters in the order they were presented. Participants were most likely to misidentify the target letter as another letter that sounded like the target, "F" was most often misidentified as "S" or "X," two letters that sound similar to "F," not as likely to be confused with letters like "E," that look like the target.

Thus, even though the participants saw the letters, the mistakes they made were based on the letters'

Semantic Meaning of what the person is saying

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Thus, even though the participants saw the letters, the mistakes they made were based on the letters' sounds Conrad concluded that the code for STM is auditory (based on the sound of the stimulus), rather than visual (based on the visual appearance of the stimulus). In everyday life we memorize phone numbers by repeating rather than by looking, sound rather than visual coding.

Visual coding involves representing items visually, as would occur when remembering the details of a floor plan or the layout of streets on a map. Experiment by Sergio Della Sala and coworkers (1999); the patterns are difficult to code verbally, so completing the pattern depends on visual memory as in pattern below.
Here is a small experiment.

Answer matrix for the visual recall test. Put a check in each square that was darkened in the pattern

Lecture 34

CONCEPT OF WORKING MEMORY

Topic: 148-154

Topic No. 148

Concept of Working Memory

As research on STM progressed, researchers were convinced that view of STM as a mere storage is too narrow. It involves both holding information and processing it

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step) and active processes (carrying the 1, multiplying 6 × 4) at the same time.

STM and the modal model do not consider dynamic processes that unfold over time. This led **Baddeley** to begin considering alternatives to the modal model. Baddeley noticed something else that was not explained by the modal model: under certain conditions it is possible to carry out two tasks simultaneously.

What kind of model can take into account both (1) the dynamic processes involved in cognitions such as understanding language and doing math problems and (2) the fact that people can carry out two tasks simultaneously?

Baddeley concluded that the short term process must be dynamic and must also consist of a number of components that can function separately. According to this idea, the digit span task in the demonstration (holding numbers in your memory) would be handled by one component while comprehending the paragraph would be handled by another component. The model Baddeley proposed was first described in a paper with Graham Hitch (Baddeley & Hitch, 1974) and, as we will see, was later modified to explain new findings.

In this model, the short-term component of memory is called **working memory**. Working memory is defined as *a limited-capacity system for temporary storage and manipulation*

Demonstration

is defined as a limited-capacity system for temporary storage and manipulation of information for complex tasks such as comprehension, learning, and reasoning.

Working Memory and STM

1. Short-term memory is concerned mainly with storing information for a brief period of time (e.g. a phone number), whereas working memory is concerned with the manipulation of information that occurs during complex cognition (e.g. remembering numbers while reading a paragraph).

2. Short-term memory consists of a single component, whereas working memory consists of a number of components.

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Baddeley's working memory model

Topic No. 149

Components of Working Memory

Working-memory approach proposed by Baddeley, our immediate memory is a multipart system that temporarily holds and manipulates information as we perform cognitive tasks. Working memory accomplishes the manipulation of information through the action of three components;

1. The phonological loop
2. The visuospatial sketch pad
3. The central executive



B, requiring no answer. String of numbers' length did not increase errors. This study contradicts Miller's magic seven in STM.

Phonological Loop

It holds limited number of sounds for a limited time

You can pronounce country names such as Burma and Greece fairly quickly, so you can rehearse a large number of them quickly. In contrast, you can pronounce only a limited number of longer names, such as Switzerland and Nicaragua. When you need to rehearse a large number of these long names, some will inevitably be lost from the phonological loop



silently

Visuo-spatial sketchpad

- Processes both visual and spatial information. This sketchpad allows you to look at a complex scene and gather visual information about objects and landmarks. It also allows you to navigate from one location to another.
- Has limited storage like phonological loop
- The visuospatial sketchpad allows you to store a coherent picture of both the visual appearance of the objects and their relative positions in a scene
- The visuospatial sketchpad also stores visual information that you encode from verbal stimuli **The Central Executive**
- Integrates information from the phonological loop, the visuospatial sketchpad, the episodic buffer, and from long-term memory

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- Most researchers emphasize that the central executive plans and coordinates, but it does not store information

The Episodic Buffer

Approximately twenty-five years after Alan Baddeley proposed his original model of working memory, he proposed a fourth component of working memory called the episodic buffer.

The episodic buffer serves as a temporary storehouse where we can gather and combine information from the phonological loop, the visuospatial sketchpad, and long-term memory.

Topic No. 150

Functions of Components Of Working Memory

Research on Acoustic Confusions

A classic study by Conrad and Hull (1964) showed participants two kinds of lists of letters of the English alphabet. Some lists featured letters that had similar-sounding names, such as the sequence C, T, D, G, V, B. Other lists featured letters with different-sounding names, such as the sequence C, W, Q, K, R, and X. The participants correctly recalled more letters from the second list, where

sentence, for example. Can you hear your "inner voice" saying the numbers silently?

- Now try counting the number of words in that same sentence, but rapidly say the word the while you are counting. When your phonological loop is preoccupied with saying the, you cannot perform even a simple counting task!
- The phonological loop plays an important role in reading,

The Phonological Loop is active when we acquire new vocabulary words in our first language and in a foreign language. It helps with mathematical calculations and problem-solving tasks in order to keep track of numbers and other information. It is important whenever you are working on a complex task that requires you to remember the task instructions for an extended period of time.

Visuospatial Sketchpad

On one occasion, Baddley decided to listen to a football game while driving along a California freeway. In order to understand the game, he tried to form clear, detailed images of the scene and

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the action. While creating these images, however, he discovered that his car began drifting out of its lane!

Students in psychology and other social sciences use the phonological loop more often than the visuospatial sketchpad. However, students in disciplines such as engineering, art, and architecture frequently use visual coding and the visuospatial sketchpad in their academic studies. Watching television, you cannot use spatial imagery and watch television, this kind of task has both spatial and visual components.

Visuospatial Sketchpad in everyday life

Look at several objects that are within your reach. Now close your eyes and try to touch one of these objects. Your sketchpad allowed you to retain a brief image of that scene while your eyes were closed. Visuospatial sketchpad is activated when trying to find way from one location to another useful in many leisure activities, such as videogames, jigsaw puzzles, and games involving a maze.

The Central Executive

Look at several objects that are within your reach. Now close your eyes and try to touch one of these objects. Your sketchpad allowed you to retain a brief image of that scene while your eyes were closed. Visuospatial sketchpad is activated when trying to find way from one location to another useful in many leisure activities, such as videogames, jigsaw puzzles, and games involving a maze.

The Central Executive

It plays a major role in focusing attention, planning strategies, transforming information, and coordinating behavior and is responsible for suppressing irrelevant information. It controls or monitors day dreaming. There are individual differences in central executive functions. There is much less research on central executive than phonological loop.

The Episodic Buffer

As the component of working memory where auditory, visual, and spatial information can be combined with the information from long-term memory. This arrangement helps to solve the theoretical problem of how working memory integrates information from different modalities. It actively manipulates information so that you can interpret an earlier experience, solve new problems, and plan future activities.

Suppose that you are thinking about an unfortunate experience that occurred yesterday, when you

Cross section of the brain showing some of the key structures involved in memory

The major methods for studying brain are:

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(1) Analysis of behavior after brain damage, either animal (Method: Brain Ablation) or human (Method: Dissociations in Neuropsychology

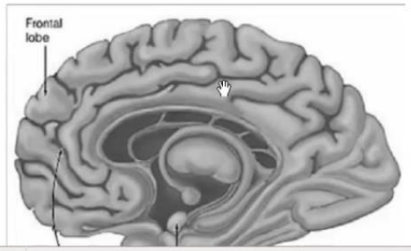
(2) Recording from single neurons in animals

(3) Recording electrical signals from the human brain (Method: Event-Related Potential and measuring

(1) Analysis of behavior after brain damage, either animal (Method: Brain Ablation) or human (Method: Dissociations in Neuropsychology

(2) Recording from single neurons in animals

(3) Recording electrical signals from the human brain (Method: Event-Related Potential and measuring activity of the human brain (Method: Brain Imaging).



remembers what has happened. Researchers, therefore, have looked for physiological mechanisms that hold information about events after they are over.



If their prefrontal cortex is removed, their performance drops to chance level, so they pick the correct food well only about half of the time. This result supports the idea that the prefrontal (PF) cortex is important for holding information for brief periods of time. Infants under 8 months, out of sight out of mind, having seen an object act as if it didn't exist after its hidden. Their frontal and prefrontal cortex does not become adequately developed until about 8 months of age.

Topic No. 152

Working Memory and Brain Processes

Research has also found neurons that are involved with working memory in other areas of the brain, including the primary visual cortex, which is the first area of the brain to receive visual signals and the temporal and parietal areas, where visual information is transmitted from the primary visual cortex. Although the PF cortex may be the brain area that is most closely associated with working memory, other areas are also involved.

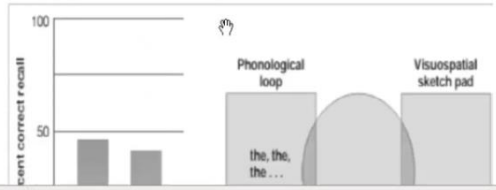
This figure summarizes the findings from many experiments using imaging techniques of PET and fMRI to measure brain activity in humans. As a person carries out a working memory task, activity occurs in the prefrontal cortex and in other areas as well, in addition to the prefrontal cortex, other areas in the frontal lobe and also areas in the parietal lobe and the cerebellum are involved in working memory. Some of the areas in the cortex that have been shown by brain imaging research to be involved in working memory. The colored dots represent the results of more than 60 experiments that tested working memory for words and numbers (red), objects (blue), spatial location (orange), and problem solving (green).



Workings of Working Memory

Central executive focuses attention on items important for a task and ignores items that are not relevant to the task. Vogel and colleagues measured even related potential ERP to see allocation of attention.

- This repetition of an irrelevant sound results in a phenomenon called articu**latory suppression**, reduces memory because speaking interferes with rehearsal.
- According to the word length effect, a list of one-syllable words should be easier to recall than a list of longer words because the shorter words leave more space in the phonological loop for rehearsal. However, eliminating rehearsal by saying "the, the, the . . ." eliminates this advantage for short words, so both short and long words are lost from the phonological store.



LONG TERM MEMORY (I)

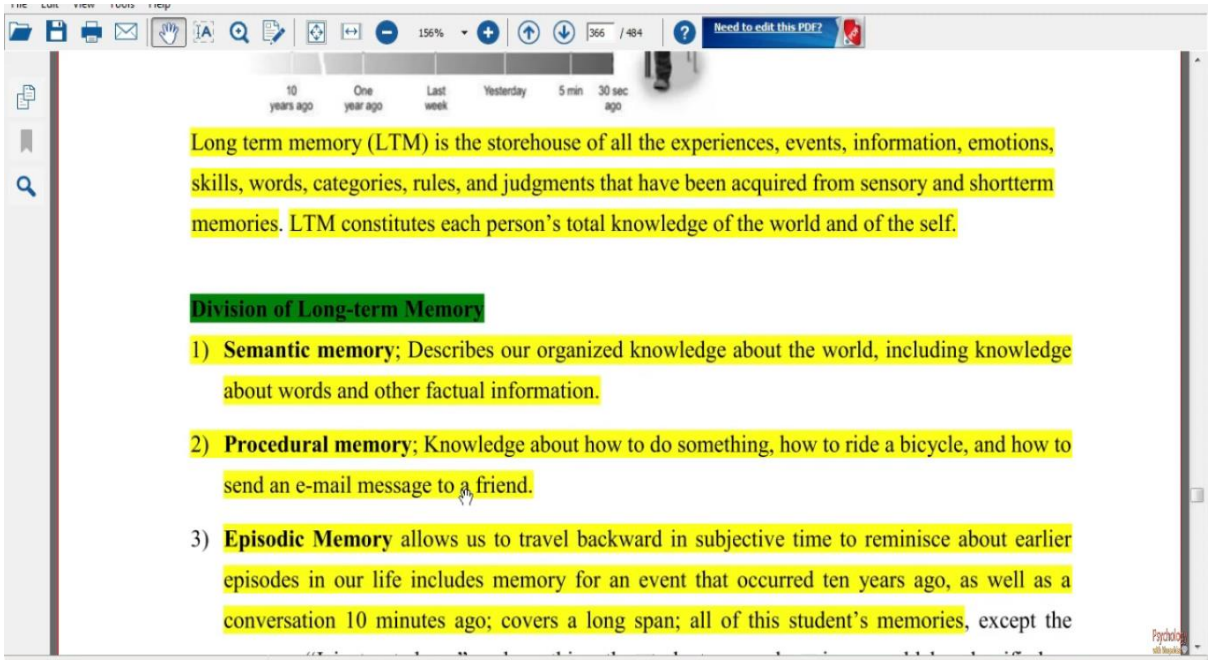
Topic: 155-160 Topic

No. 155

Long Term Memory

Two basic categories called working memory (the brief, immediate memory for material we are currently processing) and long-term memory. Long-term memory has a large capacity; it contains our memory for experiences and information that we have accumulated over a lifetime.





Long term memory (LTM) is the storehouse of all the experiences, events, information, emotions, skills, words, categories, rules, and judgments that have been acquired from sensory and shortterm memories. LTM constitutes each person's total knowledge of the world and of the self.

Division of Long-term Memory

1) **Semantic memory**; Describes our organized knowledge about the world, including knowledge about words and other factual information.

2) **Procedural memory**; Knowledge about how to do something, how to ride a bicycle, and how to send an e-mail message to a friend.

3) **Episodic Memory** allows us to travel backward in subjective time to reminisce about earlier episodes in our life includes memory for an event that occurred ten years ago, as well as a conversation 10 minutes ago; covers a long span; all of this student's memories, except the

Topic No. 156

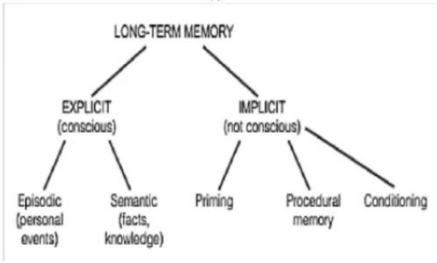
When psychologists speak of long-term memory, it is with the knowledge that memories often last a lifetime. Therefore, whatever theory explains how memories are acquired for the long term must also explain how they can remain accessible over the life course.

- Encoding refers to initial acquisition of information; during encoding, information is embedded in our memory.
- Retrieval refers to locating information in storage and accessing that information
- Autobiographical memory refers to memory for events and topics related to our own everyday life.

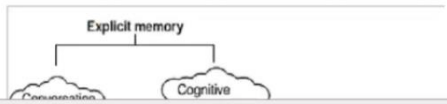
Memory is better for words presented at the beginning of the list (primacy effect) and at the end (recency effect). Three types of coding; acoustic, visual and semantic can occur in LTM. Semantic coding is the predominant type of coding in LTM. Errors that people make in tasks that involve LTM, e.g. misremembering the word tree as bush would indicate that the meaning of the word tree (rather than its visual appearance or the sound of saying "tree") is what was registered in LTM.

Long-term memory can be divided into **explicit memory** and **implicit memory**. We can also distinguish between two types of explicit memory, episodic and semantic. There are a number of different types of implicit memory. Three of the main types are priming, procedural memory, and conditioning.

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This person is experiencing two types of explicit memory (episodic and semantic), and his behavior is being influenced by three types of implicit memory (priming, procedural, and conditioning).



Tulving. The experience of semantic memory involves accessing knowledge about the world that does not have to be tied to remembering a personal experience. It involves facts, vocabulary, numbers, and concepts. When we experience semantic memory, we are not traveling back to a specific event from our past, but we are accessing things we are familiar with and know about.

Topic No. 157

Types of Rehearsal

- **Maintenance rehearsal** ; helps maintain information in STM/WM, but it is not an effective way of transferring information into long-term memory
- **Elaborative rehearsal**; more effective at transferring information into LTM; it occurs when you think about the meaning of an item or make connections between the item and something you know.

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Fergus Craik and **Robert Lockhart** (1972) proposed the idea of levels of processing (LOP). LOP Theory proposes that memory depends on how information is encoded. "Deeper" processing means better encoding and retrieval than "shallow" processing. Meaningful kinds of information processing can lead to more permanent retention than shallow, sensory kinds of processing.

- Memory depends on how information is programmed into the mind
- **Shallow processing** means paying attention to physical features of a word for example, CAPITAL or small letters, number of vowels = maintenance rehearsal
- **Deeper processing** involves paying close attention and focusing on meaning of words and relating them to something = elaborative rehearsal

Craik and Tulving's experiment

1. Shallow processing: A question about physical features of the word Question:

Is the word printed in capital letters?

- Forgiveness
- Rock
- Hamburger
- Sunlight
- Coffee
- Bottle

Instructions: Count backward by 3s from 99. When you reach 75, write down the words you remember.

Topic No. 158

Locating Memory in the Brain

Hebb (1948) introduced the idea that learning and memory are represented in the brain by physiological changes that take place at the synapse. A particular experience causes nerve impulses to travel down the axon of neuron A, and when these impulses reach the synapse, neurotransmitter is released onto neuron B. This activity strengthens the synapse by causing structural changes, greater transmitter release, and increased firing (b and c).

What happens at a synapse as a stimulus is first presented. The record next to the electrode indicates the rate of firing recorded from the axon of neuron B. (b) As the stimulus is repeated, structural changes are beginning to occur. (c) After many repetitions, more complex connections have



Design of Davachi's experiment

During encoding, participants in a scanner created images in their mind in response to words.

retrieval test. (b) Response of the hippocampus for recognized and forgotten item.

The **hippocampus** is important for aspects of memory other than recognition, such as remembering the context within which an object appears, it plays a crucial role in forming new memories, the Para hippocampal area responds to places, such as pictures of buildings or rooms), and the enthorhinal area, like the perirhinal area, is involved with recognition memory.

Many areas are involved in maintaining LTM, they serve different functions and these areas communicate and interact with each other But LTM extends beyond the MTL, to other areas in the parietal and frontal lobes, as well as to the amygdala which is important for emotional memories. New memories are fragile state, can be disrupted.

Consolidation

Consolidation is the process that transforms them to a more permanent state so they are resistant to disruption. Synaptic consolidation occurs at synapses, happens rapidly, over a period of minutes, involves the structural changes. Systems consolidation involves the gradual reorganization of circuits within brain regions, takes place on a longer time scale, lasting weeks, months, or even years.



Module – 159

Accessing semantic memory is involved in answering general knowledge questions

The Separation of Episodic and Semantic Memories

Neurophysiological evidence from patients with brain damage

- K.C., at the age of 30 rode his motorcycle off a freeway exit ramp and suffered severe damage to his hippocampus and surrounding structures, can no longer relive any of the events of his past. He does know that certain things happened, which would correspond to semantic memory.
- An Italian woman who was in normal health until she suffered an attack of encephalitis at the age of 44 had difficulty recognizing familiar people; had trouble shopping because she couldn't remember the meaning of words on the shopping list or where things were in the store; and she could no longer recognize famous people or recall facts like identity of Beethoven or that Italy was involved in World War II.

Brain imaging Experiments

Brain showing areas activated by episodic and semantic memories

o The yellow areas represent brain regions associated with episodic memories; the blue areas are regions associated with semantic memories. o Researches indicate that while there is overlap between activation caused by episodic and semantic memories, there are major differences. Other research has also found differences between the areas activated by episodic and semantic memory.



- Episodic memories can be lost; leaving only semantic memories- I may forget when did I learn a particular fact or knowledge for example table of 9 but this table is embedded in my memory.
- Semantic memories that have personal significance are easier to remember. Name of a famous singer whom concert we attended.
- Semantic Memory Can Influence Our Experience by Influencing Attention.

Topic No. 160

Implicit memory in Lab and Every day Experience

Explicit memory is conscious. Implicit memory occurs when some previous experience influences our performance on a task, even though we do not consciously remember the previous experience. We may not even be aware of exactly how we are accomplishing a particular task; we just do it.

Priming occurs when the presentation of one stimulus (the priming stimulus) changes the response to a subsequent test stimulus (the test stimulus), either positively (positive priming, causes an increase in speed or accuracy of the response to the test stimulus) or negatively (negative priming, a decrease in the speed or accuracy of response to the test stimulus). Repetition priming, occurs when the test stimulus is the same as or resembles the priming stimulus. For example, seeing the word bird may cause you to respond more quickly to another presentation of the word bird than to a word you had not seen, even though you may not remember seeing bird earlier.

Conceptual priming occurs when the enhancement caused by the priming stimulus is based on the meaning of the stimulus. For example, presentation of the word furniture might cause you to respond faster to a later presentation of the word chair. Repetition and conceptual priming both considered implicit memory; their effects can occur even though participants may not remember the original presentation of the priming stimulus when responding to the test stimulus.

(a) (b)

(a) The results of the recall test indicate that the amnesic patients (AMN) did poorly on the test compared to the medical inpatients (INPT) and the alcoholic controls (ALC). (b) The results of the implicit memory test, in which the task was to complete three-letter word stems, shows that the amnesic patients performed as well as the other patients.

Implicit Memory in Everyday Experience:

- Effect of advertisement exposure.
- Perfect and Askew (1994), had participants scan articles and not pay attention to advertisements, they gave higher ratings to the ones they had been exposed to than to other advertisements that they had never seen.

The Propaganda Effect

Participants more likely to rate statements they have read or heard before as being true, because they have been exposed to them before. This effect can occur even when the person is told that the statements are false when they first read or hear them (Begg et al., 1992). Involves implicit memory because it can operate even when people are not aware that they have heard a statement before, and may even have thought it was false when they first heard it.

Eyewitness to crime

Implicit memory can lead to memory errors; eyewitnesses to crimes have identified people as having been at the crime scene not because they were actually there, but because the eyewitnesses had seen them somewhere else at another time, so they seemed familiar.

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Procedural Memory; Skills We Learn

Procedural memory is also called **skill memory** because it is memory for doing things that usually require action.



- The implicit nature of procedural memory has been demonstrated in amnesia patients who can master a skill without remembering any of the practice that led to this mastery. The researchers presented incomplete pictures, and the participant's task was to identify the picture.



Incomplete pictures developed by Gollin (1960) that were used by Warrington and Weiskrantz (1968) to study implicit memory in patients with amnesia.

The fragmented version in Figure **a** was presented first, and then participants were shown more and more complete versions (b, c, d, and e) until they were able to identify the picture.

words and creating meaningful thoughts from the sentences? Unless you've studied linguistics, you probably don't know these rules, but that doesn't stop you from being a skilled reader.

Consider the plight of the concert pianist who, when he tried to become conscious of how he was moving his fingers as he played a difficult passage, found that he was no longer able to play the passage.



For many skills, the best practice is to disengage the mind and let implicit procedural memory take over!

Topic No. 162

Symptoms include traveling away from where the person lives and a lack of memory for the past, especially personal information, name, relationships, residence, and occupation. Few reported cases; a person vanishes from his or her normal life, often travels far away, and takes on a new identity unrelated to the previous one.



In The Long Kiss Goodnight(1996),



Who Am I?(1998), Jackie Chan, a top secr

Vocabulary used is wrong; it is not a breakdown of short-term memory but an inability to form new LTM. Actual cases of Clive Wearing and Jimmy G., forgot everything that had happened more than a few minutes previously.

Then there are totally fictional cases shown in movies that are contrary to memory science of brain.

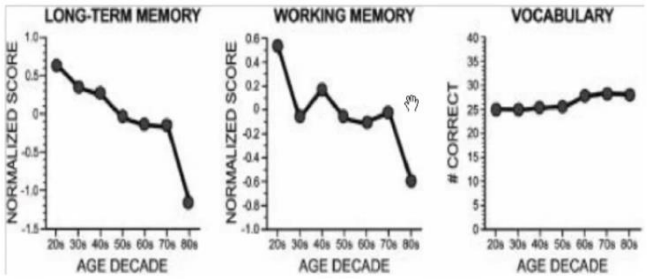


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Memory and Ageing

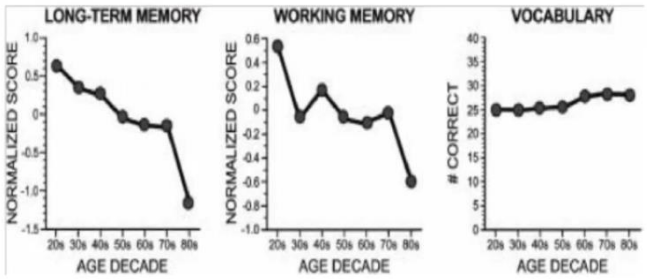


All cognitive abilities undergo change as people age. In the figure below you can see decay in memory as per decade of age; 20s to 80s for each type of memory. What does it tell us?

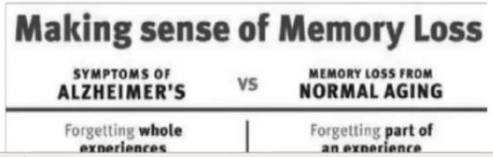


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as per decade of age; 20s to 80s for each type of memory. What does it tell us?



The working memory decay is similar to long term memory decay between 70s and 80s. There is other information that you can infer from this figure. Study the figure and attempt to describe.



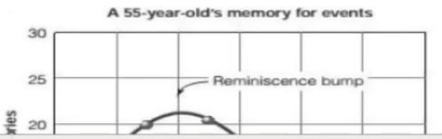
Making sense of Memory Loss

SYMPTOMS OF ALZHEIMER'S	VS	MEMORY LOSS FROM NORMAL AGING
Forgetting **whole experiences**		Forgetting **part of an experience**
Rarely able to remember later		**Often** able to remember later
Gradually unable to follow written/spoken directions		**Usually able** to follow written/spoken directions
Gradually unable to use notes as reminders		**Usually able** to use notes as reminders
Gradually unable to care for oneself		**Usually able** to care for oneself

Autobiographical memory (AM)

Autobiographical is recollected events that belong to a person's past. AM is also demonstrated when we remember the events that make up the stories of our life by using "mental time travel" to place ourselves back into a specific situation.

Autobiographical memories are mainly episodic but can also contain semantic components. A childhood birthday party; images, cake, people, games (episodic memory); knowledge; when the party occurred, where family living at the time, general knowledge about birthday parties (semantic memory).





Enhanced memory for adolescence and young adulthood found in people over 40 is called the reminiscence bump.

Explanation	Basic Characteristic
Self-image	Period of assuming person's self-image.
Cognitive	Encoding is better during periods of rapid change.
Cultural life script	Culturally shared expectations structure recall.

Self-image	Period of assuming person's self-image.
Cognitive	Encoding is better during periods of rapid change.
Cultural life script	Culturally shared expectations structure recall.

The explanation for reminiscence bump is given in above table. Self-image explanation means that this is period of assuming self-image so auto biographical memory is enhanced. Similarly, cognitive explanation proposes that encoding is key to understanding this phenomenon; encoding is better during periods of rapid change as during adolescence and early twenties.

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Cultural life scripts and autobiographical memory

Bernstein and Bohn (2009) argue that "the content of our life stories is constrained by cultural norms that influence what people think of as important and as less important from the perspective of telling a life story" (62). These cultural norms determining cultural shared expectations about the order and timing of an event in a prototypical life course are called life scripts. The concept of life scripts is based on the more general notion of "script" developed by cognitive psychologists in the late 70's. Scripts present some resemblances to the concept of schema introduced by Bartlett in 1932. In a few words, scripts constitute a huge and complex system of knowledge and ideologies (and sometimes emotional rules) about the world. Scripts are cognitive networks, which contain the concepts' attributes and the links between those attributes. They function by organizing prior knowledge ideologies and emotional rules to aid the understanding and categorization of new information. Hence, they influence what we see and remember and how we interpret and construct reality. Life scripts are scripts about the life-course.

Flashbulb Memory

Flashbulb is a person's memory for the circumstances surrounding hearing about shocking, highly charged events.



(a) Congruence score for 9/11 memories and memories for the everyday event, measured 1 year after the events. (b) Percent of participants who were able to remember at least something about the 9/11 and everyday events. Note that 35 percent of the participants could not remember anything about the everyday event.

Topic No. 164

Remembering to do activities in Future; Prospective Memory

Remembering to do activities is about storing information related to a time in future not about what has happened in past.

Examples;

- Preventing milk from boiling over.
- Buying groceries.
- Taking medicine.
- Attending an event.
- Calling an electrician for a fault.

Interruptions; a special case of prospective memory

Interruptions create implicit goal of resuming interrupted task later. Participants take series of written quizzes resembling SAT. Occasionally a quiz is interrupted by another task after which computer goes to next set of quizzes. Participants must remember to return to interrupted quiz before continuing.

Characteristics of Good Prospective Memory Cues

- Salience or distinctness
- Ability to attract focal processing
- Meaningful association with the intended action

Examples of Good Prospective Memory Cues

- To remember to take out trash when you get home, lean a small indoor trash bucket against your bedroom door
- To remember to take lunch to office tape a sticky note with lunch written on it to your laptop bag
- To remember oil change in car, stick note on car steering

Lecture 37

RECONSTRUCTION OF LONG-TERM MEMORY

Topic: 165-166

Topic No. 165

Reconstruction of Memory

Research on Remembering

A large portion of **Bartlett's** research relied upon *The War of the Ghosts*, a Native American folk tale. He used the story to conduct two experiments, one focusing on repeated reproduction and the other on serial reproduction. *Repeated Reproduction* In this experiment, the short story *The War of Ghosts* was read out loud twice to participants. Fifteen minutes later, they were asked to recall the story. Following this, subjects would be asked to recall the story at various points in time, some up to ten years later. Based on how participants were able to recall the story, Bartlett drew some interesting conclusions about memory.

Born in a small town in Gloucestershire, United Kingdom, Bartlett would mature into a wellknown psychologist. As a child, sickness prevented him from going to boarding school, but Bartlett did

Schema and Remembering

One of the main theories to emerge from Bartlett's work is the idea of schema. As described by **Bartlett**, schema is "an active organization of past reactions, or of past experiences, which must always be supposed to be operating in any well-adapted organic response." That is, certain regular responses and behaviors happen because they can be related to past experiences that have been serially organized and made sense of and operate in a bigger picture. **Roediger** describes schema as "a general organization of a story of a typical event." For example, detective movies follow the general schema involving a good detective, a bad villain, a mystery and a resolution. In Bartlett's study, he found that both experiments fell under the influence of schema. In repeated reproduction, when people removed or changed the interesting parts of the tale, they were doing so to make it fit into an existing schema they were familiar with. Participants were making an effort to change the story in order for it to make better sense, according to their standards. In the serial reproduction study, Bartlett found that the recollected versions of the story were also quickly adapted to fit more conventional forms or a known schema. In both experiments, adapting the story to fit a schema was thought to be done in an attempt for the participant to better remember the tale.

Conclusions on Schema and Memory

Based on Bartlett's research, he was able to shed light on some of the ways the mind works. One of the biggest takeaways from his experiments is how the brain remembers. Instead of reproducing facts, ideas or stories verbatim, people tend to construct them, leaving out details or including new ones based on schemas or personal experience. As Bartlett said himself, "Remembering is not the re-excitation of innumerable fixed, lifeless and fragmentary traces. It is an imaginative reconstruction or construction, built out of the relation of our attitude towards a whole active mass of organized past reactions or experience, and to a little outstanding detail which commonly appears in image or in language form." The mind is a beautiful thing and the way it works when it comes to remembering can be quite complex. With classic studies like the one conducted by Bartlett, we get closer to understanding how it works and inspiring new ways of researching, learning and instructing based on the results.

References and reading material

An important and crucial reason to understand recall of events, is its use in eye witness testimony in legal and judicial system. Life impacting decisions depend upon recall of witnesses and therefore reconstruction model has important implications both scientifically as well as practically.

Constructive Nature of Memory

Constructive nature of memory reflects creative side of our cognitive processes that helps to understand language, solve problems, and make decisions. This creativity also helps us "fill in the blanks" when there is incomplete information

Eyewitness testimony

Studies on eye witness memory show that eyewitnesses make errors due to various reasons such as familiarity; *not a crime scene but seen somewhere else.* Errors due to suggestion; *'isn't he the robber', detail added afterwards from hearing someone say something.* Errors due to focus of attention; they focus on *weapon not perpetrator*. Due to these errors innocent people are convicted as a result of false eyewitness testimony

Errors of eyewitness identification

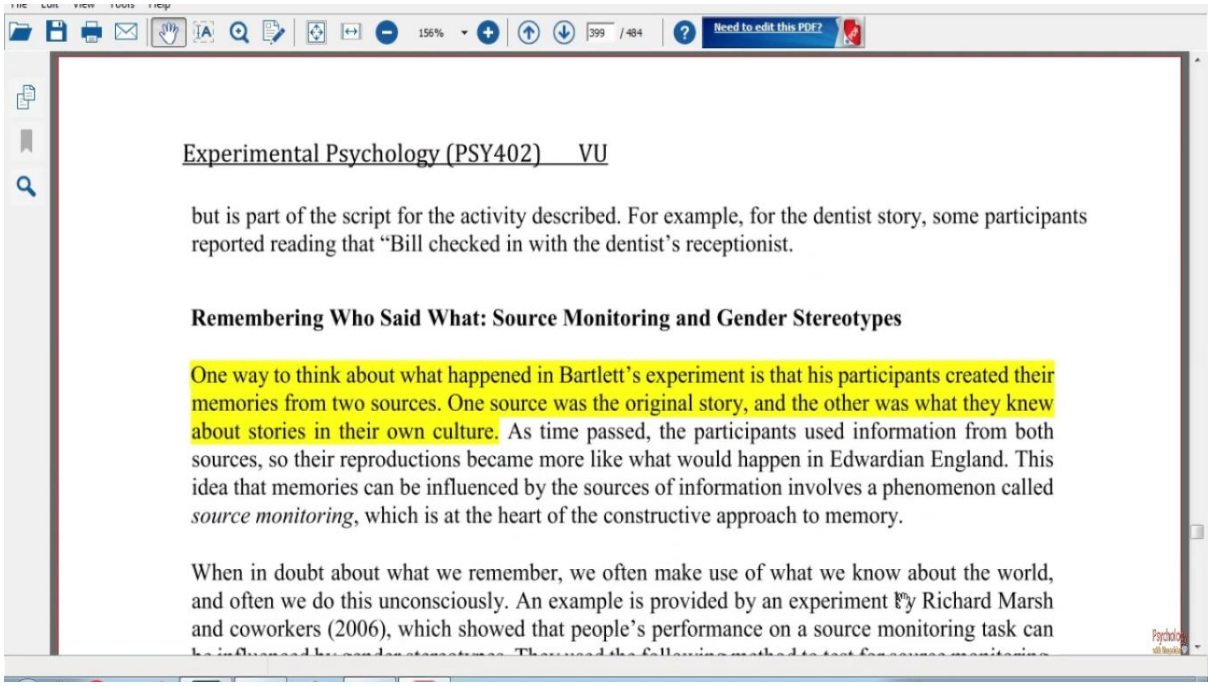
Errors Associated with Attention : Emotions often run high during commission of a crime, and

This experiment was introduced by James Deese (1959) and studied further by Henry Roediger and Kathleen McDermott (1995). When I present this list to my class, there are always a substantial number of students who report that they remember the word "sleep." Remembering *sleep* is a false memory because it isn't on the list. This false memory occurs because people associate *sleep* with other words on the list. This is similar to the effect of schemas, in which people create false memories for office furnishings that aren't present because they associate these office furnishings with what is usually found in offices. Again, constructive processes have created an error in memory. The crucial thing to take away from all of these examples is that false memories arise from the same constructive process that produces true memories. Memory, as we have seen, is not a camera or a tape recorder that creates a perfect, unchanging record of everything that happens.

A **script** is our conception of the *sequence of actions* that usually occur during a particular experience. For example, your script for visiting a post office might include waiting in line, filling out forms. if you want to send the letter by registered or certified mail, giving your letter to the post office employee, watching the employee weigh the letter and determine the postage, paying for the postage, perhaps buying some stamps for future use, and then leaving the post office.

Scripts can influence our memory by setting up expectations about what usually happens in a particular situation. To test the influence of scripts, Gordon Bower and coworkers (1979) did an experiment in which participants were asked to remember short passages like the following:

The Dentist Bill had a bad toothache. It seemed like forever before he finally arrived at the dentist's



but is part of the script for the activity described. For example, for the dentist story, some participants reported reading that "Bill checked in with the dentist's receptionist.

Remembering Who Said What: Source Monitoring and Gender Stereotypes

One way to think about what happened in Bartlett's experiment is that his participants created their memories from two sources. One source was the original story, and the other was what they knew about stories in their own culture. As time passed, the participants used information from both sources, so their reproductions became more like what would happen in Edwardian England. This idea that memories can be influenced by the sources of information involves a phenomenon called *source monitoring*, which is at the heart of the constructive approach to memory.

When in doubt about what we remember, we often make use of what we know about the world, and often we do this unconsciously. An example is provided by an experiment by Richard Marsh and coworkers (2006), which showed that people's performance on a source monitoring task can

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Lecture 38

APPLYING EVIDENCE; MEMORY TECHNIQUES BASED ON RESEARCH

Topic: 167-170

Topic No. 167

Applying evidence; memory techniques based on research

What is the best way to get information into our memory so it is available when we need it?

- Deep processing; meaning or use of words
- Placing in some context
- Pegs in LTM
- Retrieval Cues

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Applying evidence; memory techniques based on research

What is the best way to get information into our memory so it is available when we need it?

- Deep processing; meaning or use of words
- Placing in some context
- Pegs in LTM
- Retrieval Cues

Encoding and Retrieval

Research shows that encoding influences retrieval. Basic idea of all these experiments is to vary encoding and measure how retrieval (memory performance) is affected. If you were given the task of remembering the word chicken, which sentence do you think would result in better memory?

1. She cooked the chicken.

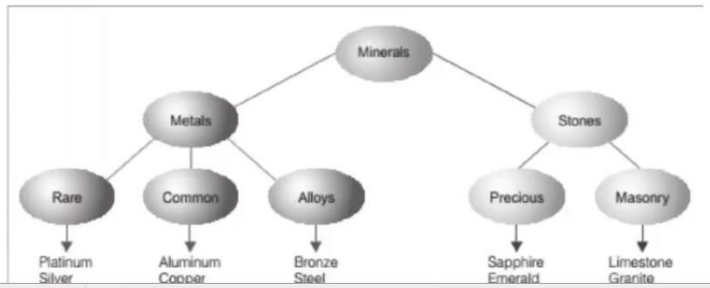
2. The great bird swooped down and carried off the struggling chicken

Placing Words in a Complex Sentence

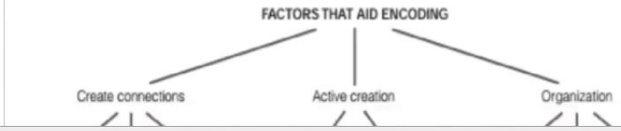


Generating Information

Generating material, yourself, rather than passively receiving it, enhances learning and retention. The "organizational tree" for minerals used in Bower et al.'s (1969) experiment on the effect of organization on memory.



Condition	Experiment/Result
Word in complex sentence	Better memory for a word ("chicken") used in a complex sentence (more detailed description of the word)
Forming visual image	Pairs of words remembered better if images formed (compared to just reading word pairs)
Linking to self	Words associated with self are remembered better (self-reference effect)
Generating information	Memory better if second word of a word pair is generated by the person, compared to just being presented with the word (generation effect)
Organizing information	Studying information that is organized, as in a "tree," results in better memory; presenting information so organization is difficult ("balloon" story) results in poor memory
Testing	Testing following learning results in better memory than rereading material after learning (testing effect)



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Retrieval Cues; Cued Recall VS free recall

I once experienced a musty smell like the stairwell of my grandparents' house and was instantly transported back many decades to the experience of climbing those stairs as a child. The operation of retrieval cues has also been demonstrated in the laboratory using a technique called **cued recall**, which is illustrated in the following Method section.

METHOD

We can distinguish two types of recall procedures. In **free recall**, a participant is simply asked to recall stimuli. These stimuli could be words previously presented by the experimenter or events experienced earlier in the participant's life. We have seen how this has been used in many experiments, such as the testing effect experiment. In **cued recall**, the participant is presented with retrieval cues to aid in recall of the previously experienced stimuli. These cues are typically words

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furniture...*

● **FIGURE 7.10** Design of the Tulving and Pearlstone (1966) experiment. The memory performance for each group is shown on the right.

Encoding specificity; Godden and Baddeley (1975) "diving experiment. Participants remembered things more that they had learned in same position or venue.

Encoding Specificity, the principle of **encoding specificity** states that we encode information along with its context. A classic experiment that demonstrates encoding specificity is D. R. Godden and Alan Baddeley's (1975) "diving experiment." In this experiment, one group of participants put on diving equipment and studied a list of words underwater, and another group studied the words on land (● Figure 7.12a). These groups were then divided, so half of the participants in the land and water groups were tested for recall on land and half were tested underwater. The results, shown in Figure 7.12b, indicate that the best recall occurred when encoding and retrieval occurred in the same location.

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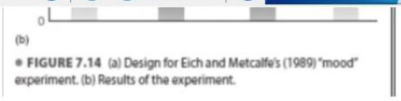
"diving" experiment. (b) Results for each test condition are indicated by the bar directly under that condition. Orange bars indicate situations in which study and test conditions matched.

State dependent learning; (a) Design for Eich and Metcalfe's (1989) "mood" experiment, (b) Results;

State-Dependent Learning Another example of how matching the conditions at encoding and retrieval can influence memory is **state-dependent learning**—learning that is associated with a particular *internal state*, such as mood or state of awareness. According to the principle of statedependent learning, memory will be better when a person's internal state during retrieval matches his or her internal state during encoding. For example, Eric Eich and Janet Metcalfe (1989) demonstrated that memory is better when a person's mood during retrieval matches his or her mood during encoding. They did this by asking participants to think positive thoughts while listening to "merry" music or depressing thoughts while listening to "melancholic" music (● Figure 7.14a). Participants rated their mood while listening to the music, and the encoding part of the experiment began when their rating reached "very pleasant" or "very unpleasant."

Once this occurred, usually within 15–20 minutes, participants studied lists of words while in their positive or negative mood. After the study session ended, the participants were told to return in 2 days (although those in the sad group stayed in the lab a little longer, snacking on cookies and

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● **FIGURE 7.14** (a) Design for Eich and Metcalfe's (1989) "mood" experiment. (b) Results of the experiment.

Transfer appropriate processing Type of task- rhyming or meaning condition, Donald Morris and coworkers (1977)

Transfer-Appropriate Processing

The phenomenon of **transfer-appropriate processing** shows that memory performance is enhanced if the type of task at encoding matches the type of task at retrieval. A transfer-appropriate processing experiment varies the type of task used for encoding and the task used for retrieval. We can understand what this means by considering two of the groups of participants in an experiment by Donald Morris and coworkers (1977). Morris's experiment had two parts: encoding and retrieval. The encoding part of the experiment had two conditions: (1) the *meaning condition*, in which the task focused on the meaning of a word, and (2) the *rhyming condition*, in which the task focused on the sound of a word (● Figure 7.15). Participants in both conditions heard a sentence with one word replaced by the word "blank"; 2 seconds later, they heard a target word. The task for the memory group was to answer "yes" or "no" based on the meaning of the sentence created by replacing "blank" with the target word. The task for the rhyming group was to answer "yes" or "no" based on the rhyme created by replacing "blank" with the target word. Here are examples from the encoding part of the experiment for each condition. Note that participants in both conditions heard the same set of target words.

- Students have Individual learning styles
- Type of material; One method of studying may work best for memorizing lists or definitions, and another method may be better for learning concepts or basic principles
- What method do you use for memorizing Verses of Quran?

Six ways of increasing the Effectiveness of Studying:

1. Elaborate
2. Generate and test
3. Organize
4. Take breaks
5. Match learning and testing conditions
6. Avoid "illusions of learning



can be achieved by making "trees," or outlines or lists that group similar facts or principles together

- Taking breaks means study in a number of shorter study sessions rather than trying to learn everything at once," or "Don't cram." Research has shown that memory is better when studying is broken into a number of short sessions, with breaks in between, than concentrated in one long session, even if the total study time is the same. This advantage is called the **spacing effect.**
- Memory performance is also enhanced if sleep follows learning
- Match learning and testing situations. You cannot always study in the classroom where you will take exams. Apply this to Virtual courses; Research has shown that people remember material better when they have learned it in a number of different locations, compared to spending the same amount of time studying in one location.
- Avoid illusion of learning; recognizing is only familiarity. Highlighting doesn't work. Deeper processing does.

Topic No. 169

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Topic No. 169

Introducing Concept of Cognitive Maps

Cognitive Maps

A cognitive map is a mental representation of the environment that surrounds us; our mental images of the relationships among objects, such as buildings on a college campus. Our cognitive maps typically represent neighborhoods, cities, and countries, they represent areas that are too large to see in a single glance. we create a cognitive map by integrating information we have acquired from many successive views research on cognitive maps; real-world settings and ecological validity.

Spatial cognition refers to our thoughts about spatial issues; not only cognitive maps, but also how we remember the world we navigate and how we keep track of objects in a spatial array. Studied in Environmental psychology and applied in Interdisciplinary; computer scientists' models of spatial knowledge, Anthropologists, Geographers' goal of creating efficient maps, architects design buildings, urban planners construct new communities.

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such as visual and auditory recognition, how the senses gather stimuli from the outside world, and how these stimuli are then interpreted by our previous knowledge.

- Research has also looked at how these stimuli from the outside world are stored in memory.
- In everyday life we are paying attention to more than one message at a time. Our previous knowledge may influence which message we choose to process and which we choose to ignore.
- When our memory systems use techniques like chunking to store information, our previous knowledge helps in process of chunking.
- Our knowledge provides the kind of expertise that enhances long-term memory, and it can influence our memory for the events in our lives.
- Our knowledge can help us organize information in order to recall it more accurately.
- When we apply general principles such as the rotation heuristic and the alignment heuristic, our previous knowledge can distort our memories of spatial relationships, making them more regular than they actually are.

Knowledge and Semantic Memory

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- Cities, names, history and general facts are all stored in a knowledge base in our system.
- Children acquire knowledge as they grow up, knowledge about environment, about moving objects about other people around them and huge amount of social knowledge.
- Wisdom is also acquired as we age. The wisdom comes with knowledge gathered through experience through learning from the experiences and through transmission of knowledge from elders and books.
- Semantic memory includes encyclopedic knowledge ("Allama Iqbal was born in…….)
- Lexical or language knowledge (e.g., "The word justice is related to the word equality")
- Conceptual knowledge ("A square has four sides")
- Knowledge influences our cognitive activities; we determine locations, read sentences, solve problems, and make decisions.
- Categories and concepts are essential components of semantic memory.

Topic No. 172

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Concepts and Categorization

Imagine that you find yourself in an unfamiliar town, where you have never been before. As you walk down the street, you notice that many things are not exactly the same as what you would encounter if you were in your own town. On the other hand, there are lots of things that seem familiar. Cars pass by, there are buildings on either side of the street and a gas station on the corner, and a cat dashes across the street and makes it safely to the other side. Luckily, you know a lot about cars, buildings, gas stations, and cats, so you have no trouble understanding what is going on. You know about the various components of this street scene because your mind is full of concepts.

A **concept** is a mental representation that is used for a variety of cognitive functions, including memory, reasoning, and using and understanding language (Solomon et al., 1999). Thus, when you think about cats, you are drawing on your concept, or mental representation, of cats, which includes information about what cats are, what they usually look like, how they behave, and so on.

Experimental Psychology (PSY402) VU

By far the most commonly studied function of concepts is **categorization**, which is the process by which things are placed into groups called categories. For example, when you see vehicles in the street you can place them into categories such as cars, SUVs, jeeps, vans, Japanese cars, and local manufactured cars. Categories are not simply convenient ways of sorting objects. They are tools that are essential for our understanding of the world.

One of the most important functions of categories is to help us to understand individual cases we have never seen before. Categories have therefore been called "pointers to knowledge" (Yamauchi & Markman, 2000). Once you know that something is in a category, whether "cat," "gas station," or "impressionist painting," you know a lot of general things about it and can focus your energy on specifying what's special about this particular object (see Solomon et al., 1999; Spalding & Murphy, 1996).

Being able to place things in categories can also help us understand behaviours that we might otherwise

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find baffling. For example, you see three boys running on street with Pakistani flag painted on their faces, wearing green shirts and singing, if you know that a cricket match is going on in city and our national team is playing against a neighbour country, you will easily understand this behaviour. Dealing with new objects becomes easier and we can function more efficiently when we face new objects that can be placed in a previously known category.

The following points about this topic will help you prepare for exam questions and summarise your knowledge.

- A category is a set of objects that belong together; the category called "fruit" represents a certain category of food items; cognitive system treats these objects as being equivalent
- The term concept refers to our mental representations of a category (Wisniewski, 2002)
- Academic courses require us to form concepts, for example concept of intelligence in Psychology course, concept of words ending with 'ing' in English
- Semantic memory gathers similar but different objects under a category. This helps to reduce storage space, helps in making new inferences for example 'Food' concept, 'fruit' category; even child can infer that everything in fruit category is for eating.
- When we encounter new objects, it is easier to make inferences, understand and interpret if that object can be placed in a category. Let us look at concept of 'viruses. it can have many categories

- According to an early theory, called the feature comparison model, concepts are stored in memory according to a list of necessary features or characteristics.
- According to an early theory, called the feature comparison model, concepts are stored in memory according to a list of necessary features or characteristics and people use a decision process to make judgments about these concepts.
- Defining features; those attributes that are necessary to the meaning of the item.
- Characteristic features; attributes that are merely descriptive but are not essential.
- Defining features of a parrot are; it is living, has feathers, is green, whereas characteristic features of a parrot are; it flies, perches in trees, is small in size.

Topic No. 173

An Exercise about Categories

- Feature comparison model; concepts stored in memory according to a list of necessary features or

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2. A squirrel is an animal.
3. A flower is a rock.
4. A carrot is a vegetable.
5. A mango is a fruit. 6. A petunia is a tree.
7. A robin is a bird.
8. A rutabaga is a vegetable.

Research on Feature Comparison

- **The typicality effect**; people reach decisions faster when an item is a typical member of a category, rather than an unusual member. Carrot is a typical member, rutabaga is not. **Sloman** and **colleagues** (1998), asked college students, if they could they imagine an example of a concept that lacked a given characteristic, imagine a robin that didn't fly, didn't eat, didn't have

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THE PROTOTYPE AND THE EXEMPLAR APPROACH

Topic: 175-178

Topic No. 175

The Prototype Approach

Given the importance of categories, cognitive psychologists have been interested in determining the process involved in categorizing objects. According to the definitional approach to categorization, we can decide whether something is a member of a category by determining whether a particular object meets the definition of the category. Definitions work well for some things, such as geometric objects. Thus, defining a square as "a plane figure having four equal sides" works. However, for most natural objects (such as birds, trees, and plants) and many humans made objects (like chairs), definitions do not work well at all.

The philosopher Wittgenstein (1953) proposed the idea of family resemblance to deal with the problem that definitions often do not include all members of a category. Family resemblance refers to the idea that things in a particular category resemble one another in a number of ways. Thus, instead of setting definite criteria that every member of a category must meet, the family resemblance approach allows for some variation within a category. Chairs may come in many different sizes and shapes and be made of different materials, but every chair does resemble other chairs in some way.

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whether a particular object meets the definition of the category. Definitions work well for some things, such as geometric objects. Thus, defining a square as "a plane figure having four equal sides" works. However, for most natural objects (such as birds, trees, and plants) and many humans made objects (like chairs), definitions do not work well at all.

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According to the prototype approach to categorization, membership in a category is determined by comparing the object to a prototype that represents the category. A prototype is a "typical" member of the category. What is a typical member of a particular category? Elinor Rosch (1973) proposed that the "typical" prototype is based on an average of members of a category that are commonly experienced. For example, the prototype for the category "birds" might be based on some of the

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birds you usually see, such as sparrows, robins, and blue jays, but doesn't necessarily look exactly like a particular type of bird. High Prototypicality means that a category member closely resembles the category prototype (it is like a "typical" member of the category). Low Prototypicality means that the category member does not closely resemble a typical member of the category. Rosch (1975a) quantified this idea by presenting participants with a category title, such as "bird" or "furniture," and a list of about 50 members of the category. The participants' task was to rate the extent to which each member represented the category title on a 7-point scale, with a rating of 1 meaning that the member is a very good example of what the category is, and a rating of 7 meaning that the member fits poorly within the category or is not a member at all. the figure below shows results of his experiment. The 1.18 rating for sparrow reflects the fact that most people would agree that a sparrow is a good example of a bird (figure a). The 4.53 rating for penguin and 6.15 for bat reflects the fact that penguins and bats are not considered good examples of birds. Similarly, chair and sofa(rating = 1.04) are considered very good examples of furniture, but mirror(4.39) and

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used a procedure called the sentence verification technique to determine how rapidly people could answer questions about an object's category.

Method

Sentence Verification Technique

The procedure for the sentence verification technique is simple. Participants are presented with statements and asked to answer "yes" if they think the statement is true and "no" if they think it isn't. They used the following two statements:

1. An apple is a fruit.
2. A pomegranate is a fruit.

When Smith and coworkers (1974) used this technique, they found that participants responded faster for objects that are high in Prototypicality (like apple for the category "fruit") than they did for objects that are low in prototypicality (like pomegranate). This ability to judge highly prototypical objects more rapidly is called the typicality effect. My guess is that if we used these two fruits, pomegranate will not have much difference in prototypicality as 'Anar' is a local Pakistani fruit and will be considered as prototypical as apple. As an assignment carry out this exercise with two vegetables that are more typical like potato and one that is less typical like French beans.

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Prototypicality

Figure 2; results of the experiment. Reaction times were faster for prototypical fruits.

- Prototypical objects are named first;

  When participants are asked to list as many objects in a category as possible, they tend to list the most prototypical members of the category first (Mervis et al., 1976). Thus, for "birds," sparrows would be named before penguins.

- Prototypical objects are affected more by Priming.

  Priming occurs when presentation of one stimulus facilitates the response to another stimulus that usually follows closely in time. Rosch (1975b) demonstrated that prototypical members of a category are affected by a priming stimulus more than are no prototypical members. The procedure for Rosch's experiment is shown in Figure 3. Participants first heard the prime, which was the name of a color, such as "green." Two seconds later they saw a pair of colors side by side and indicated, by pressing a key as quickly as possible, whether the two colors were the same or different.

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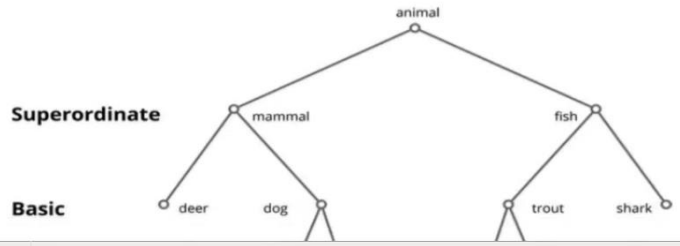
10	Tractor	Lettuce	Pajamas
11	Cart	Beets	Bathing suit
12	Wheelchair	Tomato	Shoes

Source: Rosch & Mervis, 1975.

Topic No. 176

Levels of Categorization

- Superordinate; higher-level or more general categories; furniture, sciences, tools
- Basic; Moderately specific, chair, biological sciences, screwdriver; more useful than either superordinate-level categories or subordinate-level categories
- Subordinate; lower-level or more specific categories, Desk chair, molecular genetics, Philips screw driver.



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Different levels of categorization activate different regions of the brain

- **Superordinate terms** (e.g., Toy) are more likely than basic-level terms (e.g., doll) to activate part of the prefrontal cortex. And as you know, pre-frontal cortex plays an important role in reasoning and memory.

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Experimental Psychology (PSY402) VU

- **Subordinate terms** (e.g., rag doll) are more likely than basic-level terms (e.g., doll) to activate part of the parietal region of the brain.
- McCloskey and Glucksberg (1978) found that when people made repeated category judgments such as "Is an olive a fruit?" or "Is a sponge a kitchen utensil?" they changed their minds about borderline items—up to 22 percent of the time. So, not only do people disagree with one another about borderline items, they disagree with themselves! As a result, researchers often say that categories are *fuzzy*, that is, they have unclear boundaries that can shift over time.

Influences of Typicality on Cognition
• **Typical items are judged category members more often** (Hampton, 1979).
• **Speed of categorization is faster for typical items** (Rips, Shoben, & Smith, 1973).

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Topic No. 177

The Exemplar Approach

- The exemplar approach argues that we first learn some specific examples of a concept; then we classify each new stimulus by deciding how closely it resembles those specific examples.
- Each of those examples stored in memory is called an exemplar.
- Case studies of depression in Abnormal Psychology, a description of a woman with psychological problems fits depression cases but not anxiety cases.

Exemplars and Typicality

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just take into account a very prototypical insect—perhaps a combination of a bee and a fly. Instead, you also include some information about a caterpillar, a grasshopper, and maybe even a Japanese beetle.

Comparing two approaches

- The prototype approach says that this stored representation is a typical member of the category.
- In contrast, the exemplar approach says that the stored representation is a collection of numerous specific members of the category.
- Not features of depressed people or a typical depressed person.
- The exemplar approach argues that creating a list of characteristics or a prototypical person would force you to discard useful, specific data about individual cases.
- Problem with exemplar approach; too many examples to store, hence may be more suitable for categories with few members e.g., Tropical fruit.
- The prototype approach may be more suitable when considering a category that has numerous members; may be the most efficient approach for a large category such as "fruit" or animal."

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Lecture 41

SEMANTIC NETWORKS

Topic: 179-181

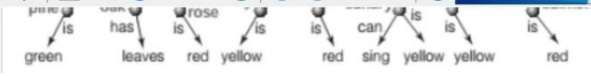
Topic No. 179

Semantic Networks; Earlier Model

The feature comparison model, the prototype approach, and the exemplar approach all emphasize whether an item belongs to a category. In contrast, network theories are more concerned about the interconnections among related items. The network models of semantic memory propose a netlike organization of concepts in memory, with many interconnections. The meaning of a particular concept, such as "apple," depends on the concepts to which it is connected

One of the first semantic network models was based on the pioneering work of **Ross Quillian** (1967, 1969), whose goal was to develop a computer model of human memory.

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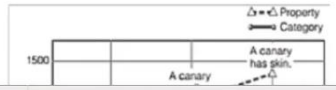


Semantic network proposed by Collins and Loftus (1975). (Source: A. M. Collins & E. F. Loftus, "A Spreading-Activation Theory of Semantic Processing," Psychological Review, 82,407–428.

The network consists of **nodes** that are connected by **links**. Each node represents a category or concept, and concepts are placed in the network so that related concepts are connected. In addition, properties associated with each concept are indicated at the nodes. The links connecting the nodes indicate that they are related to each other in the mind. Thus, the model shown in Figure 1 indicates that there is an association in the mind between "canary" and "bird," and between "bird" and "animal." It is a hierarchical model, because it consists of levels arranged so that more specific concepts, such as "canary" and "salmon," are at the bottom, and more general concepts are at higher levels. To illustrate how this network works, and how it proposes that knowledge about concepts is organized in the mind, start considering how we would retrieve the properties of canaries from the network. We start by entering the network at the concept node for "canary." At this node, we obtain the information that a canary can sing and is yellow. To access more information about "canary," we move up the link and learn that a canary is a bird and that a bird has wings, can fly, and has feathers. Moving up another level, we find that a canary is also an animal, which has skin and can move, and finally we reach the

Experimental Psychology (PSY402) VU

Collins and **Quillian's model** represent how concepts are organized in the mind. The beauty of the network's hierarchical organization, in which general concepts are at the top and specific ones are at the bottom, is that it results in the testable prediction that the time it takes for a person to retrieve information about a concept should be determined by the distance that must be traveled through the network. Thus, the model predicts that when using the sentence verification technique, in which participants are asked to answer "yes" or "no" to statements about concepts, it should take longer to answer "yes" to the statement "A canary is an animal" than to "A canary is a bird." This prediction follows from the idea that it is necessary to travel along two links to get from "canary" to "animal" but only one to get to "bird". . Collins and Quillian (1969) tested this prediction by measuring the reaction time to a number of different statements and obtained the results shown in Figure 2. As predicted, statements that required further travel from "canary" resulted in longer reaction times.



economy because of evidence that people may, in fact, store specific properties of concepts (like "has wings" for "canary") right at the node for that concept (Conrad, 1972). In addition, Lance Rips and coworkers (1973) obtained sentence verification results such as the following:

- A pig is a mammal. RT = 1,476 ms
- A pig is an animal. RT = 1,268 ms

The Collins and Loftus Network Model; Personal experience affects Networks

Collins and Loftus (1975) proposed a model that resulted in networks like the one in Figure 4, in which concepts that are more closely related are connected by shorter lines. For example, the network in Figure indicates that "vehicle" is connected to "car," "truck," and "bus" by short links (because these are closely related concepts), but is connected to "fi re engine" and "ambulance" (which are less typical vehicles than car, truck, or bus) by longer links. These shorter links predict faster reaction times for the more typical vehicles.

The Collins and Loftus model abandons the hierarchical structure used by Collins and Quillian in favor of a structure based on a person's experience. This means that the spacing between various concepts can differ for various people depending on their experience and knowledge about specific

Semantic Networks; Later Models

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Anderson's ACT Theories

- ACT-R is an acronym for "Automatic Components of Thought Rational"; it attempts to account for all of cognition.
- Was created to account for all of cognitive functions and processes; memory, learning, spatial

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cognition, language, reasoning and decision making.

- Focuses on meaning of larger units- sentences and their networks.

Declarative knowledge

- Knowledge about facts and things.
- A proposition is the smallest unit of knowledge that can be judged either true or false.
- For instance, the phrase white cat does not qualify as a proposition because we cannot determine whether it is true or false.

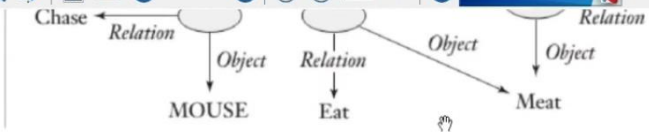
1. Susan gave a cat to Maria.

2. The cat was white.

3. Maria is the president of the club.

These three propositions can appear by themselves, but they can also be combined into a sentence,

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- Links between nodes become stronger with use and practice.
- Up to ten nodes can be activated at one time in working memory and activation spreads.
- Anderson argues that limited capacity of working memory may restrict spreading of activation.
- Anderson model has been praised for its skill in integrating cognitive processes and its scholarship. Research is continuing also using brain imaging techniques for studying activation.

Topic No. 181

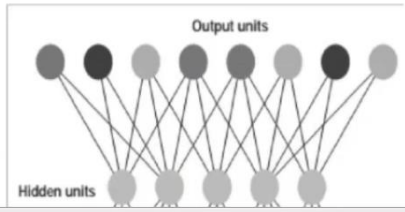
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The Connectionist Approach

Connectionism is an approach to creating computer models for representing concepts and their properties based on characteristics of the brain. These models are also called parallel distributed processing (PDP) models because, they propose that concepts are represented by activity that is distributed across a network.

An example of a simple connectionist network is shown in Figure 5. The circles are units. These units are inspired by the neurons found in the brain. The lines are connections that transfer information between units, and are roughly equivalent to axons in the brain. Like neurons, some units can be activated by stimuli from the environment, and some can be activated by signals received from other units. Units activated by stimuli from the environment (or stimuli presented by the



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Figure 6

- Connectionist networks are created by a learning process that shapes the networks so they are eventually capable of handling a wide range of inputs.

- Information about each concept in a connectionist network is contained in the distributed pattern of activity across a number of units.

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PROBLEM SOLVING

Topic: 182-183

Topic No. 182

Problem Solving

A problem occurs when there is an obstacle between a present state and a goal and it is not immediately obvious how to get around the obstacle (Lovett, 2002). A problem is difficult, and the solution is not immediately obvious.

There are many kinds of problems we have to solve. When students were asked about their problems they came up with following list;

○ Completing assignments on time. ○
Solving chemistry or statistics problems. ○
Dealing with class fellows and colleague. ○
Deciding which Courses to choose. ○ Which
career to choose? ○ Paying fee on time. ○
Learning to use a new software.

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Solving chemistry or statistics problems. ○
Dealing with class fellows and colleague. ○
Deciding which Courses to choose. ○ Which career to choose? ○ Paying fee on time. ○
Learning to use a new software.

- Some problems are well defined as you can see in the above list. Well defined problems usually have a correct answer; certain procedures, when applied correctly, will lead to a solution such as mathematical problems.

- Some problems are ill defined. These occur frequently in our everyday life and do not necessarily have one "correct" answer, and the path to their solution is often unclear for example relationships dealing or choosing a career.

Gestalt approach to problem solving

As we know the Gestalt psychologists were primarily interested in perception. They did study other aspects of cognition like problem solving. When they studied other areas, they applied the perceptual approach. According to Gestalt approach the successful solution depends on how problem is represented in the brain. Therefore, the solution is obtained by first perceiving the object and then representing it in a different way. Problem solving, for the Gestalt psychologists, was about (1) how people represent a problem in their mind and (2) how solving a problem involves a

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This problem, which was posed by Gestalt psychologist Wolfgang Kohler (1929), asks us to determine the length of the segment marked x if the radius of the circle has a length r.

One way to describe how this problem is represented on the page is "a circle with vertical and horizontal lines that divide the circle into quarters, with a small triangle in the upper left quadrant." The key to solving this problem is to change the last part of the representation to "a small rectangle in the upper left quadrant, with x being the diagonal between the corners." Once x is recognized as the diagonal of the rectangle, the representation can be reorganized by creating the rectangle's other diagonal (Figure 3). Once we realize that this diagonal is the radius of the circle, and that both diagonals of a rectangle are the same length, we can conclude that the length of x equals the length of the radius, r.

This solution does not require mathematical equations. Instead, the solution is obtained by first perceiving the object and then representing it in a different way. The Gestalt psychologists called the process of changing the problem's representation restructuring.

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Solution: The length of the line x is r.

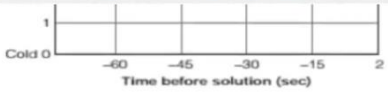
There will be some problems presented to you as part of your assignments.

The **Gestalt psychologists** also introduced the idea that restructuring is associated with insight—the sudden realization of a problem's solution. The Gestalt psychologists assumed that people solving their problems were experiencing insight because the solutions usually seemed to come to them all of a sudden.

Modern researchers have debated whether insight actually exists. Some point out that people often experience problem solving as an "Aha!" experience—at one point they don't have the answer, and the next minute they have solved the problem—which is one of the characteristics associated with insight problems (Bowden et al., 2005; Kounios et al., 2008). Other researchers have emphasized

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Obstacles to Problem Solving

- Fixedness; people's tendency to focus on a specific characteristic of the problem that keeps them from arriving at a solution.
- Functional fixedness; fixation on use of an object.

You are in a room with a corkboard on the wall. You are given the materials-some candles, matches in a matchbox, and some tacks, task is to mount a candle on the corkboard so it will burn without dripping wax on the floor.



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Topic No. 183

Approaches to Problem Solving

- **Newell** and **Simon** (1972) saw problems in terms of an initial state-conditions at the beginning of the problem-and a goal state-the solution of the problem. A problem starts with an initial state, continues through a number of intermediate states, and finally reaches the goal state.

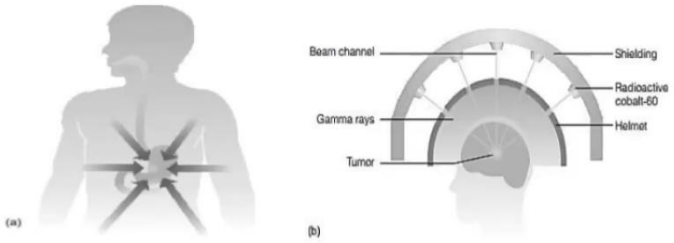
- The **initial state**, **goal state**, and all the possible intermediate states for a particular problem is called the **problem space**.

Demonstration; Tower of Hanoi problem

In addition to specifying initial and goal states of a problem, Newell and Simon also introduced the idea of operators—actions that take the problem from one state to another. For the Tower of Hanoi problem, the following rules specify which actions are allowed and which are not (see Figure 1)

1. Discs are moved one at a time from one peg to another.

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Effect of Making Surface Features More Similar

The lightbulb problem is a problem with surface features similar to the radiation problem. The following is a shortened version of this problem.

Lightbulb Problem

In a physics lab at a major university, a very expensive light bulb, which would emit precisely controlled quantities of light, was being used in some experiments. One morning Ruth, the research

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How Experts solve problems:

One factor that can sometimes make problem solving easier is practice or training. Some people can become very good at solving certain kinds of problems because they become experts in an area.

- Experts and novices solve problems differently • Experts have more knowledge of the field.

Chase and Simon's (1973a, 1973b) conducted research on how well chess masters and novices can reproduce positions on a chessboard that they have seen briefly. The results showed that experts excelled at this task when the chess pieces were arranged in actual game positions, but were no better than novices when the pieces were arranged randomly (see Figure 5.9). The reason for the experts' superior performance for actual positions is that the chess masters were able to recognize these specific arrangements of pieces. A chess master has about 50,000 patterns in his or her memory, compared to 1,000 patterns for a good player and few or none for a poor or beginning player (Bedard & Chi, 1992). But what is important for the purposes of problem solving is not just that the expert's mind contains lots of knowledge, but that this knowledge is organized so it can be

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It should be pointed out that being an expert is not always an advantage. One disadvantage is that knowing about the established facts and theories in a field may make experts less open to new ways of looking at problems. This may be why younger and less experienced scientists in a field are often the ones responsible for revolutionary discoveries (Kuhn, 1970; Simonton, 1984). Thus, it has been suggested that being an expert may be a disadvantage when confronting a problem that requires flexible thinking—a problem whose solution may involve rejecting the usual procedures in favor of other procedures that might not normally be used (Frensch & Sternberg, 1989).



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Lecture 43

REASONING

Topic: 184-185

Topic No. 184 Reasoning

- Reasoning has been defined as the process of drawing conclusions (Leighton, 2004) and as the cognitive processes by which people start with information and come to conclusions that go beyond that information (Kurtz et al., 1999).

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- Reasoning is bases of decision making often in many real-world settings such as study, career, relationships, health practices, monetary decisions like investments, even good deeds like helping the needy or going for Haj or pilgrimage.
- Reasoning is also involved in many other situations besides making decisions. For example, we might use reasoning to help solve problems like the ones we studied in topic of problem solving.
- Reasoning is also involved in reading, as we make inferences about what is happening in a story based on what we know has happened earlier in the story.

Deductive and Inductive Reasoning

- Deductive reasoning is based on drawing conclusion from statements for example K.E.M.U requires an applicant to pass an entry test, Usman is studying in K.E.M.U, Usman must have passed the entry test.

- Inductive reasoning, in which we arrive at conclusions about what is probably true, based on evidence. Thus, if we know that Richard attended State U. for 4 years and that he is now the vice president of a bank, we might conclude it is likely that he graduated. Notice, however, that in this example, we cannot say that he definitely graduated (maybe he never completed all the requirements, and his mother, who is president of the bank, made him a vice president). Thus, we can make definite conclusions based on deductive reasoning and probable conclusions

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we can make definite conclusions based on deductive reasoning and probable conclusions based on inductive reasoning. Studying both kinds of reasoning provides insights both about how the mind works and about everyday thinking.

Aristotle is considered the father of deductive reasoning because he introduced the basic form of deductive reasoning called the syllogism. A syllogism includes two statements, called premises, followed by a third statement, called the conclusion. We will first consider categorical syllogisms, in which the premises and conclusion describe the relation between two categories by using statements that begin with all, no, or some.

An example of a categorical syllogism is the following:

Syllogism 1

Premise 1: All birds are animals.

Premise 2: All animals eat food.

Conclusion: Therefore, all birds eat food.

This is an example of good reasoning which means the conclusion follows from the two premises and it is also true as both premises are true.

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shown in the far-right column of Table 1, indicate that most people (close to 100 percent in most experiments) correctly judge that Syllogism 1 is valid, but performance is lower on Syllogism 2, which is also valid, and 3 and 4, which are not valid. These percentages are the average results from many studies in which the syllogisms were stated abstractly, using the letters p and q for the antecedent and the consequent. In the next section we will describe a reasoning problem that has been studied both when stated in abstract form and also in terms of specific real-world examples.

Conditional reasoning:

The Wason Four-Card Problem

If reasoning from conditional syllogisms depended only on applying rules of formal logic, then it wouldn't matter whether the syllogism was stated in terms of abstract symbols, such as p and q, or in terms of real-world examples, such as studying or robins. However, research shows that people are often better at judging the validity of syllogisms when real-world examples are substituted for abstract symbols. As we look at this research, we will see that some real-world examples are better than others. Our main goal, however, is not simply to show that stating a problem in real-world terms makes it easier, but to consider how researchers have used various ways of stating a problem to propose mechanisms that explain why the real-world problems are easier. Many researchers have used a classic reasoning problem called the Wason four-card problem.

Demonstration

Four cards are shown in Figure 1. Each card has a letter on one side and a number on the other side.

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Topic No. 185 Heuristics

Inductive Reasoning: Reaching Conclusions from Evidence

- In inductive reasoning, conclusions are suggested, with varying degrees of certainty, but do not definitely follow from premises. This is illustrated by the following two inductive arguments:

  Observation 1; all the crows I have seen in Lahore are black; when I visited a village, all crows were black there too. Conclusion; pretty good bet that all crows are black

  Observation 2: Here in Tucson, the sun has risen every morning. Conclusion: The sun is going to rise in Tucson tomorrow.

- When people use past experience to guide present behavior, they often use shortcuts to help them reach conclusions rapidly ○ We don't have the time or energy to stop and gather every bit of information that we need to be 100 percent certain that every conclusion we reach is correct.

- A number of factors can contribute to the strength of an inductive argument. Among them are

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that we are using inductive reasoning constantly, often without even realizing it.

For example, did you run a stress test on the chair you are sitting in to be sure it wouldn't collapse when you sat down? Probably not. You assumed, based on your past experience with chairs, that it would not collapse. This kind of inductive reasoning is so automatic that you are not aware that any kind of "reasoning" is happening at all. Think about how time-consuming it would be if you had to approach every experience as if you were having it for the first time. Inductive reasoning provides the mechanism for using past experience to guide present behavior.

Heuristics

When people use past experience to guide present behavior, they often use shortcuts to help them reach conclusions rapidly. After all, we don't have the time or energy to stop and gather every bit of information that we need to be 100 percent certain that every conclusion we reach is correct. These shortcuts take the form of heuristics— "rules of thumb" that are likely to provide the correct answer to a problem, but are not foolproof.

The Availability Heuristic ○ The availability heuristic states that events that are more easily remembered are judged as being more probable than events that are less easily remembered (Tversky & Kahneman, 1973).

The following demonstration introduces the availability heuristic.

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Asthma (920)	Botulism	41
Asthma (20)	Tornado	58
Appendicitis (2)	Pregnancy	83

Adapted from Lichtenstein et al., 1978.

- Heuristics can mislead us into reaching the wrong conclusion when less frequently occurring events stand out in our memory. There are many situations, however, in which we remember events that do occur frequently. For example, you might know from past observations that when it is cloudy and there is a certain smell in the air, it is likely to rain later in the day. Or you may have noticed that your boss is more likely to grant your requests when he or she is in a good mood.

Illusory correlation; fooling ourselves

Although observing correlations between events can be useful, sometimes people fall into the trap of creating illusory correlations. Illusory correlations occur when a correlation between two events appears to exist, but in reality, there is no correlation or it is much weaker than it is assumed to be. Illusory correlations can occur when we expect two things to be related, so we fool ourselves into thinking they are related even when they are not. These expectations may take the form of a

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that support the person's preconceptions can create the illusion that a correlation exists, when there may be only a weak correlation or none at all.

The Representative Heuristic

- Is related to the idea that people often make judgments based on how much one event resembles another event.

A randomly picked person, Robert wears glasses, speaks softly and reads a lot- farmer or librarian? When Amos Tversky and Daniel Kahneman (1974) presented this question in an experiment, more people guessed that Robert was a librarian. Apparently, the description of Robert as wearing glasses, speaking quietly, and reading a lot matched these people's image of a typical librarian (see illusory correlations, above). Thus, they were influenced by the representativeness heuristic into basing their judgment on how closely they think the characteristics used to describe Robert (A in our definition of the representativeness heuristic) match those of a "typical" librarian (class B). However, they were ignoring another important source of information—the base rates of farmers and librarians in the population. The base rate is the relative proportion of different classes in the population. In 1972, when this experiment was carried out, there were many more male farmers than male librarians in the United States, so it is much more likely that Robert was a farmer (remember that he was randomly chosen from the population). One reaction to the farmer–librarian

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large hospital and farther from 50 percent in the small hospital. To make this conclusion clear, imagine that there is a very small hospital that records only one birth each day. Over a period of a year there will be 365 births, with about 50 percent being boys and 50 percent being girls. However, on any given day, there will be either 100 percent boys or 100 percent girls—clearly percentages that are not representative of the overall population. People often assume that representativeness holds for small samples, and this results in errors in reasoning. (See Gigerenzer & Hoffrage, 1995; Gigerenzer & Todd, 1999, for additional perspectives on how statistical thinking and heuristics operate in reasoning.)

Confirmation bias

One of the major roadblocks to accurate reasoning is the confirmation bias, our tendency to selectively look for information that conforms to our hypothesis and to overlook information that argues against it. This effect was demonstrated by Wason (1960), who presented participants with the following instructions:

You will be given three numbers which conform to a simple rule that I have in mind.... Your aim is to discover this rule by writing down sets of three numbers together with your reasons for your choice of them. After you have written down each set, I shall tell you whether your numbers conform to the rule or not. When you feel highly confident that you have discovered the rule, you are to write it down and tell me what it is.

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Lecture 44

DECISION MAKING

Topic: 186-187

Topic No. 186

Decision Making

Decision making refers to;

- How people make judgments that involve choices between different courses of action. It involves reasoning, weighing costs and benefits and looking at consequences of past decisions and information and knowledge stored in our memory about various facts and events.

- Involves every day decisions like what to wear, what to say in a meeting, when to meet someone or which transport to take or even what to eat when you are hungry. it also involves life time decisions like educational course, job and career decisions, choosing a partner, choosing a life style and even spiritual and faith related decisions.

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- Naturally some of these are small decisions which are only time related choices but some are big decisions.

- Moral decisions like violating a rule, practicing religious rituals, hurting someone, or helping someone are decisions that are complex and involve many factors including a person's personality and moral maturity.

- Decisions that we regret; learning from bad decisions involves hindsight, which means an insight or re-thinking that comes later when we realize the consequences of our decision or time makes some things clear.

- Expected utility theory; based on the assumption that people are basically rational, so if they have all of the relevant information, they will make a decision that results in the maximum expected utility, to outcomes that achieve a person's goals. Economists looked at utility as maximum monetary payoff. social psychologists look at social benefits or costs of a decision.

- Experiments and research on Decision making tells us many things; for example, there is the phenomenon of Disregarding the probability studies that show that people reduced air travel after 9/11. The number of Americans who lost their lives on the road by avoiding the risk of flying was higher than the total number of passengers killed on the four hijacked flights.

- We can also make decisions based on temporary feelings like when things are going well, we

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tend to be quicker in making decisions. This has been studied through experiments on gambling. When people are winning in gambling, they put more money on stake.

- Emotions can affect decisions. ○ Expected emotions and immediate emotions; emotions may be integral or incidental.
- People inaccurately predict their emotions.



(a) 1 out of 10 red
Odds = 10%

(b) 7 out of 100 red
Odds = 7%

Denes-Raj and Epstein (1994) gave participants a choice between randomly picking one jelly bean from (a) a bowl with 1 red bean and 9 white beans or (b) a bowl with 7 red beans and 93 white beans (not all of the white beans are shown in this picture). Participants received money if they



Topic No.187

Approaches to Decision Making

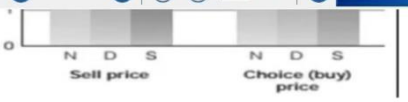
Decisions and Emotions

- There is evidence that decision making is affected by incidental emotions, even though not directly related to the decision.

- University admissions; decisions in which applicants' academic attributes were more heavily weighted on cloudy days than on sunny days, whereas nonacademic attributes were more heavily weighted on sunny days. similarly prospective students visiting a university were more likely to enroll if they had visited the campus on a cloudy day.

- Selling and buying decisions; disgust, sadness and neutral elicited by watching film clips, experiment by Lerner and coworkers in 2004 shows that the participants in the disgust and sadness group were willing to sell the set for less than the neutral group. It shows the need to

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- Emotions can affect decisions in a number of different ways (Han & Lerner, 2009). Expected emotions are emotions that people predict they will feel for a particular outcome. integral emotions are emotions that are associated with the act of making a decision. For example, in accepting a deal in who wants to be a millionaire context, a contestant who is trying to decide whether to accept or turn down the offer may feel extremely anxious. This anxiety is the integral emotion associated with making the decision, and it is probable that this emotion could affect the decision.

- **Incidental immediate emotions** are emotions that are unrelated to the decision.

- Incidental emotions can be caused by a person's general disposition (the person is naturally happy, for example), or something that happened earlier in the day, or reacting to the general environment such as background music being played in a game show or the yells of the game show audience.

- Each of these types of emotions can potentially have an effect on decisions, but only expected emotion, which involves some element of rational thought, can be handled within the expected utility framework. A basic characteristic of research on decisions is the phenomenon of risk

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- Each of these types of emotions can potentially have an effect on decisions, but only expected emotion, which involves some element of rational thought, can be handled within the expected utility framework. A basic characteristic of research on decisions is the phenomenon of risk aversion—the tendency to avoid taking risks. try to apply this to the example of show 'who wants to be a Millionaire'.

Justification for decisions

People also give justifications for their decisions. We can illustrate this by considering an experiment by Tversky and Eldar Shafir (1992), in which they presented the following problem to two groups of students. The "pass" group saw the statement indicating that they passed; the ""failure"" group saw the statement indicating that they failed.

Imagine that you have just taken a tough qualifying examination. It is the end of the semester, you feel tired and run-down, and you find out that [(pass group) you passed the exam; (fail group) you failed the exam and will have to take it again in a couple of months—after the Christmas holidays].

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1/3 chance 2/3 chance

This experiment shows how framing affects decision making, the conditions set forth for Programs A, B, C, and D.

- **Neuroeconomics**, combines research from the fields of psychology, neuroscience, and economics.
- Research has identified areas of the brain that are activated as people make decisions while playing economic games.

- Decisions are often influenced by emotions, and that these emotions are associated with activity in specific areas of the brain.

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Human Language

- Goes far beyond from fixed signals and single message.
- It involves arranging a sequence of signals-sounds for spoken language, letters and written words for written language, physical signs for sign language to transmit, from one person to another.
- It ranges from the simple and commonplace conveying simple signals to complex.

Examples of simple and complex

Simple; I am going to get my hair cut.

Complex; I am going to get my hair cut because yesterday someone thought I was a girl looking at me from back and my father was annoyed at that.

- Language is universal.
- Humans have a need to communicate; deaf children invent sign language when there is none.
- Everyone with normal capabilities learns language, rules, and can speak
- All cultures have language, language development is similar.

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- More than 5000 languages, unique but same; verbs, nouns, questions, past and present, negatives.
- Study of language in 1800s, Broca and Wernicke identifying areas in frontal and temporal lobes.
- Psycholinguistics; psychological study of language.
- Chomsky; language is genetically programmed like walking.
- Children can produce new sentences never heard never reinforced and associate words with emotions and acts.
- Psycholinguistics study; comprehension, speech production, representation in mind and acquisition.

Topic No.189

Speech and Reading Processes

Topic No.189

Speech and Reading Processes

Components of Words

- A **phoneme** is the shortest segment of speech that, if changed, changes the meaning of a word; bit, bat, pit, bid.
- **Morphemes** are the smallest units of language that have a definable meaning or a grammatical function; table = tab + ul, one morpheme.
- Bedroom = 2 morphemes.
- In perceiving words, context is important.

Phonemic Restoration Effect

- In the sound stimulus presented to the listener, the sound of the sin legislatures is masked by a cough sound.
- What the person hears is indicated here. Although the person hears the cough, he also hears the stimulus.

- **Semantics** is the meanings of words and sentences; syntax specifies the rules for combining words into sentences.

- Changing the sentence "The cats won't eat" into "The cats won't bake" is an error of semantics because the meaning doesn't make sense; changing the sentence to "The cats won't eating" is an error of syntax because the grammar is not correct.

Topic No.190

Human Motivation

- Motivation is the general term for all the processes involved in starting, directing, and maintaining physical and psychological activities.

- Latin word **Movere**, *to move,* move towards or move away from- attractions and aversions.

- Pleasure, nourishment, beauty = attraction.

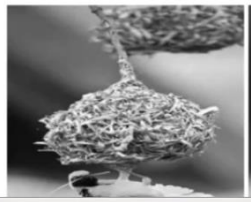
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- Pain, hurt, discomfort = aversion

  Instinctive behavior like the nest-building practices of the golden weaver is motivated by genetic inheritance. Instinct is defined as preprogrammed tendency that is essential to a species' survival

- Drive is an internal state that arises in response to a disequilibrium in an animal's physiological needs.

- Homeostasis is constancy or equilibrium of the internal conditions of the body, for example when we are hungry, the sugar level goes low in body, we crave for nourishment to satisfy our hunger. Hunger is a drive and when hunger is fulfilled, the homeostasis or state of equilibrium is restored.




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Food or water-deprived rats placed in maze, bowl either water or food provided

Drive theory predicts the rats experiencing deprivation would eat or drink at first opportunity. However, rather than immediately reducing that tension, the rats often chose to explore the maze instead. Rats that had been deprived of food for 48 or 72 hours spent 80 percent of their first two minutes in the maze exploring the maze; they spent only 20 percent of their time eating. it shows that curiosity, a strong motive!

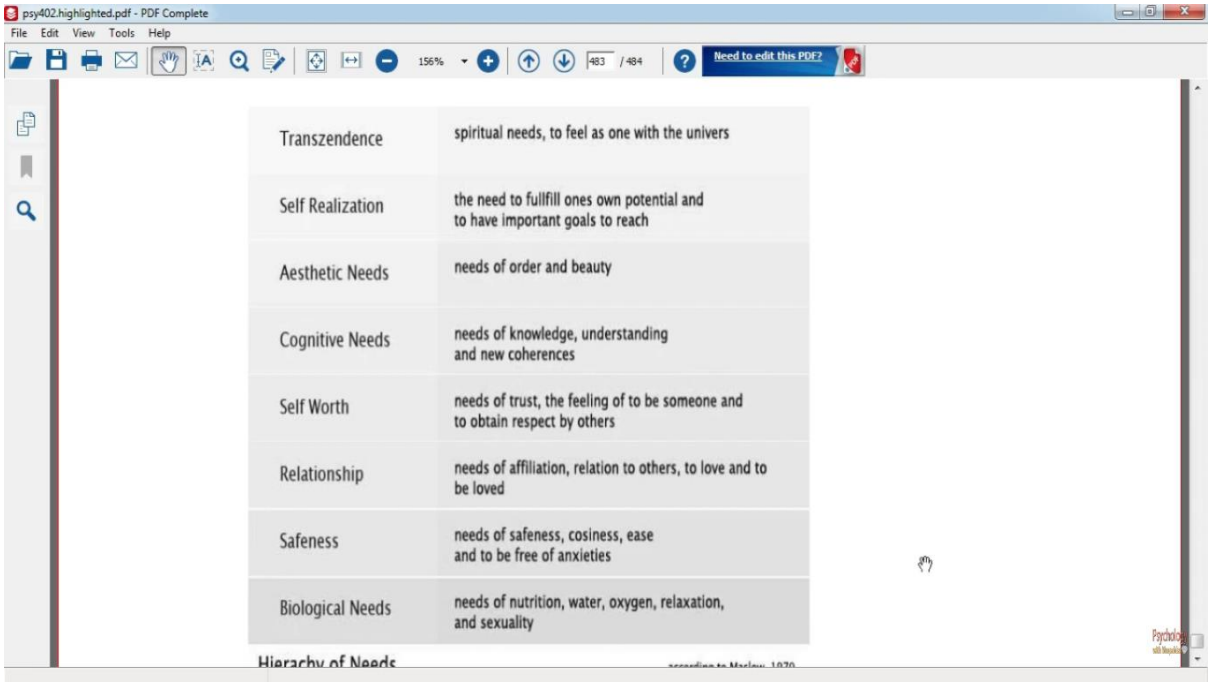
- **Incentive**; external stimulus or reward that motivates behavior although it does not relate directly to biological needs, used in work, education, performance related fields

- Achievements; sports, career, learning and competitive situations.

- **Extrinsic and Intrinsic motivation**.

- **Self-determination theory** and research; Intrinsic motivation more effective and longer lasting than extrinsic rewards or incentives, for healthy behavior, job satisfaction, practicing religion, academic success.

Look at the pictures below and identify the motivation for these activities.


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Transzendence
spiritual needs, to feel as one with the univers
Self Realization
the need to fullfill ones own potential and to have important goals to reach
Aesthetic Needs
needs of order and beauty
Cognitive Needs
needs of knowledge, understanding and new coherences
Self Worth
needs of trust, the feeling of to be someone and to obtain respect by others
Relationship
needs of affiliation, relation to others, to love and to be loved
Safeness
needs of safeness, cosiness, ease and to be free of anxieties
Biological Needs
needs of nutrition, water, oxygen, relaxation, and sexuality
Hierarchy of Needs