PSI 428
Attentional Processes

Attention and Memory

Learning Objectives

- Short term memory
- Working memory
- Working attention

Attention Memory and Action

- We have studied attentional limitations in perception of stimuli
- Attentional limitations in selection of a stimuli
  - Selective attention
  - Divided attention
  - Attentional set

Attention Memory and Action

- What is the relationship between attention and memory
- How storage, encoding and retrieval in memory depends on attetional control and attentional limitations?

Learning Objectives

- **Short term memory**
- Working memory
- Working attention

Short-Term Memory and Recall

- Free Recall
  - The memory task in which the list items may be recalled in any order
- Serial Recall
  - A recall task in which people are to recall the list items in their original order of presentation

Short-Term Memory and Recall

- K
- T
- B
- C
- Z
- W
- S
- P
- V
- R
- Y
- Q
- L
- G
- M
- X
- N
- J

Short-Term Memory and Recall

- Free Recall: Listede geçen harfleri hatırlayınız.

Short-Term Memory and Recall

- S
- P
- V
- R
- Y
- Q
- L
- G
- M
- X
- N
- J
- K
- T
- B
- C
- Z
- W

Short-Term Memory and Recall

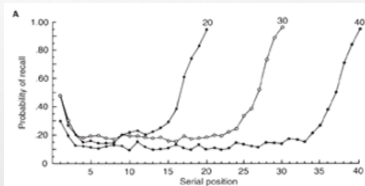- Serial Recall: Listede geçen harfleri sırasıyla hatırlayınız.

Short-Term Memory and Recall

- Serial Position Curve
  - The accuracy in recall across the original positions in a list; often found to have a bowed shape, indicating lower recall in the middle of the list than in the initial or final positions

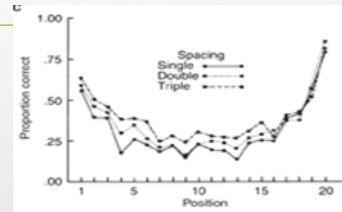## Short-Term Memory and Recall

- Primacy Effect
  - Better memory for items at the early positions of the list
- Recency Effect
  - Better memory for items at the end positions of the list, presumably because the items are still in short-term memory
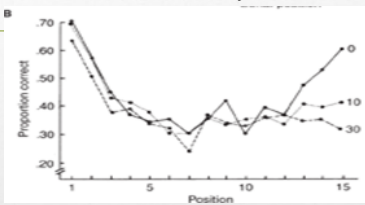
Short-Term Memory and Recall

Serial position curves showing recall accuracy across the original positions in the learned list

Short-Term Memory and Recall

Three different rates of presentation: single (3 s), double (6 s), and triple (9 s).
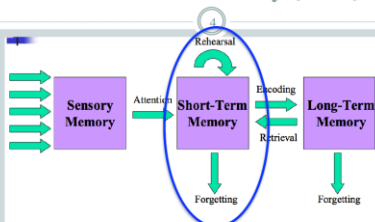
Short-Term Memory and Recall

Serial position curves showing the decrease in recency when 10 or 30 s of backward counting is interpolated between study and recall

Short-Term Memory

- The part of memory that holds information for a brief amount of time seconds
- Where current and recently attended information is held
- Sometimes loosely equated with attention and consciousness
- *This view of STM is consistent with which*
- *Early selection or late selection?*
- *Serial or parallel processing?*

Short-term Memory (STM)

- STM receives input from both sides
  - Bottom-up: sensory info that has passed the attention buffer
  - Top-down: prior knowledge and expectations from LTM

P335 Cognitive Psychology

Short-Term Memory

- Forgetting takes place because of the passage of time—forgetting caused by **decay**
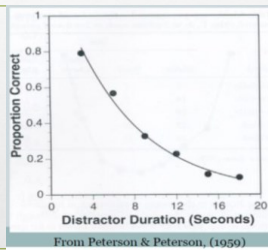- Because of the holding a new information —forgetting caused by **interference**

Short-Term Memory

- Brown and Petersons' task:
- First present trigrams
  - (group of letters, set =3)
- Then counting: (count back by 3, at a rate of 2 items per sec)
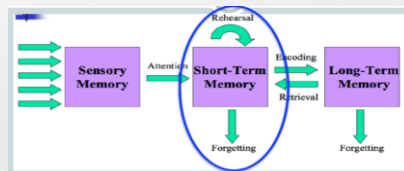- Finally recall the trigrams

---

Short-Term Memory

XQJ	VPG	LTW
187	89	131
184	86	128
?	83	125
	80	122
	?	119
		116
		113
		?

Short-Term Memory

From Peterson & Peterson, (1959)

The Brown-Peterson Task: Decay from Short-Term Memory

- How can you explain these results in reference to Atkinson and Shiffrin's model?
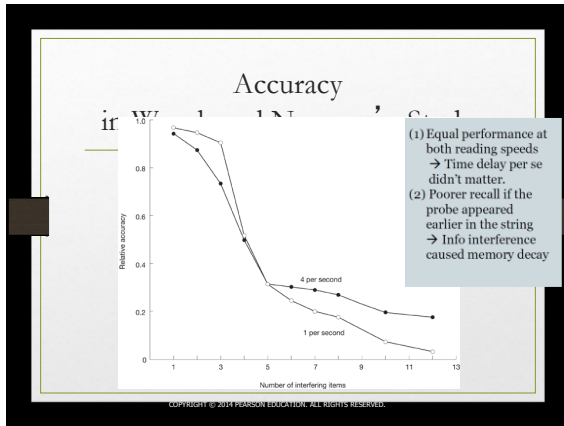

Interference versus Decay

- Waugh and Norman
  - Questioned wither the distractor task may have been a source of interference (or retroactive interference)
- Forgetting is influenced by the number of intervening items, not the passage of time— forgetting is caused by interference, not decay.

Interference versus Decay

- The task: read a string of numbers at either 1 or 4 digits per second… then, recall the number after the probe

Read the string of 16 digits

8 3 2 6 0 7 8 5 4 5 3 6 9 0 1 4

1 digit per sec, 16 seconds
4 digits per sec, 4 seconds

Probe: 2   Answer: 6

Slide 1

Accuracy in Waugh and Norman's Study

(1) Equal performance at both reading speeds → Time delay per se didn't matter.
(2) Poorer recall if the probe appeared earlier in the string → Info interference caused memory decay

Slide 2

Interference versus Decay

- Keppel and Underwood:
  - As you experience more and more trials in the Brown-Peterson task, recalling items becomes more difficult because the previous trials are generating interference.
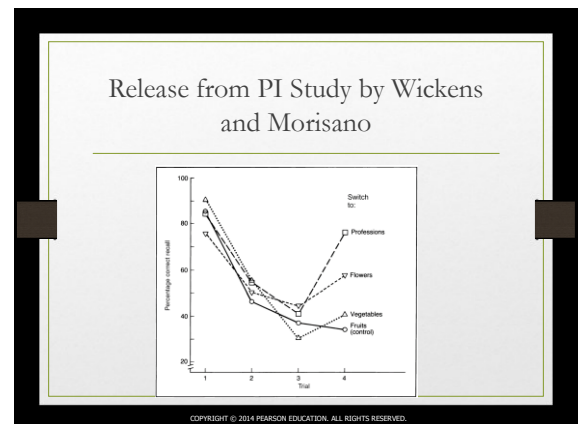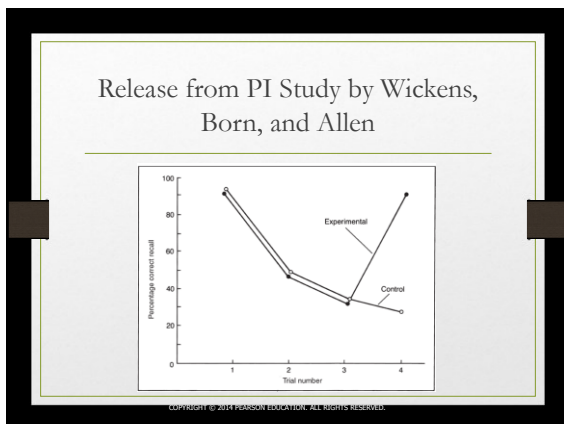
Slide 3

Interference versus Decay

- Proactive Interference
  - Older material interferes forward in time with your recollection of the current item.
- Retroactive Interference
  - Newer material interferes backward in time with your recollection of older items.

Slide 4

Interference versus Decay

- Release from PI
  - The decline in performance caused by proactive interference is reversed because of a switch in the to-be-remembered information

Slide 5

Release from PI Study by Wickens, Born, and Allen

Slide 6

Release from PI Study by Wickens and Morisano

Learning Objectives

- Short term memory
- **Working memory**
- Working attention

Working Memory

- An augmentation of the STM concept

  - $[(4 + 5) \times 2] / [3 + (12/4)]$

Ben

bugün

okula

geldim

ve

hemen

hemen

aynı

Working Memory
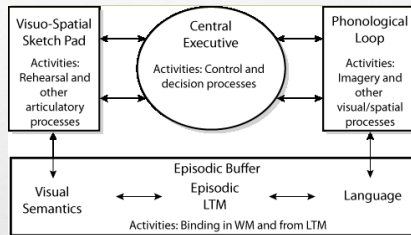
- An augmentation of the STM concept

  - Bugün okula geldim ve hemen ders çalışmaya başladım
  - Bugün okula geldim ve hemen hemen aynı

Working Memory

- Information is not passively stored in STM,
- It is actively manipulated and transformed

Working Memory

Visuo-Spatial Sketch Pad	Central Executive	Phonological Loop
Activities: Rehearsal and other articulatory processes	Activities: Control and decision processes	Activities: Imagery and other visual/spatial processes

Visual Semantics	Episodic Buffer Episodic LTM	Language
	Activities: Binding in WM and from LTM	

Assessing Working Memory

- Working Memory Span
  - A growing body of evidence suggests that people differ in working memory capabilities, and that these are related to various cognitive processes.
  - Measures of working memory span

Assessing Working Memory

- Simple Span Measures
  - Simple retention of a list of items
    - Digits span
    - Letter span
    - Word span

Assessing Working Memory

- Complex Span Measures
  - Retention of a set of items along with additional cognitive processes
    - Sentence span
    - Operation span
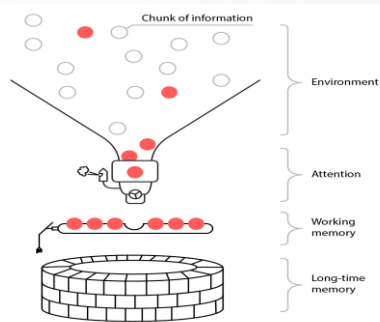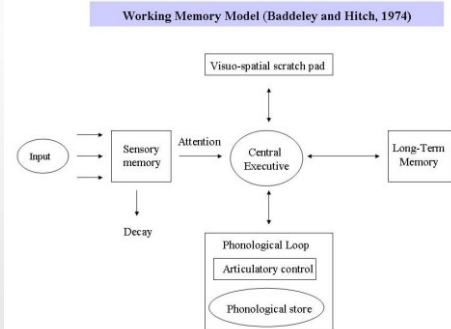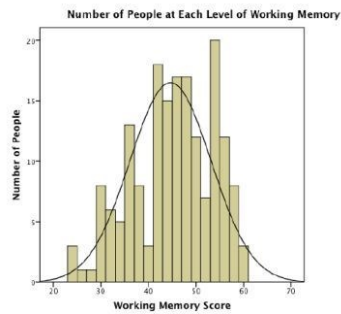

Assessing Working Memory

Simple Span	Reading Span (WMC)	Operation Span (WMC)
B	The tiger leapt to the ridge. B	Is $(3 \times 1) - 1 = 3$? B
N	I'll never forget my days of combat. N	Is $(10 / 2) + 1 = 6$? N
K	Andy was arrested for speeding. K	Is $(8 / 4) - 1 = 1$? K
J	The mirror cast a strange reflection. J	Is $(3 \times 3) + 1 = 12$? J
S	Broccoli is a good source of nutrients. S	Is $(4 \times 3) + 2 = 14$? S

Assessing Working Memory

- Working memory capacity:
- A limited number of items (or chunks), that can be stored, and accessible immediately

Number of People at Each Level of Working Memory

Working Memory Model (Baddeley and Hitch, 1974)

Learning Objectives

- Short term memory
- Working memory
- **Working attention**

Working Attention

- Randall Engle
- WM capacity is not directly about memory
- It is about using attention to maintain or suppress information.

Working Attention

Simple Span	Reading Span (WMC)	Operation Span (WMC)
B	The tiger leapt to the ridge. B	Is (3 x 1) – 1 = 3 ? B
N	I'll never forget my days of combat. N	Is (10 / 2) + 1 = 6 ? N
K	Andy was arrested for speeding. K	Is (8 / 4) – 1 = 1 ? K
J	The mirror cast a strange reflection. J	Is (3 x 3) + 1 = 12 ? J
S	Broccoli is a good source of nutrients. S	Is (4 x 3) + 2 = 14 ? S

Working Attention

- Attentional processes filter information represented within the cognitive system as well
- Measures of WM capacity reflect both memory processes and executive attention
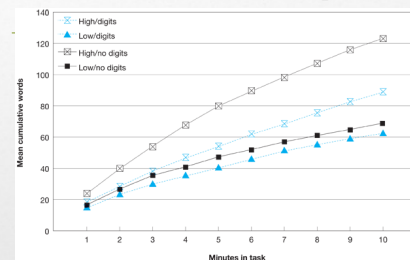
Working Attention

- Greater WM capacity does mean that more items can be maintained as active, but this is a result of greater ability to control attention, not a larger memory store.
- Greater WM capacity also means greater ability to use attention to avoid distraction.

Working Memory

- Rosen and Engle (1997)
- In the single task condition:
- People generate category members.

- In a dual-task situation.
- They also monitored a stream of digits
  - They pressed the space bar whenever they saw a third odd digit in a row appear in the sequence.

The Cumulative Number of Animal Names Generated by People of

Working Memory

- High-span people were more affected than were low-span people.
- High-span people were able to normally engage in inhibition of previously retrieved items in addition retrieval processes.
- During the dual task, they could not do this. The low-span people were not engaged in these extra processes, and so were less disrupted.

Working Attention

- How do you integrate these ideas with alternative theories of attention
- Earcly vs. late selection
- Serial vs. parallel processing
- Attentional set
- Central bottleneck