Cognitive Psychology

PSYC230

Lecture # 5

REVIEW -Attention

Selective attention Divided attention

Attentional capacity

Central capacity, multiple resource, & structural models

Automatic processing

Some stimuli attract our attention automatically

Preconscious processing

Some processing of incoming information occurs even before we are aware of it

Priming studies & subliminal messages

REVIEW

Attention & Consciousness

Controlled processing

We *can* exercise voluntary control over what we pay attention to

Sustained attention (vigilance) is affected by habituation (sensitivity) and motivation (criterion)

Theories of Attention

Early vs late and flexible filter models vs parallel (attenuator) and resource models

TODAY

Sensory Memory & Primary Memory (STM)

Information enters through the ***sensory register***, a large capacity, short duration memory system (information selected for further processing via the process of attention)

Iconic memory

Perception of a visual image lasts longer than the actual stimulus duration

Helps to 'smooth out' visual input

Sensory Memory

George Sperling's (1960) *Duration of the Icon*

Wanted to measure the Span of Apprehension the size and duration of sensory memory

Presented arrays of letters for 50 msec

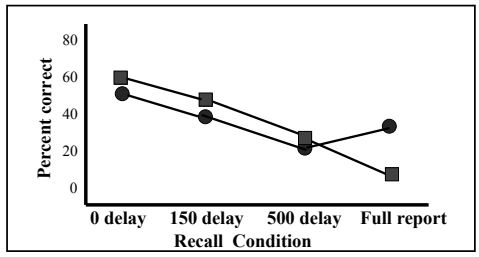
C	F	P	Y
J	M	B	X
S	G	R	L

Participants had to report as many letters as they could recall

Participants could only recall about 4-5 letters correctly, unless they used the partial report technique

Sensory Memory

Example laboratory results



Partial report condition better than full report, performance poorer as the recall delay increases.

Sensory Memory

Iconic Memory

What is the size of Iconic memory?

The partial report manipulation suggests that everything seen by the eyes is stored in the iconic memory (large capacity)

What is the duration of Iconic memory?

The cue delay manipulation suggest that icons decay within about 250 msec

Sensory Memory

Iconic Memory

Is Sperling's procedure the best way to measure Iconic memory?

Robert Efron (1970) argued manipulating cue delay was only an indirect measure of icons' duration

Efron had participants adjust the onset of an auditory stimulus to coincide with the offset of a brief visual stimulus (and vice versa).

He measured offset to onset and found an estimated duration of persistence of 250ms

Sensory Memory

Iconic Memory

Direct measures showed some things the indirect measure did not:

The Inverse Duration Effect – The longer a stimulus lasts, the shorter its persistence after the offset of the stimulus

The Inverse Intensity Effect – The more intense the stimulus, the briefer its persistence

Direct measures are indicators of *visible persistence*

Indirect measures are indicators of *informational persistence*

Sensory Memory

Iconic Memory

Is Iconic memory really a memory? (or just an afterimage?)

Afterimages are the opposite colour of the stimulus (red-green; blue-yellow)

Banks & Barber (1977) found that participants don't make colour confusions

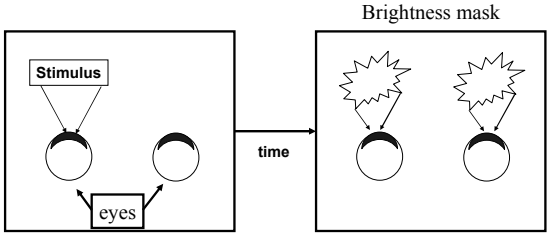
Also evidence from visual masking experiments

Two types of visual masking:

Brightness masking & Pattern masking

Sensory Memory

Brightness masking

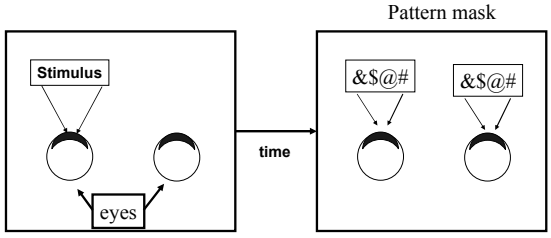


Result 1 (left eye): Icon is erased from sensory register (cannot identify stimulus if delay is short enough)

Result 2 (right eye): No Effect (can still read icon in sensory memory)

Sensory Memory

Pattern masking



Result: If time (t) is short enough, then subjects cannot identify stimulus regardless of which eye receives the mask

Sensory Memory

Erasure from Iconic Memory

(Averbach & Coriell, 1961)

Used same stimulus presentation as Sperling

But recall cue was a visual marker instead of a tone; bar, circle or disc

Participants only had to report the one letter indicated by the marker

Pattern masking interfered with the icon
Bar produced least interference, disk the most.

Two Stages of Iconic Memory

Stage 1: Brightness masking

Disrupts memory *only* when the mask is presented to the *same eye* as the briefly presented stimulus

Brightness masking seems to have its effect on memory before information from the eyes is combined (very early)

Amount of masking depends on brightness (energy) and duration of the mask

Two Stages of Iconic Memory

Stage 2: Pattern masking

Interferes with iconic memory AFTER information from the eyes is combined

Interference occurs even when the mask is presented to a different eye than is the briefly presented stimulus

Amount of interference depends on the interval between the presentation of the brief stimulus and the pattern-mask

Sensory Memory

Iconic Memory

Second stage of Iconic memory may even last days!

Icon Recognition experiments

(Phillips, 1971 & 1974; Goldstein 1971)

Participants presented with visual patterns then after a delay same or slightly changed pattern shown again

Recognition accuracy after 48 hours:
71% faces
48% ink blots
33% snowflakes

Sensory Memory

Iconic Memory
Span of Apprehension

Within the first few seconds of visual memory a great deal of information is lost.

The time in which the information is held can be influenced by a number of things.

However, enough information can be held to make a recognition out to a number of days

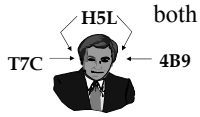
Sensory Memory

Echoic memory

Three-eared Man Procedure

Darwin, Turvey, & Crowder, 1972
(auditory analogue to Sperling)

Three auditory stimuli: left ear, right ear, or both ears (middle ear)



Recall cue

Right

Visual recall cue indicating left, right or middle stimulus after 0, 1, 2, or 4 sec delay

Similar findings to iconic memory, but much longer Span of Apprehension, 2-4 sec

Sensory Memory

Echoic memory

Efron's (1970)
direct measurement of sensory memory

Participants adjusted the onset of an light stimulus to coincide with the offset of a brief auditory stimulus

Regardless of the duration of the tone (between 30 and 100 ms), participants tended to perceive a tone duration of 130 ms

Sensory Memory

Masking in Echoic Memory

Crowder & Morton (1969)
non-speech sound (buzzer) did not cause the same disruption as speech sound
but the speech sound could be anything

Precategorical Acoustic Store

Items stored as an uncategorised code for ~2secs in an acoustic store with new items interfering with stored items

Sensory Memory

Masking in Echoic Memory

The Suffix Effect (Robert Crowder, 1970)

After auditory presentation of a list of words, a recall cue (suffix) was presented, either a tone or the word "zero"

The tone suffix group performed better than "zero" suffix group

Crowder concluded that the verbal suffix erased or masked the echoic trace of the last list item

Sensory Memory

Masking in Echoic Memory

Acoustic vs Categorical Storage
(Crowder, 1972)

Participants heard a nine digit list followed by one of four types of suffixes:

Real animal sound (Animal Suffix)
English word (Human Suffix)
"baa" Ss are told it is made by a sheep (Animal Sheep)
"baa" Ss are told it is made by a human (Human Sheep)

Found interference for Human Suffix & Human Sheep only (even though Animal Sheep & Human Sheep are the same)

Sensory Memory

Echoic memory

Echoic memory is similar to Iconic memory in that there is more information accessible than can be recalled

Echoic memory is different in that the trace lasts much longer than a second

Echoic memory can be masked

Echoic memory is not stored pre-categorically

The sensory register is not what most people think of when you discuss "memory"

In fact they don't even know they have a sensory register because it is preconscious, subliminal, implicit

The only memories we are aware of are in
Primary memory,
aka Working memory,
aka Short-term memory (STM)

Ebbinghaus (1885)

& the "Curve of Forgetting"

Learned lists of nonsense syllables, until two errorless repetitions

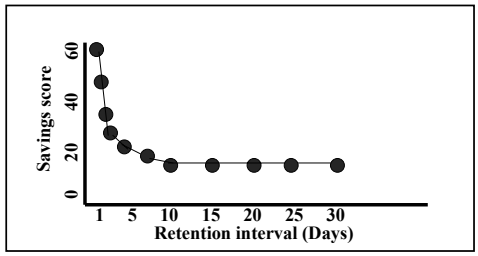
"baf, lub, zug…"

Then measured relearning after 1 day, 2 days, 3 days, 4 days etc.

called a "savings score"

Ebbinghaus (1885)

and the "Curve of Forgetting"



Other notable contributions by Ebbinghaus (1885)

Digit Span: the number of syllables remembered after one reading without error = 7

Distributed Practice: better for retention than massed practice

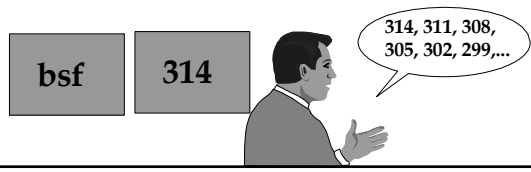
Meaningfulness effect: list of 80 nonsense syllables took 10 times as long to learn as a poem of equal length

Brown (1958)
Peterson & Peterson (1959)

Subjects presented with a three-consonant nonsense syllable

followed by a three-digit number

Subjects had to count backwards by 3s while waiting for recall test.



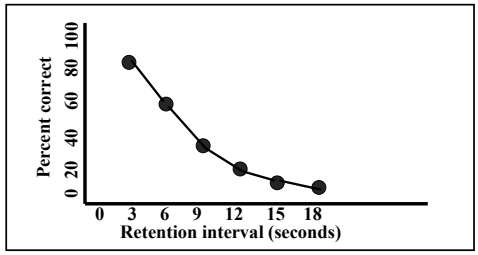
Subtraction task was used to prevent subjects from rehearsing information.

(Without an interfering task, subjects could repeat and rehearse, maintaining the information as long as desired.)

Brown and the Petersons used much shorter retention intervals than Ebbinghaus

They were interested in the first few minutes of memory, before "memorization"

The Brown & Peterson data showed a quite different *curve of forgetting*



Nonsense syllables could not be recalled after 18 sec of subtraction

Maybe Ebbinghaus & the Peterson's were looking at different kinds of memory systems

Short-term vs Long-term memory

Cognitive Psychologists began to map the parameters of STM with a series questions and clever experiments

How much does STM hold?

Short-term Memory Span

This week's practical

Short-Term Memory Scanning

Saul Sternberg (1966)

Wanted to find out how long it takes to find an item in short-term memory and the method we use to search it

Do we search STM one item at a time?

Serial vs. parallel search

Do we search every item, or stop once we find what we're looking for?

Exhaustive vs. self-terminating

Sternberg manipulated memory set size

Independent variable: something you manipulate to "ask the question"

if search is serial, larger memory sets should take longer to search

Sternberg measured reaction time

Dependent variable: something you measure to "answer the question"

how long it took to answer a question about an item in the memory set

Sternberg also manipulated the type of probe question, positive vs negative.

if search is self-terminating, positive trials should be shorter

if search is exhaustive, positive & negative trials should take same amount of time

	memory set	**probe**	
Trial 1	LGR	G	**Y or N** ?
Trial 2	LTIQ	V	**Y or N** ?
Trial 3	TJ	T	**Y or N** ?
Trial 4	BIVJL	F	**Y or N** ?

Short-Term Memory Scanning

Saul Sternberg (1966)

Do we search STM one item at a time?

Serial vs. parallel search

Do we search every item, or stop once we find what we're looking for?

Exhaustive vs. self-terminating

Sternberg found

Serial exhaustive search!

Why does it work that way?