

Sensory memory

PSY 200
Greg Francis
Lecture 13

*Why telephone operators
seem rude.*

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Memory

- Humans demonstrate memory when they behave in a way that could only be based upon previous experience
 - does not necessarily imply that there are memory *systems*
- Memory could be a by-product of other systems (vision, audition, language,...)

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Perception to memory

- Suppose you want to know how much information is available in a single visual glance
- How would you measure it?
- It turns out it's a complicated task because it involves perception, attention, and memory

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Whole Report

- Write down as many letters as you see

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Whole Report

- Write down as many letters as you see

G W X R
T P Q N
B Z Y H

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Whole Report

- Write down as many letters as you see

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Whole report results

- Subjects report 4.5 letters on average (Sperling, 1960)
- Subjects claim they saw more letters, but lost the percept while they reported
 - they cannot report fast enough
- How can we tell if percept is lost?

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Partial report

- Same type of letter matrix
- Indicate which row to report *after* the matrix disappears
 - choice of row is *random*
- Suppose the subject reports 3 of 4 letters from *any* row
 - => 3/4ths of *each* row was available
 - ==> entire field was available
- This is essentially how college tests are designed!

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Partial report

- Write down letters from the indicated row

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Partial report

- Write down letters from the indicated row

R W V D
P S C K
H L Z Q

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Partial report

- Write down letters from the indicated row



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Sensory memory

- Temporal characteristics
 - delay

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Sensory memory

- Temporal characteristics
 - delay

Y K W X
 L B M R
 J T C Q

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Sensory memory

- Temporal characteristics
 - delay

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Sensory memory

- Temporal characteristics
 - delay

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Results

- Vary delay to watch decay from memory
 - compare to CogLab data

Delay of tone (seconds)	Number of letters correct
0	3
0.2	2.8
0.4	1.8
0.6	1.8
1	1.5

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Results

- CogLab data (139 participants)

ISI (ms)	% identified
10	65
357	45
1050	40

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Results

- We can test on any row and get essentially the same result
 - so, the number of letters that actually persist and is available is found by *multiplying* by the number of rows

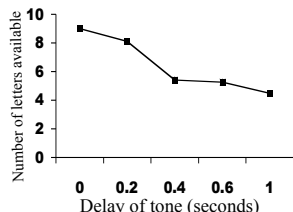
Delay of tone (seconds)	Number of letters available
0	9
0.2	8
0.4	5.5
0.6	5.5
1	4.5

Delay of tone (seconds)	Number of letters available
0.02	4.5
0.1	4.5
0.3	4
1	3.5

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Iconic/sensory memory

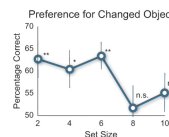
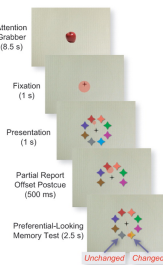
- Performance is better than the whole-report procedure because you can focus *attention* on just one row before the percepts fade away
- Fading percepts are due to visual persistence, which we talked about earlier
- We call the use of this information *iconic memory*
 - Large capacity
 - Short duration



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Infant iconic memory

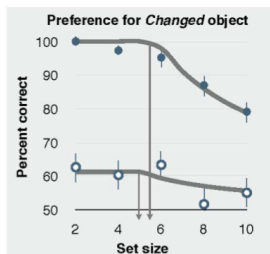
- The partial-report experiment can be modified in several ways
- Blaser and Kaldy (2010) modified it to test iconic memory of infants
 - 60, 6 month old infants
- Infants show a preference to look at the changed object for small enough set sizes



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Infant iconic memory

- Infant iconic memory is actually quite similar to adults
- Ask adults to report the location of the changed color item
 - They do better than infants (who did not understand the "task")
- Look for sharp drop in performance as set size increases
- Estimate items in memory
 - Adults = 5.75
 - Infants = 5.0



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Masking

- Masking effects can influence iconic memory
 - persistence-based memory is *very* brief, and is easily destroyed by a mask
- Iconic memory is
 - brief
 - easily disturbed

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Partial report with masking

- Write down letters from the indicated row

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Partial report with masking

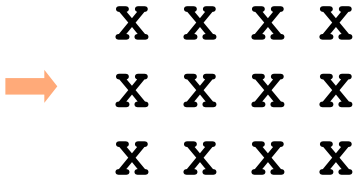
- Write down letters from the indicated row

M H T R
Y V N W
L S C B

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Partial report with masking

- Write down letters from the indicated row



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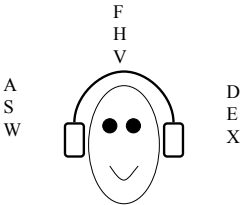
Masking

- With the mask you do not have enough time to focus attention on the indicated row
- Iconic memory is so brief (less than a second) that it probably has little to do with "normal" memory
 - Too brief to be useful for many situations (except maybe knowing how to reach for something just after lights go out)
- Other similar systems are more notable

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Echoic memory

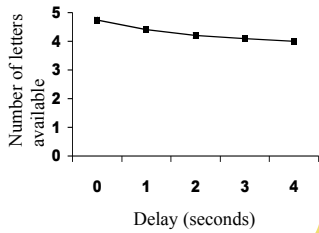
- Other senses have a similar type of persistence or sensory memory



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Echoic memory

- Properties
 - Longer duration (seconds)
 - Smaller capacity
- Significant for some memory tasks



Delay (seconds)	Number of letters available
0	5
1	4.5
2	4.2
3	4.1
4	4.0

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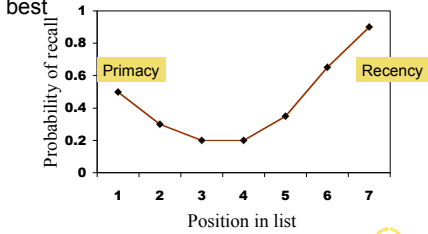
Immediate serial recall

- After given a list of items
 - e.g., digits, letters, words,...
 - subject must report them back
 - 1) no delay (immediate)
 - 2) in the correct order (serial)
 - 3) no cues (recall, not recognition)
- Plot percentage correctly recalled against position of item in list

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Serial position curve

- Often, subjects recall first and last items best



Position in list	Probability of recall
1	0.5
2	0.3
3	0.2
4	0.2
5	0.35
6	0.65
7	0.85

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Modality effect

- Recency depends on the *modality* of presentation

Position in list	Auditory (Probability of recall)	Visual (Probability of recall)
1	0.5	0.5
2	0.3	0.3
3	0.2	0.2
4	0.2	0.2
5	0.3	0.2
6	0.6	0.2
7	0.9	0.2

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Modality effect

- Explanation:
 - In this task, recency depends on sensory memory
 - It takes time to report all the items in the list, in order
 - in the visual presentation, iconic memory of the last item is gone before subject tries to report it (poor recall)
 - in the auditory presentation, echoic memory of last item is still present when subject tries to report it (good recall)
- Thus, auditory presentation shows recency, but visual does not
- We will explain the primacy effect later

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Suffix effect

- Auditory presentation only
- Cue to report is either a word or a tone

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Suffix effect

- Recency when cue to report is a tone
- Loss of recency when cue to report is a word

Position in list	Tone (Probability of recall)	Word (Probability of recall)
1	0.5	0.5
2	0.3	0.3
3	0.2	0.2
4	0.2	0.2
5	0.3	0.2
6	0.6	0.2
7	0.9	0.2

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Suffix effect

- Not affected by
 - practice
 - meaning of cue word
 - common vs. rare word
- Words are *physically* different from tones
 - suffix word acts like a *mask* to wipe out last word in list from echoic memory
 - the situation is similar to being unable to report the letters in the partial report task with the X-masks

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Phone operators

- Call *information* for a number
- Operators are very short
 - give the number
 - do not say “goodbye” or “have a nice day”
- Avoiding the suffix effect!
 - you would forget the last part of the phone number if they finished with pleasantries

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Conclusions

- Partial report experiment
- Sensory memory
 - iconic memory (visual)
 - echoic memory (auditory)
- Relation to immediate serial recall (recency)
 - modality effect
 - suffix effect
 - significance for phone operators

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Next time

- Memory
- Modal model
 - short term memory
 - long term memory
- Experiments
- CogLabs on Brown-Peterson and Serial position due!
- *Why it is difficult to win a pizza at Little Caesars.*

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