

### 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

B X P Q  
 M H E L  
 V N W A

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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


S	T	Y	I
R	F	C	Q
Z	E	V	N


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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

R Q V L  
 S D G F  
 P N B A

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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 (121 participants)
  - 3 letters in each row

Delay of tone (seconds)	Number of letters correct
0	1.4
0.4	1.2
1	1.1

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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 (3)

Original published data

CogLab data

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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

Delay of tone (seconds)	Number of letters available
0	10
0.2	8
0.4	5.5
0.6	5.2
1	4.5

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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

Set Size	Percentage Correct
2	65
4	62
6	68
8	52
10	55

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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

Set size	Adults (Percent correct)	Infants (Percent correct)
2	100	62
4	98	60
6	95	62
8	85	52
10	78	55

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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

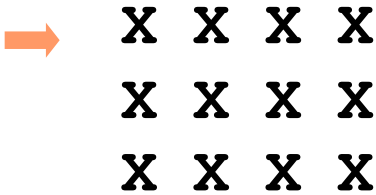
X	V	F	R
W	K	D	M
S	N	J	Y

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### Partial report with masking

- Write down letters from the indicated row



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### Masking

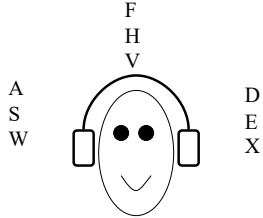
- With the mask you do not have enough time to focus attention on the indicated row
- Iconic memory is so brief (less than a second) that it probably has little to do with “normal” memory
  - Too brief to be useful for many situations (except maybe knowing how to reach for something just after lights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

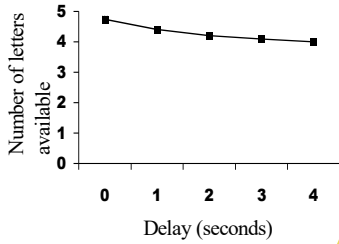


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### Echoic memory

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



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### Immediate serial recall

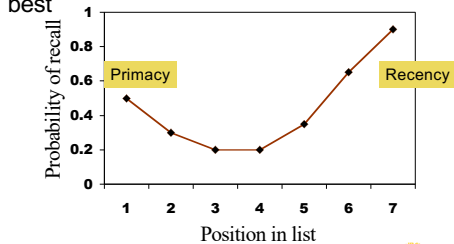
- After given a list of items
  - e.g., digits, letters, words,...
  - subject must report them back
  - 1) no delay (immediate)
  - 2) in the correct order (serial)
  - 3) no cues (recall, not recognition)
- Plot percentage correctly recalled against position of item in list

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### Serial position curve

- Often, subjects recall first and last items best

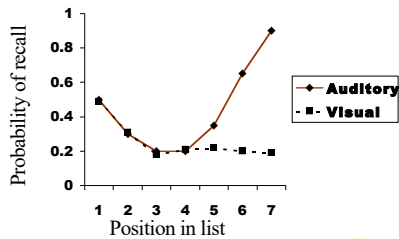


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### Modality effect

- Recency depends on the *modality* of presentation



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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

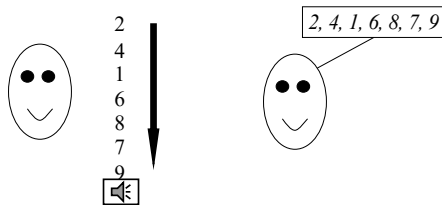
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### Suffix effect

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



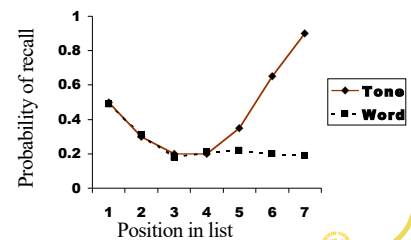
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### Suffix effect

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



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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

- Lecture is a vodcast available on the class web site!
- 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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