Divided Attention

Issues in Attention Research

- What happens to unattended information?
- What factors affect our ability to divide our attention?

Dual Task Performance

- Task Similarity
- Task Difficulty
- Practice

Task Similarity

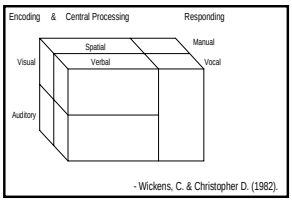
Allport & Colleagues

- Shadowing while recognizing:
  - Words presented in auditory modality
  - Pictures (presented visually)
- Memory for:
  - Words – terrible
  - Pictures – excellent

Task Similarity

- MacCleod (1977)
- Continuous Tracking
  - (Manual Response)
- Tone Identification
  - Manual Response
  - Spoken Response
- Spoken Response Easier
- Treisman & Davies
- Monitor
  - Visual
  - Auditory
- Detect
  - Visual
  - Auditory
- Aud/Vis, Vis/Aud Easy
- Aud/Aud, Vis/Vis Hard

Multiple Resources



Task Difficulty

- Sullivan (1976)
- Method:
  - Dichotic Listening
  - Tone Detection on Unattended Channel
  - Shadowing Simple Message
  - Shadowing Complex Message
- Result:
  - Tone Detection Worse when Shadowed Message *Complex*

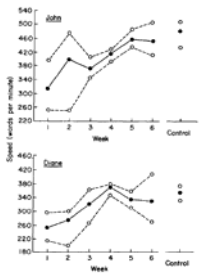
Practice, Practice, Practice

- Spelke et al.
  - Read stories
  - Write down dictated words
- Hirst et al.
  - Read stories
  - Write down dictated sentences

Table 1. *Chronology of the Study*

Sessions 1–29	Practice: 14 trials per week of reading while writing at dictation – 10 full experimental trials, 4 recognition trials, and 1 control trial.
Sessions 30–35	Controlled testing: 1 full experimental, 1 recognition, and 1 control trial per day.
Sessions 36–43	Dictation with embedded lists of related words: Sentences, words from semantic categories, words from syntactic classes, or rhymes. Subjects were not forewarned that the dictated words would be structured in any way.
Sessions 44–46	Dictation with embedded lists of related words: Subjects were asked to look for and report the occurrence of any structured sublists. (a one-week vacation followed session 46).
Sessions 47–49	Retraining (comprehension trials only).
Sessions 50–55	Controlled testing of reading comprehension by means of free and cued recall of the stories.
Sessions 56–61	Dictation of categorizable lists, in which subjects either wrote the dictated word or the name of its category.
Sessions 62–68	Continuation of sessions 44–46.
Sessions 69–74	Continued practice of reading while categorizing dictated words, as in sessions 56–61. (Diane only).
Sessions 75–80	Controlled testing of reading while categorizing dictated words.
Session 81	Writing at dictation while reading aloud.
Sessions 82–85	Writing at dictation while shadowing.

Figure 1. *Reading speeds during the practice phase: weekly means and interquartile ranges.*



Session	Reading speed (wpm) Experimental	Reading speed (wpm) Control	Reading comprehension (% correct) Experimental	Reading comprehension (% correct) Control
Diane				
30	336.7[a]	351.0	100	100
31	365.8	354.9	100	100
32	302.1	330.8	100	100
33	322.2	297.6	100	100
34	358.2	323.2	100	100
35	303.6	332.4	95	95
X	331.43	328.65	99.17	99.17
John				
30	485.3	593.3	100	100
31	412.1	502.0	90	100
32	573.5	555.0	82.5	80
33	477.6	471.6	65	95
34	468.0	380.4	100	100
35	450.0	441.8	80	100
X	477.78	490.68	86.25	95.83

[a] Each score is based on 1 trial.

Automatic Processes

- Fast
- Require no attentional resources
- Outside of consciousness
- Obligatory

Stroop Effect

BLUE GREEN WHITE
RED YELLOW BROWN
PINK BLACK ORANGE

Stroop Effect

- Experiment I: Say the word.

Incongruent	*Congruent*	
GREEN	BLUE	
43.3 secs	41.0 secs	(100 words)

- Experiment II: Say what color the word is printed in.

Incongruent	*Congruent*	
GREEN	BLUE	
110.3 secs	63.3 secs	(100 words)

Kahneman & Henik

- Fixate in the middle, name ink color in circle
- Fixate in the middle, name ink color in rectangle
- Attention Matters
  - Reading is not completely obligatory

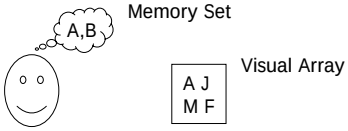
Automatic

- Without intention
- Not subject to introspection
- Few, if any, attentional resources
- Rapid (1 second or less)
- Inflexible

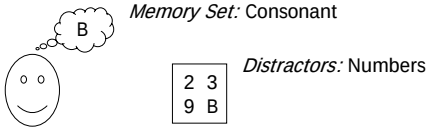
Controlled

- With intention
- Subject to introspection
- Uses most, if not all attentional resources
- Relatively slow (several seconds)
- Flexible

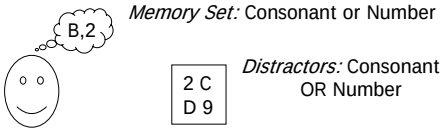
Memory Search Task (S&S)



Consistent Mapping



Varied Mapping



Schneider & Shiffrin

- Consistent Mapping (diff cat. distr.)
  - Memory Set Size (no effect)
  - Distractor Set Size (no effect)
  - 80 ms/trial for 95% accuracy
- Varied Mapping (same cat. distr.)
  - Memory Set Size (more is harder)
  - Distractor Set Size (more is harder)
  - 400 ms/trial for 95% accuracy
- Letter/Number distinction automatic: fast and done in parallel

Problems w/S & S

- Redescription of data w/o explanation

Cheng

- Quantitative Effects
- Qualitative Effects
  - Restructuring

2+2+2+2+2+2+2+2+2+2=?

2+2=4
4+2=6
6+2=8
8+2=10
10+2=12
12+2=14 ...
18+2=20

2x10=20

Instance Theory of Automaticity (Logan)

- Each time stimulus encountered, traces stored in memory
- Practice
  - More info about stim and what to do w/it
- Practice
  - Rapid retrieval of info in response to stim

Instance Theory

- Race between memory & procedure
- 12+5=?
  - If solved before, remember “17”
  - If not, calculate
- Needle Analogy
  - When needles easy to find, search works
  - When needles hard to find, make a new needle

Explains Characteristics

- Fast
  - Retrieve old solutions
  - (Don’t compute anew)
- No Effect on Processing Capacity
  - Retrieval of overlearned material
- Unconscious
  - No processes intervene

Attention & Resource Allocation

- Partial Selection Occurs Early
- Not Simple Physical Filter
- Sensitive to:
  - Past Experience
  - Context
  - Arousal
- Performance of multiple tasks is a complex task of:
  - allocating limited resources
  - using automatized routines