Divided attention

- TRY to split attentional resources between 2 sources
  - Dual-task methodology
- Real-world examples
  - Musicians
  - DRIVING
- How are you capable of doing more than 1 thing at the same time?
  - 1 or more of the tasks requires fewer resources
  - Automatic processing: require little or no conscious attention
- How does automaticity develop?
Divided attention: Tyler et al (1979)

- **Question:** Can attention be split?
- **Method:**
  1) Anagram task (easy or hard)
  2) RT to tone
- **Results:**
- **Conclusions:**
  - Difficult tasks uses more resources leaving less for 2nd task, causing decrease in performance
  - Competition for limited attentional resources
Divided attention

- What are the research questions?
- What makes divided attention possible? What are the factors involved?
- How does practice affect divided attention? How does automaticity develop (for easy and hard tasks)?
- What is the application of divided attention research to real-world topics, such as driving?
Schneider & Shiffrin (1977)

Question:
- How does processing become automatic?

Task:
- Dual task: hold info in memory; search for target among distractors
- Stimuli: #s or letters
- Measure: RT and accuracy

Conditions
- Memory set size (1-4) (target stimuli)
- Frame set size
- Presentation time (40 to 800ms)
- Congruency of memory set and distractors
  - Consistent-mapping vs. Varied-mapping
Shiffrin & Schneider (1977)

- **Consistent mapping**
  - Memory set: 7 4 9 2
  - Distractor set: K G R T

- **Varied mapping**
  - Memory set: M J D T
  - Distractor set: C G F M
  - Memory set (trial2): G M Y V

Memory set size = 4
Frame size = 2
Frame time: 100ms
Shiffrin & Schneider (1977)

**consistent mapping**

Set size = 1
Frame size = 4
Frame time = 100ms

Note: previous distractor becomes target

**target = 8**

G K T Y
M F R G

......

**target = 3**

Y L R B
P X J G

......

**target = J**

target = R

Y L P X
R F T P

......

**varied mapping**
Schneider & Shiffrin (1977)

- Improvement in performance with practice in Schneider and Schiffrin’s consistent mapping condition. The arrow indicates the point at which participants reported that the task had become **automatic**.
Shiffrin & Schneider (1977)

The graph illustrates the relationship between memory set size and reaction time, categorized by frame size (1, 2, and 4) and type of mapping (Varied vs. Consistent). The x-axis represents memory set size, while the y-axis shows reaction time in milliseconds. The graph includes data points for POS and NEG conditions, with markers for varied and consistent mappings.
Shiffrin & Schneider

Results

- **Consistent mapping:**
  - Only frame duration affects accuracy
  - Automatic processing
  - Parallel search

- **Varied mapping:**
  - All conditions affected accuracy
  - Controlled processing
  - Serial search

**Figure 4-12**

A. Reaction times from Shiffrin and Schneider's detection task for the initial 2,100 trials of detection and for the 2,400 trials after the target and distractor sets were reversed. B. Percentage of correct detections of targets for the same initial and after-reversal conditions. In both, the asterisk denotes the point during the initial condition when the time for stimulus presentation was reduced from 200 ms to 120 ms.
Developing automaticity
Spelke, Hirst, & Neisser (1976); Hirst, et al. (1980)

- Dual-task
  - Read stories silently
  - Copy irrelevant words being dictated

- Results
  - Week 1: handwriting illegible, reading slow
  - Week 6: better reading comprehension, poor recall of dictated words
  - Week 17: Can copy complete sentences while reading, with understanding of both

- Conclusion
  - Practice can automatize particular task or how tasks function simultaneously
  - But, alters ability only for those particular tasks!
Automatization

- How do processes become automatic?
  - More efficient through practice
  - Effortful steps integrated into single operation
    - Example: math
- Logan (1988)
  - Automatization = memory retrieval
- Is automatization always good?
  - What are some automatic errors?
  - What situations could it be harmful?
Disadvantages of automaticity
Barshi & Healy (1993): proofreading

Task: Scan pages of multiplication problems w/ same mistakes repeated; find errors

Fixed order: problems in same order on each page

Varied order: problems in different order on each page

- Hard to undo automatic behaviors
- Real world examples?
Strayer & Johnston (2001)
Cell phones and driving

Results: When the person was talking on the cell phone, they (a) missed more red lights, and (b) took longer to apply the brakes.
Horswill & McKenna (1999)

- **Question:**
  - Do attentional capacity limits negatively affect driving while talking on a cell phone?

- **Method:**
  - Simulated driving
  - Monitor auditory list for letter “K”

- **Results:**
  - Dual-task (vs. single task): worse driving performance and worse on monitoring task

- **Conclusion:**
  - Participants took more risks driving in dual-task condition
  - Tasks compete for same pool of attentional resources