PSI 428
Attentional Processes

Selective Attention

Learning Objectives

- What is selective attention
- Selective Attention in Audition
- Selective Attention in Vision
- Article Presentation
- **Indirect measures for selective attention**
- Article Presentation

Indirect Measures

- Indirect measures for identification of unattended information.
- Is rejected stimulus perceptually analyzed and identified?
- The general strategy
  - Present both attended and rejected stimulus around similar locations
  - Analyze effects of the rejected stimulus on the processing of the attended stimulus

Indirect Measures for Identification of Unattended Information

- Stroop
  - Flanker
  - Simon
- Semantic Priming

Selective Attention

- Any selectivity of processing must rely on central rather than peripheral or mechanical processes."
- The observed performance differences must only be due to selective attention, and sensory differences, (or other factors) unrelated to attention should not lead a difference in performance.

Stroop Stimuli

- Instruction: Name the color
- Congruent stimulus

mavi

Stroop Stimuli

- Instruction: Name the color
- Incongruent stimulus

sari

Stroop Stimuli

- Instruction: Name the color
- Neutral stimulus

xxx

Stroop, J.R. (1935). "Studies of interference in serial verbal reactions "*Journal of Experimental Psychology, 18,* 643-662.

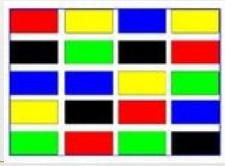
Stroop Experiment
The Classic Study

- Classic Presentation Stroop Test Cards
- Name the color

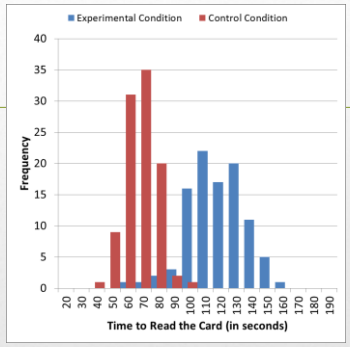
Red	Yellow	Blue	Yellow
Black	Green	Black	Red
Blue	Blue	Yellow	Green
Yellow	Black	Red	Blue
Green	Red	Green	Black

Stroop Experiment
The Classic Study

- Classic Presentation Stroop Test Cards
- Name the color



Subject	Experimental Words in Color	Colored Squares
SNO1	72	76
SNO2	93	70
SNO3	108	76
SNO4	138	69
SNO5	97	64
SNO6	107	56
SNO7	130	66
SNO8	75	61
SNO9	156	63
SNO10	85	56
SNO11	91	68
SNO12	103	78
SNO13	81	57
SNO14	106	55



Stroop Experiment
The Classic Study

- **MacLeod (1991) Table 2**

Table 2
Experiment 2: Mean Times (in Seconds with Standard Deviations [SD]) for Naming Ink Colors in the Experimental Condition (Incompatible Color Words) and in the Control Condition (Solid Color Squares)

		Experimental: words in color		Control: squares in color	
Experiment	Sample size	*M*	*SD*	*M*	*SD*
Stroop (1935b)	100	110.3	18.8	63.3	10.8
MacLeod (1986)	40	102.27	18.06	59.76	8.09

Stroop Experiment

- In the color naming task, on average, subjects were 47 seconds longer to complete the task with incongruent words compared to solid-color squares.
- The meaning of the word affects the task performance
- The word is recognized even if it was unrelated to the task
- **Do these results support early or late selection theory?**

Stroop Experiment
The Classic Study

- Classic Presentation Stroop Test Cards
- Read the word

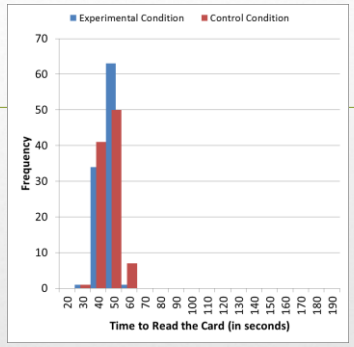
Red	Yellow	Blue	Yellow
Black	Green	Black	Red
Blue	Blue	Yellow	Green
Yellow	Black	Red	Blue
Green	Red	Green	Black

Stroop Experiment
The Classic Study

- Classic Presentation Stroop Test Cards
- Read the word

Red	Yellow	Blue	Yellow
Black	Green	Black	Red
Blue	Blue	Yellow	Green
Yellow	Black	Red	Blue
Green	Red	Green	Black

Subject	Experimental Word in Color	Control Words in Black
SNO1	45	39
SNO2	53	44
SNO3	40	25
SNO4	39	33
SNO5	45	42
SNO6	49	35
SNO7	30	51
SNO8	39	46
SNO9	49	47
SNO10	47	36
SNO11	42	48
SNO12	34	43
SNO13	55	46
SNO14	44	42



Stroop Experiment
The Classic Study

- **MacLeod (1991) Table 1**

Table 1
Experiment 1: Mean Times (in Seconds With Standard Deviations [SD]) for Reading Color Words in the Experimental Condition (Incompatible Colored Inks) and in the Control Condition (Black Ink Only)

		Experimental: words in color		Control: words in black	
Experiment	Sample size	*M*	*SD*	*M*	*SD*
Stroop (1935b)	70	43.30	6.15	41.00	4.84
MacLeod (1986)	50	41.58	6.98	41.16	7.12

Stroop Experiment
The Classic Study

- In the word naming task, on average, subjects were almost equal to complete the task with incongruent words compared to congruent words.
- The color of the word does not affects the task performance
- The color was not recognized when it was unrelated to the task
- **Do these results support early or late selection theory?**

Stroop Asymmetry

- When the task was word naming, the color information filtered our easily.
- When the task was color naming, the word information cannot be filtered out.

sarı

Does Stroop asymmetry support early or late selection theory?

Stroop Stimuli
Contemporary Experiments

- The use of computers
  - Colored words are presented one at a time
  - Reaction time and error is recorded for each stimulus
  - For each condition and for each participant correct RT and proportion of error was calculated

Stroop Stimuli
Contemporary Experiments

- To measure the effects of irrelevant (ignored, unattended) stimulus dimension on the processing of the relevant (processed, attended) stimulus dimension, we usually present stimuli many times

Stroop Stimuli

		RENK BOYUTU			
		mavi	**sarı**	**yeşil**	**pembe**
KELİME BOYUTU	**MAVİ**	30	10	10	10
	SARI	10	30	10	10
	YEŞİL	10	10	30	10
	PEMBE	10	10	10	30

Stroop Stimuli

- Instruction: Name the color
- Congruent stimulus

mavi

Stroop Stimuli

- Instruction: Name the color
- Incongruent stimulus

sarı

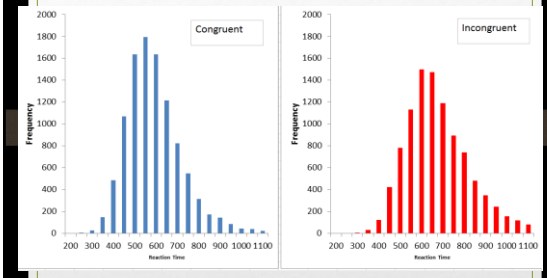
Stroop Stimuli

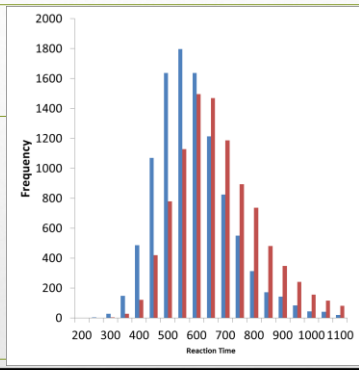
- Instruction: Name the color
- Neutral stimulus

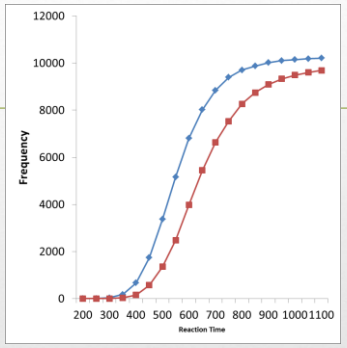
xxx

A Stroop Experiment

- 50 participants
- 600 stimuli for each participant
- 50 % congruent 50% incongruent



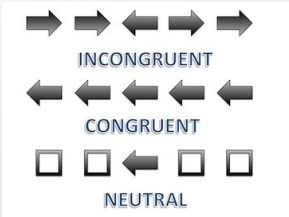




Stroop Effect and Conclusion

- Stroop effect = Incongruent – Congruent
- Stroop facilitation = Neutral – Congruent
- Stroop inhibition = Incongruent – Neutral
- One cannot turn-off word reading machinery

Flanker Study



Flanker Study with Words

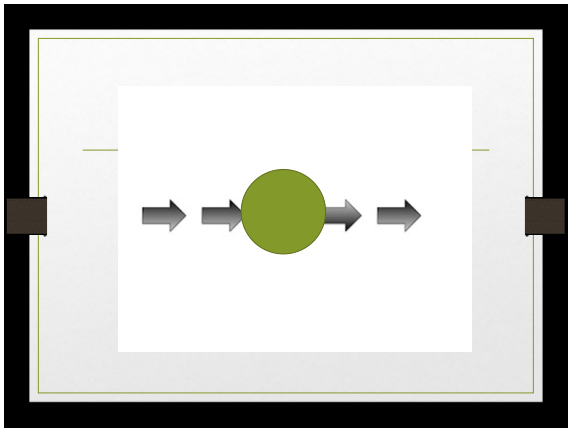
KÖPEK KÖPEK KÖPEK
ÇİLEK ÇİLEK ÇİLEK
ÇİLEK KÖPEK ÇİLEK
KÖPEK ÇİLEK KÖPEK
XXXXX KÖPEK XXXXX
XXXXX ÇİLEK XXXXX

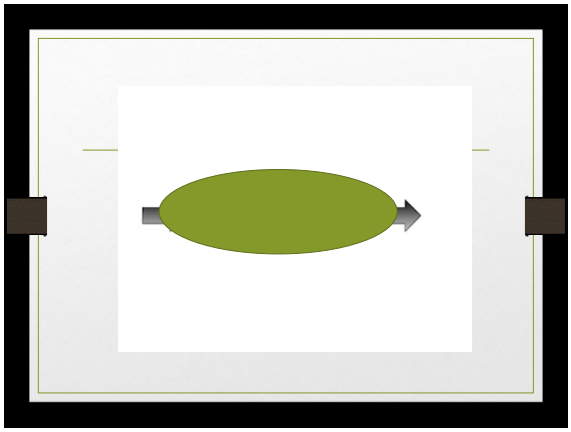
Flanker Results

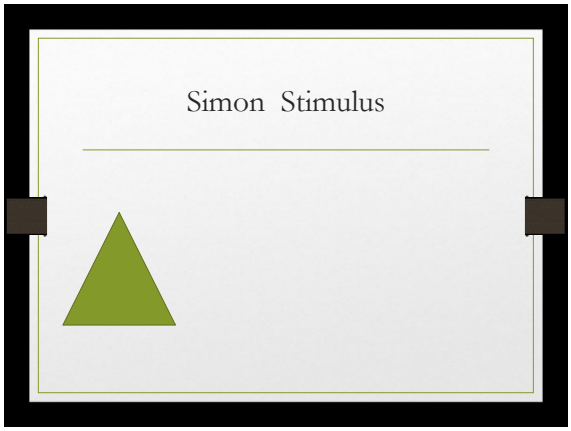
- "When the flankers were associated with the opposite response from the correct one on that trial, RTs to the target stimuli were slowed, compared with the case when the distractors were associated with the correct response."

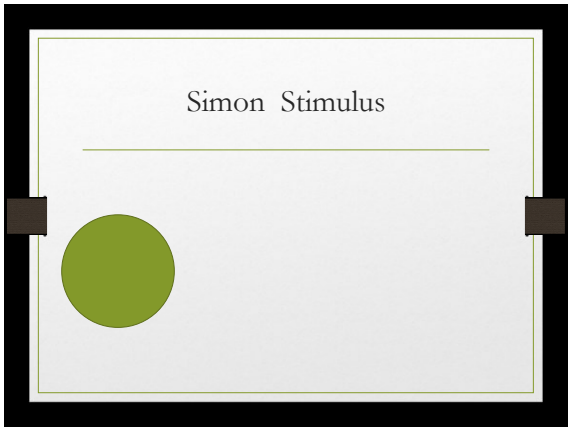
Conclusions

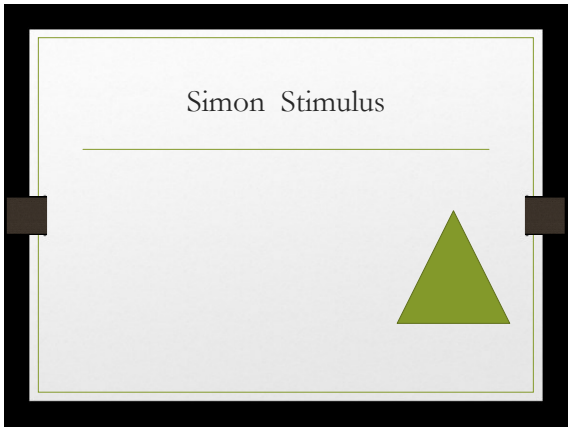
- One cannot focus only on a small and specific location on a visual field
- One cannot turn-off well-learned stimulus-response associations
- **Do these results support early or late selection theory?**

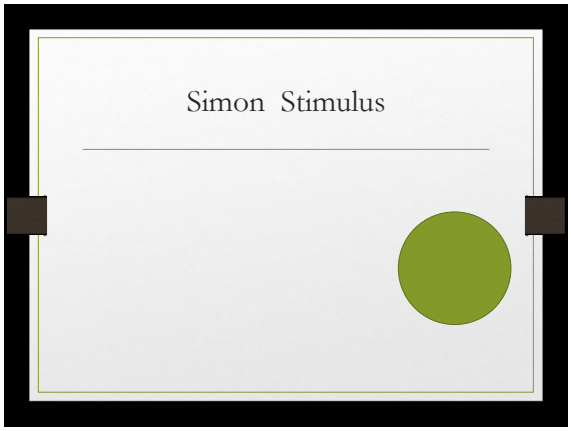




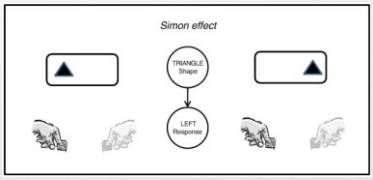

Simon Stimulus


Simon Stimulus


Simon Stimulus


Simon Stimulus

Simon Effect



Simon Results and Conclusion

- When the stimulus was presented at the opposite location from the correct one on the trial, RTs to the target stimuli were slowed, compared with the case when the correct response and the stimulus location was the same."
- **Do these results support early or late selection theory?**

Semantic Priming

- «Recognition occurs more quickly when someone has just read a semantically associated word."

Nuts and Bolts of Priming

- Prime: The first stimulus in a prime–target pair; intended to exert an influence on the second stimulus
- Target: The second part of a prime–target stimulus
- Lag: Number of intervening items between prime and target
- SOA (Stimulus-Onset-Asynchrony
  - The time interval between prime and target

Nuts and Bolts of Priming

- Usually there are there types of primes
  - Related / Unrelated / Netural
- Facilitation
  - Any positive effect on processing; usually the result of prior presentation of related information
- Cost
  - Any negative effect on processing; usually the result of prior presentation of some specific kind of information

Priming Task

Lexical Decision Tasks and Semantic Priming,

http://www.apa.org/pubs/highlights/peeps/issue-33.aspx

- «Semantic priming refers to the observation that a response to a target (e.g., dog) is faster when it is preceded by a semantically related prime (e.g., cat) compared to an unrelated prime (e.g., car).»
- «Semantic priming may occur because the prime partially activates related words or concepts, facilitating their later processing or recognition.»

Semantic Priming

- Semantic priming was observed even if the prime and target was presented at the same time

Dallas, M., & Merikle, P. M. (1976). Semantic processing of non-attended visual information. *Canadian Journal of Psychology/Revue canadienne de psychologie*, *30*(1), 15.

Semantic Priming

- **Method:** Participants name the word in a pre-cued position, ignoring another word above or below it

xxxxx

göz
el

xxxxx

ayak
yol

Dallas, M., & Merikle, P. M. (1976). Semantic processing of non-attended visual information. *Canadian Journal of Psychology/Revue canadienne de psychologie*, *30*(1), 15.

Semantic Priming

- **Method:** Participants name the word in a pre-cued position, ignoring another word above or below it
- **Results:** Subjects were faster (about 20 ms) when the two words were related compared to when they were unrelated

Dallas, M., & Merikle, P. M. (1976). Semantic processing of non-attended visual information. *Canadian Journal of Psychology/Revue canadienne de psychologie*, *30*(1), 15.

Semantic Priming

- **Conclusion:** This result reflect automatic processing of the prime word, even if it was not attended.
- **Do these results support early or late selection theory?**