Week 5.2
Perception and Attention
9/26/2018
Roadmap

• Categorical perception (cont’d)
• Top-down vs. bottom-up process
• Attention
  ➢ Filter theory
  ➢ Spotlight approach
  ➢ Arousal
Categorization task: Instruction

Each time you will see three filled circles in a row. Judge if the third one is similar to the first or the second one. Respond as quickly as you can.
First or second?
First or second?
Where is the boundary?

- If the distinction between A and B is vague → low categorization accuracy.
- If the distinction between A and B is clear → high categorization accuracy.
Categorical perception

"White" response

"Grey" response

%
Bottom-up or Top-down?

• Do we use only bottom-up process in categorical perception?

• Is top-down needed for categorical perception?
Top-down process

Context effect
Letter recognition task

In the following screen, the letter “K” or “D” will either appear in isolation or with other letters VERY BRIEFLY. Your task is to judge which letter appears.
WORK
Top-down process

Word superiority effect
Top-down process

Missing-letter effect

• Cross out “t” in the following paragraph

“As we become well practiced doing something, that act takes less of our attention to perform. Typing is a good example. If you are skilled at typing, you can probably type fairly quickly.”
Top-down process

Missing-letter effect

• Greenberg et al. (2004)

  ➢ Task: crossing out a particular letter in a written text
  ➢ Findings: subjects tend to overlook the target letter in function words (e.g., preposition, conjunction, aux. verbs, etc.)
  ➢ Evidence for word familiarity effect (?)
Bottom-up vs. Top-down

• Top-down needs to interact with bottom-up

• Needs input first; then top-down process helps with recognition
Interaction of bottom-up and top-down processes

• Perceptual learning
  ➢ Learning by building up the perceived instances
  ➢ Non-linguistic sequence learning task

➢ Experienced learners know what information to attend to
What cues do we attend to during perception?

- Is attention separable from other cognitive processes?
- Can we attend to something without perceiving it?
- Can we perceive something without attending to it?
What’s so important about attention?
Attention

Test your attention!

https://www.youtube.com/watch?v=vJG698U2Mvo
How do we choose what information to attend to?

Selective attention

• Focus our attention on a very limited events/objects/tasks

• Do we process anything from the information that we are not attending to?
Dichotic listening task

One way to investigate selective attention

• Play one message to one ear, and a different message to another ear

• Participants need to repeat what they heard (which can be from either ear)
Dichotic listening task

• Most people can repeat the attended message from one year with few errors

• If the unattended message sounds weird (e.g., backward speech), some people can notice the difference
Filter theory of attention (Broadbent 1958)

• Limited capacity to process information

• When information exceeds capacity, overflow info is filtered through the ‘bottleneck’

• All unattended messages will be filtered out.

→ Do we process those overflow info at all?
Evidence against the filter theory of attention

• Cocktail party effect
  - Conversation in noisy environment
  - Conversation → attended message
  - Noise in the background → unattended message

• Filter theory: all background noise (unattended message) will be filtered out
Evidence against the filter theory of attention

• Cocktail party effect
  ➢ What if someone calls your name in the background? Can you hear it?

• Moray (1959): ‘important messages’ can get through the bottleneck
  ➢ Name embedded in either the attended or unattended message
  ➢ Shadowing (repeating messages) was disrupted
  ➢ Many participants reported hearing their name

→ How does our brain know what is important?
Evidence against the filter theory of attention

• Exception in cocktail party effect
  Pashler (1998)
  • Only 33% heard their name if not informed about the possibility of hearing their name before the experiment

→ People not always attentive to the shadowing task
→ Attention might be switched to the unattended message?
“Switched ears”

• Treisman (1960)
  • Dichotic listening task: one message per ear
  • At some point, the message switched:

Message 1: Today I’m going to buy some pants with my parents after school. But it looks like it’s going to snow.

Message 2: Mr. Johnson was very disappointed at his son’s behavior at school. He went to the school and talked with the principal for two hours. But it looks like it’s going to snow.
“Switched ears”

• Treisman (1960)
  • People repeated a few words from the unattended ear right after switch
  • People not aware of the switch and their own repetition of the words from the unattended ear

→ Attention can also be influenced by the nature of the message itself – the meaning of the message
→ Another evidence for top-down process
→ Evidence against the idea that people are not always attentive to the shadowing task
Attenuation theory

• Treisman (1960)
  ➢ Unattended message not completely blocked or filtered out
  
  ➢ The “volume” is turned down or *attenuated* on the unattended ear
    ➤ less resources allocated to that ear
    ➤ *Depending on the message, some information might still be processed*
Attenuation theory

• Treisman (1960)
  ➢ Top-down influence on attention
    o Words of subjective importance (one’s own name)
    o Words signaling danger

→ Require little mental effort to recognize
→ Recognizable even at “low volume” (or ”low threshold”)

Spotlight approach

• Is our attention like “spotlight”?
  ➢ Fuzzy boundaries of spotlight: Size of the objects to focus on
    ➢ *Depending on the processing demands of each object/event*
  ➢ Most of the time we can control where to direct our attention
  ➢ But attention is not unidirectional like spotlight
Arousal level

• Kahneman (1973)
  ➢ Attention: a set of cognitive processes involved in categorization and recognition
  ➢ Availability of mental resources affected by the level of arousal (or state of alertness)
    ➔ Task difficulty
    ➔ Evaluation of task demand
    ➔ Level of interest
    ➔ Personal preference