Psy 200 – Cognitive Psychology

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Basic Approach of Cognitive Psychology

➢ Use an information processing approach to explain human thought and behavior.

➢ Understand the internal mechanisms and mental processes responsible for thought and behavior.

How do we infer internal mental events?

➢ It can be very difficult.

➢ Requires methods that produce observable behavior that can be used to infer mental processes.

➢ We will begin with some specific examples of the types of research questions one might ask and the methods that are used to answer them.

Early Schedule

➢ Today: Visual Attention – Mark W. Becker, Ph.D.

➢ Thursday: Sleep & Memory – Kimberly Fenn, Ph.D.

➢ Tuesday: Memory and Studying – Erik Altmann, Ph.D.

➢ Next Thursday: Working Memory – Susan Ravizza, Ph.D.

Visual Attention

Mark W. Becker

I began by investigating limits in conscious processing

➢ How much of a visible scene are people aware of at any instant?

➢ Does awareness depends on attention?

➢ How limited is attention?
Is an application of change blindness

- **Demo**
- [http://www.gocognitive.net/sites/default/files/change_blindness.v.0.93.swf](http://www.gocognitive.net/sites/default/files/change_blindness.v.0.93.swf)

Change Blindness

- In the absence of attention, people fail to notice rather large changes in their visual environment.

- Changes to central interest items are detected more rapidly than changes to marginal interest items.
  - Suggests that people agree about what is worthy of attention and constrain attention to those objects
Change Blindness in the Real World (Simons & Levin)

- http://www.youtube.com/watch?v=mAnKy o-fPs0

Capacity Limits & Attention?

- Demo - Multiple Object Tracking – http://ruccs.rutgers.edu/finstlab/MOT- movies/MOT-Occ-baseline.mov
- Demo 2 - Single Object Tracking- http://www.youtube.com/watch?v=vJG698 U2Mvo

Implication

- Suggests that attention must be allocated efficiently

Conclusion

- Attention is necessary for explicit awareness of object identity
  - Change blindness
  - Details of attended objects may not be processed (e.g., real world changes)

Conclusion

- Attention is necessary for explicit awareness of object identity
  - Change blindness, inattentional blindness
  - Only attend to small number of items (~4 items)
    MOT, Change Blindness

Potential processes involved in the allocation of attention

Low Level Salience | Emotional & Unexpected Stimuli | Top Down Control

Knowledge, Expectation, & Goals
Guidance of attention / eye movements

- Low-level visual saliency
  - Itti & Koch

- But we can exert top-down control over it.
  - EX: Goals
Find the C that looks is faced toward the left

Find Among

Any Color

Red

Red or Blue
People’s goals can guide attention based on basic feature (color).

People simultaneously bias towards union of two features (Blue OR Red).

Can People Bias Toward Conjunction of two features?

Call out “Now!” when you see the bar that is both horizontal AND blue.
Call out "Now!" when you find the black square above the white square.
Guidance of attention / eye movements

- Top-down effects – Task Defined Relevance
  - Based on basic features
    - Can do OR unions but not AND conjunctions
    - Binding two features together (AND) requires attention
    - Some limits in how flexibly we can guide attention. These limits should allow insight into how the process is working
  - Based on higher level knowledge - Yarbus

Guidance of attention / eye movements

- Top-down effects – Task Defined Relevance
  - Top-down bias toward relevant information –
    - Based on basic features
      - Can do OR unions but not AND conjunctions
    - Based on higher level knowledge – Yarbus
      - Knowledge of likely location of goal relevant information can guide attention
      - EX: finding a glass in a friend’s kitchen
      - There are consistencies in the world that we use to guide attention.

People should attend to potential threat

- James (1890)
  - Blood, wild animals, blows
- Emotional stimuli detected outside of awareness and able to attract attention
- Thought to be a phylogenetically old & present in everyone

Some things are relevant regardless of immediate goals

- Long standing personally relevant stimuli?
  - E.G., your name
- Unexpected things?
- THREATENING THINGS?

Subcortical Threat Detection

- Connection from Retina to S2 to Pulvinar to Amygdala...
- Amygdala evaluates emotional significance (Surgeson, Dough, & Armony 2008)
- Direct connections from amygdala to cortical visual areas can increase the gain for a threatening stimulus (Yam 1994, Vallatimer et al 2004)
Is there behavioral evidence for capture of attention by threat?
Not really…

Recent Meta-Analysis (Frewen et. al. 2008)
- Non-anxious people tend to have a bias away from threat.
- Highly-anxious (HA) people tend to have a bias toward threat.
- Possible Conclusion: Threat captures attention only when it reaches a critical threshold & that threshold is lower in HA.

Can you show capture by threat in typicals?
- Increase reality of threat via classical conditioning
  - Stormark & Hugdahl, 1996 & Stormark et al., 1999 - No

Could decrease the threshold
- Remove task
  - Without a task any long standing bias should show itself….

Use Facial Expressions of Emotion
- Ekman
- Available non-cortically
  - de Gelder, Vroomen, Pourtois & Weiskrantz, (1999), de Gelder et al. (2001); Penga, Kralab, Laebyrac, & Segnier (2000)
- Activate the amygdala better than objects/pictures
  - Adolphs & Tranel, 2003; Hanri et al 2002

Experiment 1 – Fear or Happiness vs. Neutral Faces
- Is attention drawn to a negative facial expression more rapidly than to a positive facial expression during passive viewing?
Method

- Ss “passively view” images of faces while their eye movements were tracked

- Task: None – “We are interested in how people look at images of faces. Please just view the scenes as you normally would”

Procedure

- Eye track w/ EyeLink II at 500 hz.
- Each image presented for 3 seconds
- Central fixation between images
- 64 total images –
  - 4 faces x 4 locations x 2 emotions x 2 orientations

Probability of the 1st Fixation Going to the Emotional Face

- Error bars = within subject error bars

Time to 1st Fixate the Emotional Face

- Error bars = 95% confidence interval

Conclusions – Fearful Facial Expression

- People Rapidly Identify & Avoid Fear.
  - Avoidance evident by the 1st fixation
Why no guidance?

- Fear – Don’t look at me... look at what I am afraid of.
- Replication with Angry

Method

- Identical, with an additional 32 images that contain 1 angry face amid 3 neutral faces

Conclusions – Negative Facial Expressions of Emotion

- Are detected rapidly in the periphery & are actively avoided.
  - Avoidance shows up early in viewing (first saccade).
- In non-select population long standing bias seems to be away from negative!!