Attention

Weighting: 2/17

Chang, S., & Egeth, H. E. (2019). Enhancement and Suppression Flexibly Guide Attention. *Psychological Science*, 1–9. <https://doi.org/10.1177/0956797619878813>

# Agenda

* What is attention?
* The article: Enhancement and Suppression Flexibly Guide Attention
* Motivation and hypothesis
* Method
* Results
* Authors’ conclusion
* Criticism
* Greater perspective

# What is attention?

“The marshalling of cognitive processing resources on a particular aspect of the external or internal environment, or on internal processes such as thoughts or memories.” – Purves

* Selects information/directs focus (external/perceptual or internal/thoughts/memories)
* Selective attention: chooses a type of stimulus and ‘highlights’ it
* Types of selection: early (stimulus driven, based on physical characteristics) and late (top-down, based on semantic knowledge or controlled attention)

# The article: Enhancement and Suppression Flexibly Guide Attention

## “Previous research suggests that observers can suppress salient-but-irrelevant stimuli in a top-down manner. However, one question left unresolved is whether such suppression is, in fact, solely due to distractor-feature suppression or whether it instead also reflects some degree of target-feature enhancement” (p. 1)

## Motivation and hypothesis

“In the current study, we used a new capture-probe paradigm to test whether attention can be guided by target-feature enhancement as well as by distractor-feature suppression.” (p. 2)

## Method

#### Figure 1:

**Search trials** (70%): The task is to search for the diamond, and report in which side the black dot appears. In some trials a singleton (one shape shown in a different colour) was present as a distractor. All other shapes are the same colour, which varies between participants, though they do not know the meaning of colours. Target display shown for up to 2000 ms.

**Probe trials** (30%): Four ovals of different colour, task being to report whether an A or a B (probe target) was present. One oval would have a critical colour (target or distractor colour in search trials); sometimes the probe target would appear on a critical colour and sometimes it would appear on a neutral colour. Target display shown for 100 ms.

Feedback was given immediately by showing ‘correct!’ or ‘incorrect!’ in the middle of the screen for 500 ms.

“To avoid reallocation of attention following initial attentional selection, we presented the target display for 100 ms.”

## Results

#### Search trials

Responses were faster when singleton was present than when it was absent, 9 ms singleton presence benefit; participants did learn the relationship.

#### Probe trials (Figure 2)

* Target colour present
  + Probe on target: ↓RT ↑ACC - 34-ms target-color benefit.
  + Probe on neutral: ↑RT ↓ACC
* Distractor colour present:
  + Probe on distractor: ↑RT ↓ACC - 43-ms distractor-color cost
  + Probe on neutral: ↓RT ↑ACC

## Authors’ conclusion

“The current study provides a clear demonstration that both target-feature enhancement and distractor-feature suppression contribute to guiding attention in separate and independent ways.” (p. 7)

“The current results contribute to resolving the debate between models of target-feature enhancement and distractor-feature suppression by providing clear behavioral evidence for an enhancement-plus-suppression model; observers can concurrently maintain two different attentional control processes and use either one of them as the occasion demands.” (p. 8)

# Criticism

* Ceiling effect: is the task too easy? Very high accuracy scores! It might not be necessary to maintain two different attentional control processes at the same time. Participants might be able to solve the task without relying on either suppression or enhancement.
* No masking of probe target display meaning participants might actually have more than 100 ms to search **(iconic memory/sensory memory/afterimage)**
* No control with neither target nor distractor colour: we can’t be sure that we’re witnessing enhancement and suppression as two separate processes.
  + We are comparing a version of the task made easier with a version of the task made more difficult instead of comparing them to the ‘unaltered’ task (without target or distractor colour)
  + Would such a comparison still provide a significant result? If so, who not include it?
* **Uncertainty**: Are we measuring peoples attention or how certain they are of their answer?

# Broader perspective

* Stroop: Trained responses, inhibition, executive functions
* IOWA: Somatic marker - Correct! Incorrect! Too slow! (clear, immediate feedback, good for skill learning)
* RTPD: Learning occurs nondeclaratively- if the participants in this experiment aren’t aware of target or distractor colours, the experiment shows that implicit learning did occur
* Feature search: pop-out effect versus suppression in this
* Input attention versus controlled attention (R&A kap. 4)
  + Cocktail party effect
* Negative priming: A stimuli that was just suppressed, takes a longer time to acknowledge when it isn’t supposed to be suppressed anymore. Example: Red was distractor colour in search trails, therefore it takes a longer time to locate the probe in the probe trails, if the probe is in a red oval. (Negative priming = suppression effect)
* Selection models
  + Early selection (Broadbent, 1958): sensory systems filter information because they cannot process all of it. Perception of a stimulus is not required for it to be filtered. Not consistent with empirical evidence, as stimuli which do not comply with pre-applied filters can be perceived (hearing one’s name)
  + Attenuation (Treisman, 1960): Stimuli are not processed at an all or nothing rate. Irrelevant stimuli are suppressed while important ones are enhanced.
  + Late selection (Deutsch & Deutsch, 1963): All stimuli are processed to the semantic level, but this can happen without conscious awareness. Only few stimuli are processed to response level.
  + Modern understandings usually include selection at several stages by accounting for both sensory level and higher-level processing. Sensory memory is required for this to work, hence iconic, echoic and other memory types are included in this understanding.
* TVA
* Attentional blink
* Neglect
* **Posner cueing task:** Participants must react to stimuli left or right of fixation without moving their eyes.
  + **Endogenous cues (arrows):** Valid, invalid, and neutral cues are given (arrows pointing in right, wrong or both directions). Valid cues facilitate for attention to be moved and processing of target to begin earlier.
  + **Exogenous cues (highlighting target box)**: Highlighting the target box or presenting an arrow outside the fovea creates exogenous cueing.
  + There are 3 mental operations that occur during covert orienting: **disengagement** of current focus, **movement** to selected target, and **engagement** of selected target.