Facilitation and inhibition of return using NUMBERS as attentional cues

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Introduction

- Numbers are central non-predictive attentional cues as they can orient visuo-spatial attention to different visual hemifields depending on their magnitude (i.e., small → left and large → right) [1-3]
- This orientation manifests itself through shorter reaction times (RT) when detecting a target appearing after a relatively short interval in the cued location (left/right after small/large numbers respectively) [3] → facilitation
- Using similar visuo-spatial attention cues (e.g. gaze & arrows) it has been shown that attention moves away from the cued location to the uncued location if the target appears after a longer interval [4-5] → inhibition of return

Hypothesis: Numbers are visuo-spatial attentional cues, after a facilitation at short intervals, we should observe inhibition of return at longer intervals

Methods

- N=25, right-handed, 7 male
- TASK:
  - Maintain gaze on central fixation point
  - Detect lateral target as fast as possible
  - Magnitude does not predict target side
- RESPONSE MODALITIES:
  - Right hand response
  - Press “B” key (index finger)
  - 2 Testing Sessions, 20 minutes each

Results

ANOVA

- Congruence x Interval interaction
  - Significant: F(5,24)=2.3, p=0.05
- Facilitation effect of congruent target detection RT, at Interval 250 ms, t-test :
  - RT Congruent < RT Incongruent
    - Facilitation of target detection when left/right target preceded by small/large digit respectively
    - At interval 250 ms: [t(24)=1.61, p=0.06]
- Inhibition effect of congruent target detection RT, at Intervals 1000 ms and 1250 ms, t-test :
  - RT Congruent > RT Incongruent
    - Inhibition of target detection when left/right target preceded by small/large digit respectively
    - At interval 1000 ms: [t(24)=1.67; p=0.05]
    - At interval 1250 ms: [t(24)=2.46; p=0.01]

Hypothesis: Numbers are central non-predictive attentional cues as they can orient visuo-spatial attention to different visual hemifields depending on their magnitude (i.e., small → left and large → right) [1-3]

Facilitation of target detection when left/right target preceded by small/large digit respectively
- Regression slopes
  - ISI 250 ms:
    - negative slope coefficient (-1.14)
    - significantly ≠ 0, (t(24)=1.7, p=0.05)
  - ISI 1250 ms:
    - positive slope coefficient (1.61)
    - significantly ≠ 0, (t(24)=2.7, p<0.01)

Conclusion

The present results confirm previous evidence showing that irrelevant numerical cues cause shifts of attention towards the left or the right visual hemifields depending on their magnitude at first, causing a facilitation to detect a target in the congruent location.

They further extend these findings, demonstrating that this initial facilitation is followed by an inhibition of target detection in the congruent location, indicating that at longer intervals, visuo-spatial attention is moved away from the initial cued location. This also shows that the effect that numerical cues have on visuo-spatial attention are quite long-lasting (up to 1250ms in our studies).

These findings further characterize Arabic digits as valid visuo-spatial attention cues and provide another powerful demonstration of their visuo-spatial nature.

References


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