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**

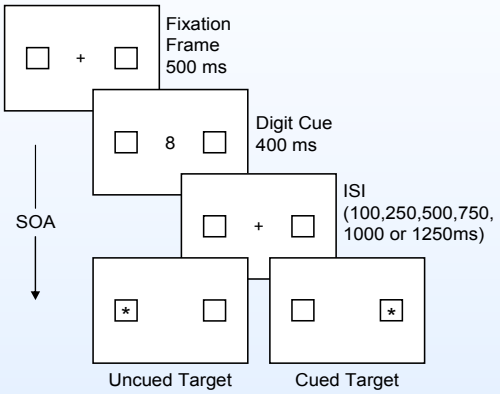
Hypothesis: Numbers are visuo-spatial attentional cues, after a facilitation at short intervals, we should observe inhibition of return at longer intervals

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]

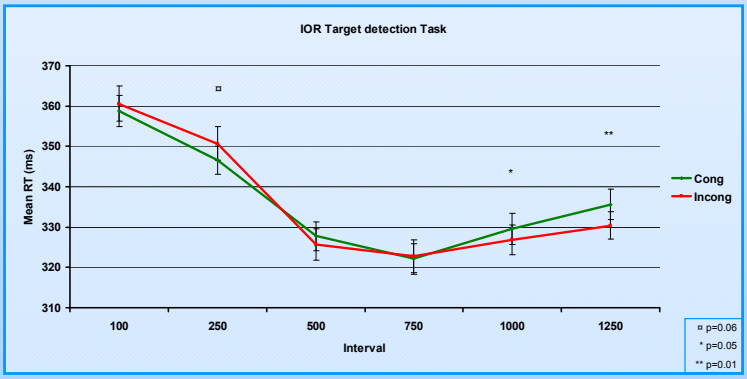
REGRESSION SLOPES

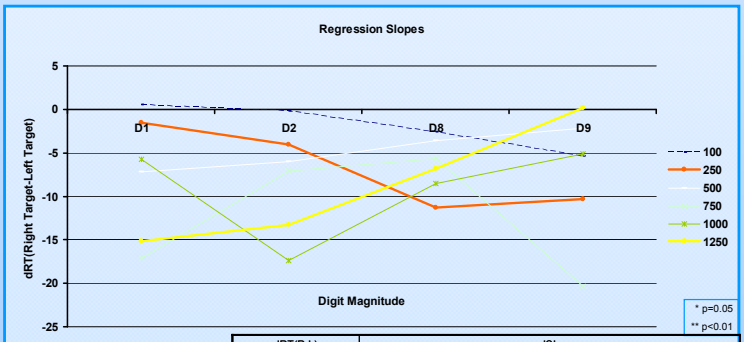
• **ISI 250 ms:**
  • negative slope coefficient (-1.14)
  • significantly ≠0, (t(24)=1.7, p=0.05)

• **ISI 1250 ms:**
  • positive slope coefficient (1.61)
  • significantly ≠0, (t(24)=2.7, p<0.01)

CORRELATIONS

Slopes at interval 250ms and at interval 1250ms
• **r = -.36; p<0.05**
→ **Facilitation turns into inhibition**





dRT(R-L)	ISI					
	100	250	500	750	1000	1250
Slope coefficients (Regression weights)	-0.62	-1.14*	0.55	-0.17	0.58	1.61**
Intercept	1.16	-1.14	-7.47	-11.73	-12.12	-16.81

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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