

# Differential effects of exogenous and endogenous cueing in multi-stream RSVP: implications for theories of attentional blink

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## Abstract

Attentional blink (AB) refers to the difficulty of detecting a target item following a preceding target item. In this study, we examined the differential effects of exogenous and endogenous cueing on AB. In two experiments, participants were presented with two visual streams (e.g., letters and numbers) in a random sequence. Targets were preceded by either a cue or no cue. In the exogenous cueing condition, the cue was a letter from the same stream as the target. In the endogenous cueing condition, the cue was a letter from the other stream. The results showed that the AB effect was reduced when the cue was endogenous compared to when it was exogenous. This finding suggests that endogenous cues are more effective than exogenous cues in reducing AB.

## Keywords

Attentional blink · Cueing · Multi-stream RSVP

## Introduction

Attentional blink (AB) refers to the difficulty of detecting a target item following a preceding target item. AB has been extensively studied in the field of cognitive psychology (e.g., Yonelinas et al. 2004). AB is often measured by the percentage of misses for the second target item. AB is typically observed when the first target item is detected but the second target item is not detected. AB is usually attributed to the limited capacity of the visual system to process multiple items simultaneously (Yonelinas et al. 2004). AB has been found to be reduced when the second target item is cued (e.g., Yonelinas et al. 2004; Yonelinas et al. 2007).

AB has been examined in various experimental paradigms. One common paradigm is the visual search task. In this task, participants are asked to search for a target item among distractors. AB is often measured by the percentage of misses for the second target item. AB has been found to be reduced when the second target item is cued (e.g., Yonelinas et al. 2004; Yonelinas et al. 2007). Another common paradigm is the RSVP task. In this task, participants are presented with a series of items (e.g., letters and numbers) in a random sequence. Targets are preceded by either a cue or no cue. In the exogenous cueing condition, the cue is a letter from the same stream as the target. In the endogenous cueing condition, the cue is a letter from the other stream. The results showed that the AB effect was reduced when the cue was endogenous compared to when it was exogenous. This finding suggests that endogenous cues are more effective than exogenous cues in reducing AB.

In this study, we examined the differential effects of exogenous and endogenous cueing on AB. In two experiments, participants were presented with two visual streams (e.g., letters and numbers) in a random sequence. Targets were preceded by either a cue or no cue. In the exogenous cueing condition, the cue was a letter from the same stream as the target. In the endogenous cueing condition, the cue was a letter from the other stream. The results showed that the AB effect was reduced when the cue was endogenous compared to when it was exogenous. This finding suggests that endogenous cues are more effective than exogenous cues in reducing AB.



and  $t_1$  are defined as  $T_1$  and  $T_2$ , respectively. The first condition is  $\text{ff}(\text{m}_1, \text{m}_2) = \text{m}_1$ .  
The second condition is  $\text{ff}(\text{m}_1, \text{m}_2) = \text{m}_2$ . The third condition is  $\text{ff}(\text{m}_1, \text{m}_2) = \text{m}_1 \wedge \text{m}_2$ .  
The fourth condition is  $\text{ff}(\text{m}_1, \text{m}_2) = \text{m}_1 \vee \text{m}_2$ . The fifth condition is  $\text{ff}(\text{m}_1, \text{m}_2) = \text{m}_1 \wedge \neg \text{m}_2$ .  
The sixth condition is  $\text{ff}(\text{m}_1, \text{m}_2) = \text{m}_1 \vee \neg \text{m}_2$ . The seventh condition is  $\text{ff}(\text{m}_1, \text{m}_2) = \text{m}_1 \wedge \text{m}_2 \wedge \neg \text{m}_1 \wedge \neg \text{m}_2$ .  
The eighth condition is  $\text{ff}(\text{m}_1, \text{m}_2) = \text{m}_1 \vee \text{m}_2 \wedge \neg \text{m}_1 \wedge \neg \text{m}_2$ .  
The ninth condition is  $\text{ff}(\text{m}_1, \text{m}_2) = \text{m}_1 \wedge \text{m}_2 \wedge \neg \text{m}_1 \vee \neg \text{m}_2$ .  
The tenth condition is  $\text{ff}(\text{m}_1, \text{m}_2) = \text{m}_1 \vee \text{m}_2 \wedge \neg \text{m}_1 \vee \neg \text{m}_2$ .  
The eleventh condition is  $\text{ff}(\text{m}_1, \text{m}_2) = \text{m}_1 \wedge \text{m}_2 \wedge \neg \text{m}_1 \wedge \neg \text{m}_2 \wedge \neg \text{m}_1 \vee \neg \text{m}_2$ .  
The twelfth condition is  $\text{ff}(\text{m}_1, \text{m}_2) = \text{m}_1 \vee \text{m}_2 \wedge \neg \text{m}_1 \wedge \neg \text{m}_2 \wedge \neg \text{m}_1 \vee \neg \text{m}_2$ .

## Method

### Design

The study used a mixed design with two factors:  $m \times k \times U$ . The first factor was the number of items ( $m$ ) in the task, which had three levels: 1 item ( $m_1$ ), 2 items ( $m_2$ ), and 3 items ( $m_3$ ). The second factor was the number of keys ( $k$ ) used to enter the data, which had two levels: one key ( $k_1$ ) and two keys ( $k_2$ ). The third factor was the type of input unit ( $U$ ), which had two levels: a numeric keypad ( $U_1$ ) and a standard keyboard ( $U_2$ ). The total number of conditions was 12 ( $3 \times 2 \times 2$ ).

### Procedure

$E_1$  and  $m_1$  were used to familiarize participants with the task.  $E_2$  and  $m_2$  were used to familiarize participants with the task.  $E_3$  and  $m_3$  were used to familiarize participants with the task.  $E_4$  and  $k_1$  were used to familiarize participants with the task.  $E_5$  and  $k_2$  were used to familiarize participants with the task.  $E_6$  and  $U_1$  were used to familiarize participants with the task.  $E_7$  and  $U_2$  were used to familiarize participants with the task.

### Experimental procedure

$m_1$ ,  $m_2$ , and  $m_3$  were used to perform the task.  $m_1$  was performed with  $k_1$  and  $U_1$ .  $m_2$  was performed with  $k_1$  and  $U_1$ .  $m_3$  was performed with  $k_1$  and  $U_1$ .  $m_1$  was performed with  $k_2$  and  $U_1$ .  $m_2$  was performed with  $k_2$  and  $U_1$ .  $m_3$  was performed with  $k_2$  and  $U_1$ .  $m_1$  was performed with  $k_1$  and  $U_2$ .  $m_2$  was performed with  $k_1$  and  $U_2$ .  $m_3$  was performed with  $k_1$  and  $U_2$ .  $m_1$  was performed with  $k_2$  and  $U_2$ .  $m_2$  was performed with  $k_2$  and  $U_2$ .  $m_3$  was performed with  $k_2$  and  $U_2$ .

## Results

The results showed that the time taken to complete the task increased with the number of items ( $m$ ). The results also showed that the time taken to complete the task decreased with the number of keys ( $k$ ). The results also showed that the time taken to complete the task decreased with the type of input unit ( $U$ ).

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### Conclusion

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### **Acknowledgments**

and the  $\mathbf{E}$  field is zero. The electric field  $E$  is zero at the center of the loop.

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mm mm m  
mm mm m m m

## References

- E**      **MH**      **m**      **m**      **fi**  
**M**      **m**      **m**      **m**      **fi**  
**MM**      **K**      **K**      **K**      **fi**  
**E**      **H**      **m**      **m**      **fi**

