

Semantic activation of target congruence contingently captures attention

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Contingent attentional capture occurs when a stimulus property captures an observer's attention, usually related to the observer's top-down attentional set for target-defining properties. This study examined whether contingent attentional capture occurs for a stimulus property that does not define the target by itself, but is congruent with the target-defining property. In an RSVP stream, we defined the target by a color (e.g., a green-colored Japanese Kanji character). Before the target onset we presented a distractor that referred to the target-defining color (e.g., a white-colored Kanji character with the meaning "green"). We observed that the distractor produced contingent attentional capture which was revealed by a deficit in identifying the subsequent target. This result suggested that the attentional set included congruency between the activated meaning and the target-defining color to detect the target.

Key words: contingent attentional capture, attentional set, RSVP

Contingent attentional capture is a phenomenon in which a given stimulus property will contingently capture viewers' attention only to the extent that it matches their top-down attentional set. For example, in the study of Folk et al. (2002) observers were required to view an RSVP stream of letters and search for a target letter defined by a specific color (e.g., green). Before the target onset, a critical distractor was presented. They observed that the accuracy of target identification dropped sharply when the distractor was the same color as the target-defining color (e.g., green), whereas the accuracy was constant when the distractor was a different color (e.g., gray). The observed deficit in target processing was interpreted as a transient resource depletion caused by contingent attentional capture, i.e. the needless selection of the distractor corresponding to the observer's current attentional set for the color green.

Three things are notable about the function of the attentional set that leads to contingent attentional capture. First, the attentional set established by observers is used to scan stimuli in relation to the target-defining property. Second, a focus of the at-

tentional set can be a higher representation activated by a stimulus (Barnard et al., 2004). Third, the attentional set can be used to scan stimuli for multiple dimensions, provided that they define the target (Bacon & Egeth, 1994). These findings give rise to a question concerning the content of the attentional set: What makes the distractor similar to the target? In this study, we propose that the attentional set is characterized by a tendency to scan for "congruency" between the target and distractor.

In this RSVP study, we manipulated the distractor-target congruence between the meaning and color dimensions. The logic of our study was the same as that of Folk et al. (2002). We hypothesized that if the attentional set scans the distractor-target congruency, the congruent distractor may contingently capture observers' attention (or deplete resources) and may impair processing of the following target.

Experiment 1

Method Fourteen naive students participated in Experiment 1. After the presentation of a fixation cross (500 ms), the RSVP stream of 22 Japanese Kanji characters commenced (SOA = 100 ms, ISI = 0 ms). Of the 22 characters, 20 were white fillers, one was a target composed of a green Kanji character of something natural (e.g., 谷, a valley; 星, a star), and one

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Table 1
The mean percent correct.

	Distractor type	D-T Lag			
		1	2	3	7
Experiment 1 (Green target)	Congruent	79	64	71	69
	Incongruent	80	69	72	72
	Neutral	71	72	72	71
Experiment 2 (Red target)	Congruent	75	60	70	68
	Incongruent	70	66	69	65
	Neutral	59	67	65	67

was a white Kanji character which was the distractor. The distractor character always preceded the target onset and was manipulated as the factor of Distractor Type: congruent, incongruent, or neutral conditions. In the congruent condition the meaning of the distractor was congruent with the target-defining color (緑, green). In the incongruent condition the meaning of the distractor was incongruent with the target-defining color (赤, red). In the neutral condition the distractor was a Kanji character of something natural and similar to the fillers. Additionally, the temporal interval between the distractor and the target onset was manipulated as the factor of Distractor-Target (D-T) Lag: either 1, 2, 3, or 7. The lag reflected the post-distractor serial position. The task of the observers was to identify the target character. The experiment consisted of 300 trials.

Results and Discussion The results are shown in Table 1. A 3 (Distractor Type) \times 4 (D-T Lag) two-way ANOVA revealed a significant main effect of D-T Lag [$F(3, 39)=6.97, p<.001$], without a significant main effect of Distractor Type [$F(2, 26)=0.99, ns$]. The interaction between these factors was significant [$F(6, 78)=3.68, p<.005$]. Post-hoc tests revealed a significantly lower target identification for the lag-2 condition in the congruent condition [$ts>2.60, p<.05$].

The observers often missed the target only when the D-T Lag was brief in the congruent condition and so demonstrated evidence of contingent attentional capture. Probably the observers' attentional set would scan for congruency between semantic activation by the distractor and the target-defining color. However, one may argue that the observers' atten-

tion was captured merely by the highly salient distractor and not by the distractor-target congruence. Note that the congruent distractor (緑, green) was perceptually more salient than the incongruent one (赤, red). That is, in Experiment 1 the highly salient distractor might capture an observer's attention only in a bottom-up manner. We rejected this possibility in Experiment 2 because the target was defined by a red color, and consequently the low-salient distractor was the congruent distractor.

Experiment 2

We used the same method as in Experiment 1 except that the target was defined by a red color. A statistical analysis revealed that the performance of the nineteen naive students was the same as in Experiment 1 (see Table 1). Even the low-salient distractor impaired correct identification for the lag-2 condition of the congruent condition. Our results therefore demonstrate evidence of contingent attentional capture by the distractor-target congruence.

Conclusion

This study investigated the effect of distractor-target congruence on contingent attentional capture. The observers more frequently missed the target when the meaning activated by the distractor was congruent with the target-defining color, than when it was incongruent or neutral. We therefore propose that contingent attentional capture depends not only on the target-defining property itself, but it is also related to the "congruency" of the stimuli with the target-defining property, even across dimensions (e.g., meaning vs. color).

References

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