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Perceptual, Decisional, and Motor Effects in Speeded Choice Decisions

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Introduction

Individuals must routinely detect, recognize, identify, or classify an object to make an appropriate behavioral response toward the object. In some cases, an individual only has a brief moment of time to initiate a response. Even these quick decisions involve a combination of attentional, perceptual, decisional, and motor processes.

Previous research has shown that certain features of stimuli can influence the speed and accuracy of behavioral responses (Wiegand & Wascher, 2007). For example, individuals are generally faster and more accurate when responding to a stimulus that is in the same location as a response key (Wiegand & Wascher, 2007; Phillips & Ward, 2002). This phenomenon is referred to as stimulus-response congruency effects, or Simon effects. However, these kinds of decisional biases may be influenced by additional features of stimuli, such as timing. For instance, when the perceptual evidence afforded by a stimulus is poor due to very brief presentation timing, individuals may rely more heavily on stimulus-response biases when making quick decisions.

The goal of the current study is to gain a deeper understanding of the selective and combined effects of perceptual, decisional, and motor processes in speeded decisions. Participants were required to respond to briefly presented shapes while the timing and relative positioning of stimuli and response keys were systematically manipulated.

The results of the present study improve our understanding of the dynamic relationship among perceptual, decisional, and motor mechanisms in speeded choice decisions.

Hypotheses

Null Hypothesis: Responses will show no differences based on location or duration of stimuli.

Perceptual Hypothesis: Responses will be faster and more accurate on long duration trials than short duration trials.

Spatial-Motor Hypothesis: Responses will be faster and more accurate on location-congruent trials than location-incongruent trials.

Interaction Hypothesis: Location-congruency effects will be larger on short duration trials than long duration trials.

Method

Participants

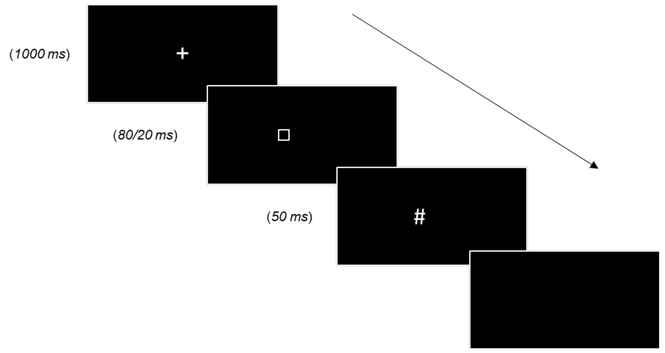
- 30 CSB/SJU students (Experiment 1)
- 31 CSB/SJU students (Experiment 2)

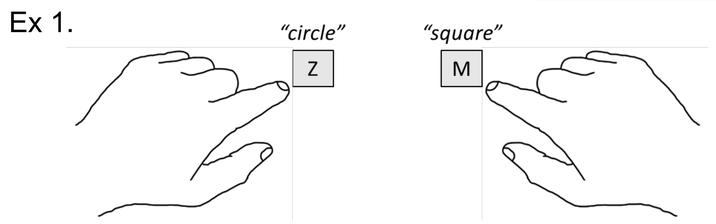
*n_{right} = 14 , n_{left} = 17

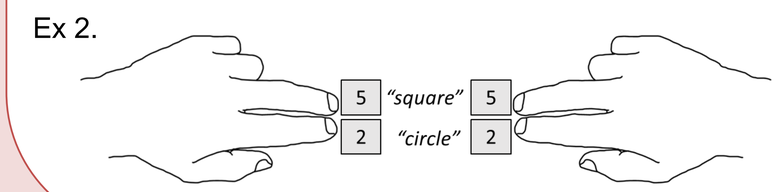
Procedure

Participants were presented with a 'square' or a 'circle' either to the right or left of a central fixation. Each stimulus was presented for a duration of 20 ms (short) or 80 ms (long). In Experiment 1, participants were instructed to press a key positioned to the right on square trials and a key positioned to the left on circle trials, creating both *location-congruent* and *location-incongruent* stimulus-response mappings.

In Experiment 2, response keys were positioned vertically. Participants used a single hand to make responses. They were instructed to press the top key "5" on square trials and bottom key "2" on circle trials.

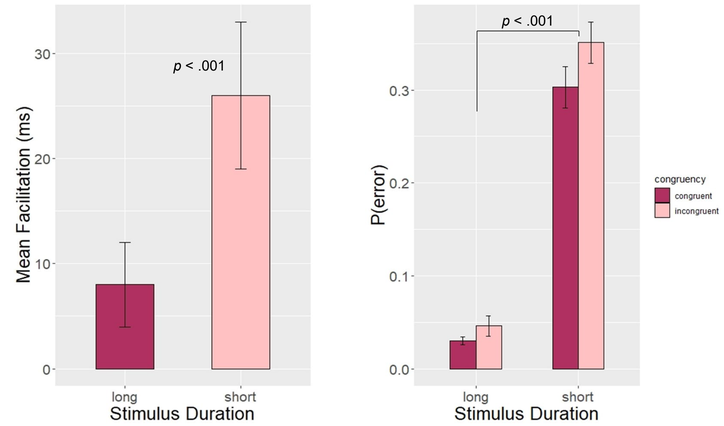




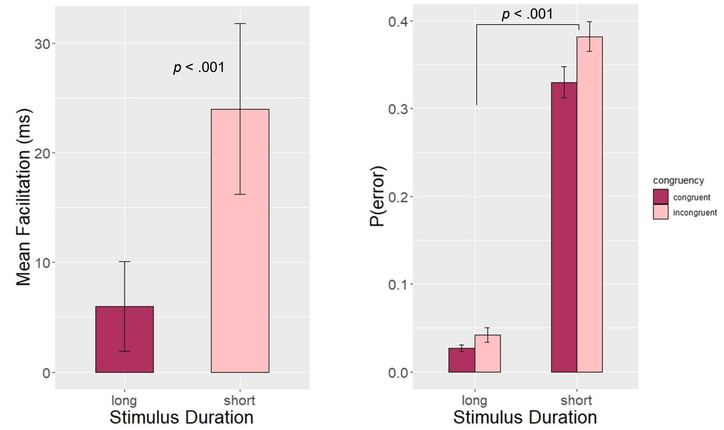


Results

Experiment 1



Experiment 2



Conclusions

Results support the Interaction Hypothesis. When stimulus duration was short (i.e., evidence had low perceptual quality), individuals rely more heavily on spatial-motor biases when making speeded decisions. This effect occurs regardless of response mapping.

References

Phillips, J. C., & Ward, R. (2002). S-r correspondence effects of irrelevant visual affordance: Time course and specificity of response activation. *Visual Cognition, 9,* 540-558.

Wiegand, K., & Wascher, E. (2007). The simon effect for vertical s-r relations: Changing the mechanism by randomly varying the s-r mapping rule? *Psychological Research, 71*(2), 219-233.