Stimulus-Response Correspondence Effect: Is Our Action Altered by the Presence of Salient Objects?

Logan Pedersen & Dr. Mei-Ching Lien

School of Psychological Science, College of Liberal Arts

Introduction

A classic finding in Psychology is that responses to a stimulus are faster and more accurate when the stimulus appears in the same relative spatial location as the response (left vs. left), even if stimulus location is completely task-irrelevant. This **stimulus-response correspondence effect** has been attributed to automatic coding of stimulus location (left vs. right) relative to our response (left vs. right).

Dolk, Hommel, Prinz, and Liepelt (2013) recently found that the correspondence effect can be observed even while performing a go-nogo task (e.g., pressing a key to green but not to red), rather than the 2-choice task used in previous studies (e.g., pressing the left key for green and the right key for red). However, the effect was observed only when a salient, irrelevant object appeared (in their case, a Japanese Waving Cat). They concluded that any salient object - irrespective of its relation to the task - can induce a correspondence effect by providing a spatial reference frame that allows people to code their own action as left vs. right.

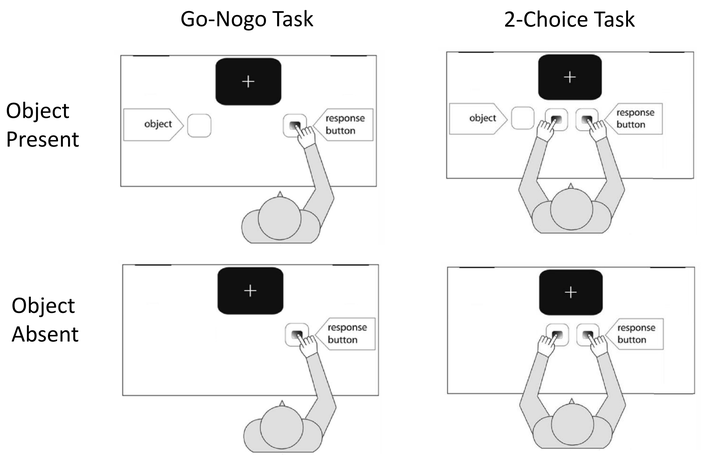
According to this *reference coding* view, one would expect that response activation (e.g., selecting a left response key) for the go-nogo task is similar to that for the 2-choice task. The present study tested this prediction using both behavioral measure (i.e., a correspondence effect on response time) and electrophysiological measures (i.e., lateralization of brain activity).

The Present Study

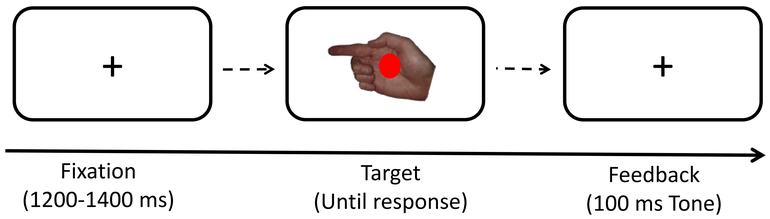
We aimed to determine whether our action is altered by the presence of salient objects. We presented a Japanese Waving Cat and compared its effects on a 2-choice task and a go-nogo task.

Stimuli: A red or green dot within a hand pointing left, right, or straight head (see below for an example).

Tasks: Participants performed a 2-choice task or go-nogo task on the red or green dot. The pointing direction of finger pointing was irrelevant to the task, as was the presence/absence of the Japanese Waving Cat and its location (left/right). Session order (2-choice vs. go-nogo) was counterbalanced across participants.



Event Sequence:



Responses:

2-Choice Task: Left key for red, right key for green (half of participants) or vice versa

Go/Nogo Task: right key for red (no response for green) for half of the participants; right key for green (no response for red) for the other half

Stimulus-Response Correspondence:

Correspondent: left response key with left-pointing finger; right response key with right-pointing finger

Noncorrespondent: left response key with right-pointing finger; right response key with left-pointing finger

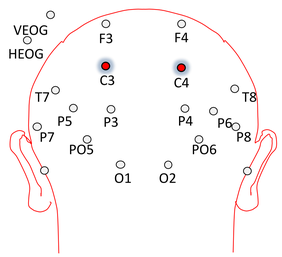
Behavioral Measures: Response time (RT; in ms) and Proportion of Error (PE)

Correspondence Effect = Noncorresponding– Corresponding

Lateralized Readiness Potential (LRP)

As an index of relative response activation (left vs. right hand), we measured lateralized readiness potential (LRP). The LRP reflects the degree to which motor cortex is more active contralateral than ipsilateral to the correct response hand (e.g., Coles, 1989). The LRP can measured continuously during response preparation, even if participants make no response (as on no-go trials). Specifically, we measured the average stimulus-locked LRP across trials by calculating the difference waveforms between the C3 and C4 electrode sites:

LRP = (left hand[C4-C3] + Right hand[C3-C4]) / 2



Negative LRP indicates response activation toward correct response whereas positive LRP indicates response activation toward incorrect response.

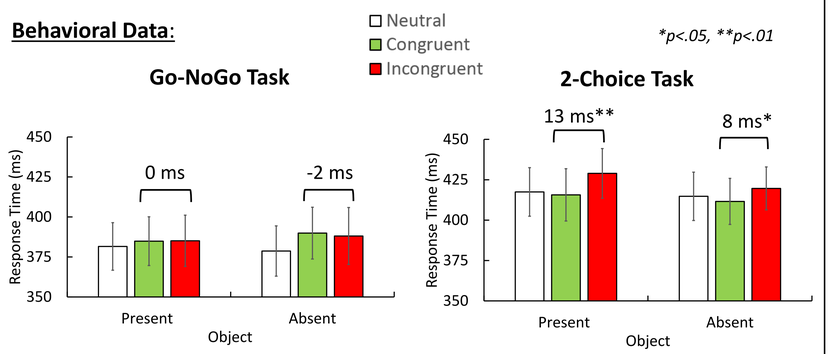
Predictions

As in previous studies with 2-choice tasks, we expect correspondence effects on RT in the 2-choice task irrespective to the presence or absence of the salient object (the Japanese waving cat). We also expect LRPs to be observed.

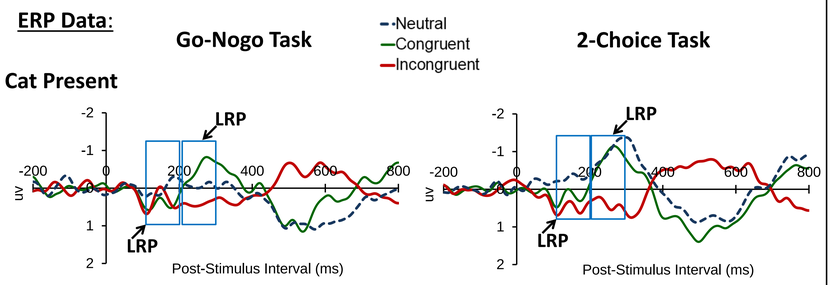
For the go-nogo trials, the reference coding view would predict correspondence effects on RT and/or PE only when the salient object (the Japanese waving cat) was present. We also expect LRPs to be observed only when the cat is present.

Results and Discussion

Behavioral Data:



ERP Data:



As predicted, the 2-choice task produced a significant correspondence effect on RT irrespective of cat presence or absence, *ts*(19)≥2.30, *ps*≤.05. In contrast, the go-nogo task produced no effect on RT in both the cat-present and cat-absent conditions, |*ts*|<1.0. The LRP data showed a correspondence effect during the 100-200 ms and 200-300 ms time windows, *Fs*(2,38)≥18.45, *ps*<.0001, regardless of task and cat conditions, *Fs*<1.61. Thus the correspondence between finger-pointing direction (left/right) and the response location (left/right) was not modulated by the presence of the salient, irrelevant object (the Japanese Waving Cat).

Summary

We found correspondence effects on RT in the 2-choice task, not the go-nogo task, even when the salient Japanese Waving Cat was present, contradicting Dolk et al.'s (2013) finding. The LRPs were similar for both tasks irrespective of the presence of the cat, suggesting that response activation/preparation was not modulated by the presence of the salient, irrelevant object. Our findings argue against the reference coding view and indicate that a salient, irrelevant object does not necessarily provide a spatial reference frame that allows people to code their own action as left vs. right.

References:

Dolk, T., Hommel, B., Prinz, W., & Liepelt, R. (2013). The (not so) social Simon effect: A referential coding account. *Journal of Experimental Psychology: Human Perception and Performance, 39*, 1248-1260.

Coles, M. G. H. (1989). Modern mind-brain reading: Psychophysiology, physiology, and cognition. *Psychophysiology, 26*, 251–269.