Effect of complementarity on the joint Simon effect

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When two participants sitting side-by-side are engaged in complementary go/no-go tasks, each participant’s performance is better when the stimulus is presented on one’s own side rather than the other actor’s side (joint Simon effect). This study investigated the roles of perception-related (target stimulus assignment) and action-related (response button) complementarity in the joint Simon effect. Half of the pairs were subjected to full complementary go/no-go tasks where each participant had a different target color (e.g., one responded for red and the other for green). The other half shared the same target color (e.g., both responded for red). Thus only response button complementarity, but not task complementarity, was maintained in the latter condition. Similar joint Simon effects were observed for both conditions. The results indicate that the adjacent partner’s action, rather than the task, is co-represented in the joint Simon effect.

Key words: perception and action, stimulus-response compatibility, co-representation, joint action, social interaction

The actions of others influence one’s own task performance. For example, an observer’s attention and action are affected by perceiving a social stimulus that shows another’s action, such as an eye gaze or finger pointing. Moreover, social situations, such as observation, cooperation, competition, or division/sharing of a task, modify our cognitive representation and affect performance.

Performance is better when a stimulus is presented on the same side as the response (compatible trial) rather than on the opposite side (incompatible trial) for a two-choice task where participants respond by pressing a left or right button based on a non-spatial feature (e.g., color) of the stimulus presented on the left or right (Simon effect; Craft & Simon, 1970). The Simon effect is usually absent in go/no-go tasks where participants are instructed to press one button (e.g., left) for a certain color (e.g., red) but not to respond to another color (e.g., green). However, the Simon effect is observed when two participants sitting side-by-side engage in complementary go/no-go tasks (joint Simon effect). In a typical joint Simon task, the left participant presses left button for a red stimulus, but does not respond to a green stimulus, while the right participant presses right button for a green stimulus, but does not respond to a red stimulus. The joint Simon effect indicates that the other person’s actions are represented in a way functionally equivalent to one’s own actions (Sebanz, Knoblich, & Prinz, 2003).

The present study investigates which aspects of others’ action are co-represented in the joint Simon effect by manipulating the ‘go’ target color in a go/no-go task. Similar to previous joint Simon tasks, the complementary target color condition engaged two participants in separate but complementary go/no-go tasks; each participant was assigned a different color (e.g., red or green). In the same color condition, participants had the same target color; that is, both participants pressed the button in front of them for one color (e.g., red), but did not respond to another color (e.g., green). If the partner’s action itself is represented and functions as a reference to spatially code one’s own action (Guagnano, Rusconi, & Umiltà, 2010), then the joint Simon effect would emerge in both conditions because the division of left and right response buttons between the participants is maintained in both conditions. On the other hand, if the partner’s task is represented and functions the same as one’s own stimulus-response mapping, then the joint Simon effect would emerge only in the complementary target color condition and the overall reaction time (RT) would be shorter for that condition than for the same target color condition (Sebanz, Knoblich, & Prinz, 2005).

Method

Twenty-four volunteers participated in the experiment. Half
were assigned to the complementary target color condition, and the other half were assigned to the same target color condition. Two participants sitting side-by-side were concurrently engaged in the experiment. The participant on the right side pressed the right button with his/her right index finger, and the participant on the left side pressed the left button with his/her left index finger. The task was a go/no-go task. Participants were to press the response button as fast as possible only when a target stimulus was a specific color (e.g., red). If another color (e.g., green) was presented, participants were not to press the button. In the complementary target color condition, the adjacent participants were assigned different target colors. Therefore, a go trial for one participant was a no-go trial for the other. In the same target color condition, the two adjacent participants shared the same target color. Therefore, both participants either had a go or no-go trial. Each trial began with a 1000-ms display of a central white cross. Then either a green or red square was presented for 2000 ms on the right or the left of the central cross.

Results

The mean RTs were used in a two-way ANOVA with the target color condition (same, complementary) as a between-participants factor and compatibility (compatible, incompatible) as a within-participants factor. The main effect of compatibility was significant; \( F(1, 22) = 25.67, p < .005 \), with a 9-ms joint Simon effect (301 ms vs. 310 ms). However, the main effect of the target color condition and the interaction were not significant, \( Fs < 1 \). Neither the overall RT (303 ms vs. 308 ms) nor the joint Simon effect (7 ms vs. 10 ms) differed between the complementary and the same target color conditions.

Discussion

Irrespective to the complementarity of the target color assignment, a joint Simon effect was obtained, indicating that the joint Simon effect emerges as long as the complementarity of the response button of each individual is maintained. Moreover, target color complementarity did not affect the overall RT. These results suggest that in the joint Simon effect, what is co-represented and affects one’s own action is the adjacent partner’s action itself and not the task. The present findings support the referential coding account of the joint Simon effect (Guagnano et al., 2010). According to the referential coding view, the co-actor’s action provides a spatial reference frame relative to which one’s own action is coded as left or right. The present study revealed the importance of response button complementarity or an action-related factor, rather than task (target color) complementarity or a perception-related factor in the joint Simon effect. The present findings are consistent with the notion that, similar to the classic Simon effect, the joint Simon effect emerges at the response selection stage.

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References


