Analysis of Attention: Response Selection and the Simon Effect

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Abstract

A male university student completed a computer experiment to examine whether responses to stimuli are faster on the congruent side of presentation as opposed to the incongruent side. This is known as the Simon Effect. Stimuli were presented to the right side or left side of a fixation point and the response was dependent on both location and color. Results indicate a significant difference in reaction time when the stimulus was presented on the same side of the response. These findings are in agreement with similar types of experiments done and are used in explaining response selection in cognitive theories of information processing. Practical considerations such as manufacturing and design should take this effect into account when making objects with which mankind must interact.
Analysis of Attention: Response Selection and the Simon Effect

The purpose of this paper is to analyze whether the Simon Effect can be observed using a computer simulation. It is thought that there is a natural tendency to be quicker to respond to stimuli presented to the same side of our visual or auditory field than to the opposite side. These tendencies have implications in various theories of cognition and memory. The information processing approach to cognition and memory is based on studies such as this which try to analyze cognitive tasks in different stages (Anderson, 2000). During the response selection stage in the Simon Effect, one has to keep track of both the location dimension as well as the color dimension of the stimuli to make a proper response. It is believed that when the dimensions are contrary to one another, a delay in responding occurs due to interference. This experiment analyzed whether this indeed did occur.

Method

Participants

This is a self experiment on attention for a course in memory. I am a male undergraduate student at the University of Manitoba. There is class of students that are conducting the same experiment, and our ages range anywhere from 18 and above. For this experiment, only individual results will be used.

Materials and Apparatus

The apparatus in this experiment was a home computer running Windows XP and Internet Explorer 6.0. The monitor used was a 17 inch CRT display. A standard keyboard and mouse were used to complete the demonstration. The computer simulation comes from http://coglab.wadsworth.com/experiments/SimonEffect/index.html. It was necessary to have a
valid login and password for access to the demonstration. The viewing distance from the monitor was approximately 55 cm.

Clicking the start button was necessary to begin the experiment and a window that covered the entire screen appeared to start the simulation. The background appeared black. The experimental window had a pull-down context menu of ‘trials to go’ and ‘instructions’ at the top of the user interface should that information be needed once the experiment has began. The experiment presented a green or red stimulus (in the form of a box) to the visual system.

Procedure

The demonstration consisted of 100 trials. Once the program loaded, the space bar was used to begin the trials for the experiment. The trial began with a white fixated dot (approximately 2 mm) appearing in the middle of the black background. A few seconds later, a red or green square (approximately 2 cm) was presented to the left or right of this fixation. The task of the experiment was to press the ‘v’ key when the square presented was green and to press the ‘m’ key when the square was red. The left index finger was placed on the ‘v’ key and the right index finger was placed on the ‘m’ key at all times until the experiment is over. If there was an early response to the stimulus, the message: ‘Too early, wait for the stimulus’ was presented. The stimulus was then presented and the key pressed was recorded as usual. Again, pressing the spacebar initiated a new trial. After each trial, there was feedback given to the response that was recorded, either it being correct or incorrect. The time was not given during the trial which was contrary to what the simulation stated it would do for each trial, but these values could be obtained in the results at the end. In any trial, the ‘t’ key could be used to discard and retry a trial later if so desired.

Results
Table 1 summarizes the mean of the RTs (in milliseconds) to the condition of the presentation. Congruence means that the presentation and the response are on the same side, whereas incongruence means that the presentation and the response are on opposite sides. It is clearly seen that when the presentation of the stimulus is on the same side as its response key (green stimulus on left side which is the same side as the ‘v’ key and red stimulus on right side which is the same side as the ‘m’ key), the reaction time is smaller than its incongruent condition (green stimulus on the right and red stimulus on the left). Although no statistical computation has been performed, from the results obtained, it can be surmised that the difference of over 100 ms from the two conditions is indeed statistically significant.

Discussion

The results clearly indicated that the reaction time to the stimulus was faster when the stimulus was presented on the same response side, which is in agreement to what was expected. Numerous experiments similar to the one conducted here have validated the classical finding that people tend to respond to stimuli that occur on the same side of a given response (Cristina, Nicoletti, Rubichi, & Umilta, 2003; Nicoletti, Proctor, & Vu, 2003; Proctor & Roswarski, 2003). Research by Ansorage and Wuhr (2004) compared stimulus responses along both the vertical and horizontal dimensions and found a greater observable difference along the horizontal dimension. The importance of this finding is that response selection can be affected when a number of stimuli dimensions are present and are contrary to one another. These findings can be used to help understand the processes involved in cognition and memory. Furthermore, these findings have importance in the real world when it comes to manufacturing and design of man made objects with which we must interact. Improper design can lead to safety concerns, dissatisfied consumers, and loss of profit.
References


Table 1

Table displaying reaction times (RT) in milliseconds as a function of direction of presentation - Congruent (same side) and Incongruent (other side).

<table>
<thead>
<tr>
<th>Condition</th>
<th>Mean RT (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congruent</td>
<td>455.6</td>
</tr>
<tr>
<td>Incongruent</td>
<td>572.46</td>
</tr>
</tbody>
</table>