A New Model for the Stroop Effect

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Abstract

In general, the Stroop effect demonstrates our inability to ignore meaningful but irrelevant information. Typically, this effect is explained in terms of speed of processing. For instance, in the color-word Stroop task, words are considered to be processed faster than colors, therefore, the word, which is a valid response, either facilitates or interferes with naming the color. In order to examine which dimension (i.e., color or word) is processed faster in the Stroop task, researchers have varied the stimulus onset asynchrony between the color and word dimensions. This research suggests that maximum interference and facilitation occur when the two dimensions are presented within 100 msec of each other. Interestingly, Stroop interference can be found when the word precedes the color and when the color precedes the word. Although these findings do not support the typical explanation of Stroop processing described above, this research was conducted using non-integrated color-word stimuli. A non-integrated color-word stimulus consists of a color word with a color block. An integrated color-word stimulus is a color word printed in a color. The processing of non-integrated stimuli may not be the same as the processing of integrated stimuli. In one experiment, integrated color-word stimuli were presented for varying durations (40 to 1000 msec) and then masked. Stimuli consisted of color congruent, color incongruent, and color neutral words (e.g., BOOK, CHAIR, LADDER, TOP). Results show that color incongruent stimuli produces significantly longer RTs than color congruent words at the shortest durations of 40 and 60 msec. Therefore, the Stroop effect appears to occur only when processing time is limited. A second study attempted to replicate these findings in the parafovea. However, parafoveal presentation of integrated color-word stimuli failed to produce Stroop interference. In order to assess whether the lack of Stroop interference was due to spatially distributing attention over an area which limited attentional resources available to a given stimulus or due to the retinal location of the stimulus (i.e., due to acuity issues, etc.), a third study was conducted in which the location of the color-word stimulus was validly cued on 67% of the trials. The results show Stroop interference for validly cued locations. Therefore, failure to find Stroop interference in the second experiment was due to the spreading of attention. These three experiments suggest that Stroop interference occurs during the initial stages of processing and. is depends upon attention resources. In a fourth study, integrated color-word stimuli were presented in the fovea. Stimuli consisted of color words and nonwords. Subjects were asked to respond either word or nonword instead of responding to the color. Results show that color congruent stimuli were identified as words significantly faster than color incongruent words and nonwords. Therefore, color enhanced word processing. Again, this finding questions the relative speed of processing account of Stroop processing. Finally, a fourth experiment used a color-color version of the Stroop task. Subjects were presented two blocks of color. The two blocks were either the same color (congruent) or different colors (incongruent). Single blocks of color were presented as the neutral condition. The results show that incongruent color blocks produce Stroop interference. This finding demonstrates Stroop interference with information within the same domain (color) instead of two separate domains (color and word). Thus, these findings suggest that the Stroop effect not only occurs during the initial stages of processing and depends on attentional resources but that information within the same domain as the target dimension can cause interference and facilitation. A new model for Stroop processing is presented to accommodate these findings. Implications for neural network accounts of the Stroop effect are also discussed.