

At any moment, what one attends to is a complex function of stimulus conditions (e.g., movement, novelty), intentions, and habits. The classic Stroop task, which requires participants to name the color in which a word is presented, and its variations have been used in thousands of experiments on the competition for the control of attention. When response tendencies conflict (e.g., the word BLUE is printed in red, where the correct response is "RED"), participants must override the strong, habitual tendency to read the word and maintain instead the goal of naming the word's color. Robust disruption of performance (lower accuracy, longer response times) is observed on these incongruous trials, compared to the baseline (e.g., CLUE printed in red) and the congruous conditions (e.g., RED printed in red) where there is no competition. However, it seems unlikely competition is a purely dichotomous state. That is, trials are typically treated as being incongruous or not, but we hypothesized that there are variations in the degree of conflict, such that some incongruous trials are harder than others. For example, it may be harder to respond correctly for PINK printed in red than BLUE printed in red, even though the same response ("red") is required in both cases, because red and pink are highly similar. In the present study, we administered five computer-based variations of the Stroop paradigm to 155 undergraduate volunteers. Across tasks, we analyzed both the differences between conditions (incongruous versus baseline) and also any trial-by-trial variations in degree of stimulus competition. Significant interference effects were observed in accuracy measures for all five tasks, and in latency measures for four of the tasks. Unique to the present investigation, we also found that the magnitude of Stroop-like interference varied reliably as a function of stimulus competition for all tasks. Thus, incongruous trials were not all equally incongruous. These findings not only provide additional information about the competition between executive constraints, environmental constraints, and experiential constraints on the control of attention, but they may also yield insights on some of the psychometric challenges commonly associated with Stroop-like paradigms.