Comparing Measures of Inhibition among College Students with and without a Reading Disability

UMBC
AN HONORS UNIVERSITY IN MARYLAND

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Abstract

This independent study is part of a larger study on metacognition and executive function in college students with and without a reading disability. One of the study's measures is the Stroop Task, an assessment of inhibition that some researchers say may not be accurate when used with participants with a reading disability because it involves reading. The purpose of the current study is to compare the Stroop Task to the Spatial Incompatibility Task, an assessment of inhibition that does not involve reading. It is expected that students with a reading disability will show different patterns of performance on the two tasks, whereas students without a disability will perform similarly on the two tasks. Also of interest is whether students with a reading disability will show greater difficulty overall in their ability to inhibit inappropriate responses. The results of this study will help future researchers choose appropriate measures of executive functioning when studying cognitive skills in individuals with a reading disability, which could lead to better interventions to help them succeed in academic settings.

Introduction

Dyslexia and other reading disabilities are conditions that involve difficulty in reading and comprehending written language. Several studies have found a link between inhibition and dyslexia such that dyslexia is associated with a deficit in inhibition of incorrect responses to stimuli.

Many of these studies used the Stroop task to measure inhibition. The Stroop task involves color-word stimuli that are presented in colored ink, such as the word green being presented in red ink (see measures section, at right). This incongruency between the color-word and the ink-color is problematic for the participant when they are instructed to say the ink-color they see, because the prepotent response is to read the word rather than name the color. In order to give a correct response, the participant must inhibit that prepotent response to say the word they read and instead say the color of the ink they see.

Wang and Gathercole (2015) argue that the Stroop task is inappropriate to use with participants with dyslexia on the basis that the Stroop task's involvement of reading words confounds the results for such participants. They suggest that using a nonverbal inhibition task would remove the confounding influence of the Stroop task's verbal nature.

Brosnan et al. (2002) did use a nonverbal task to measure inhibition, and they found in both adults (18 undergraduate student participants: 9 with dyslexia and 9 without dyslexia) and children (60 participants: 30 with dyslexia and 30 without dyslexia; average age is 14 years old) a negative association between dyslexia and inhibition. These findings contradict those of Wang and Gathercole (2015).

The current study aims to directly compare the Stroop task to the Spatial Incompatibility Task in order to clarify the discrepancy between the findings of Brosnan et al. (2002) and Wang and Gathercole (2015), and to determine whether the Stroop task is inappropriate to measure inhibition in people with dyslexia, as Wang and Gathercole suggest.

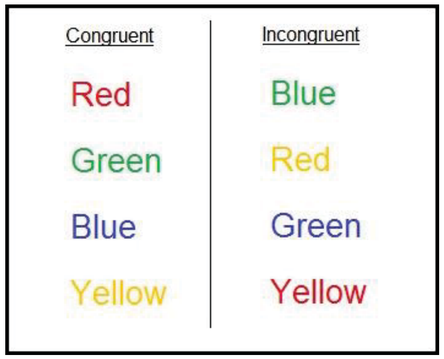
Method

Participants

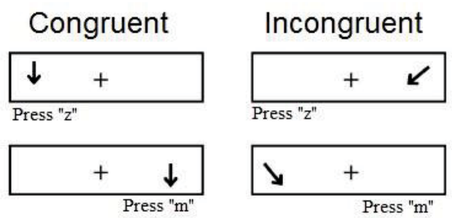
9 college students attending UMBC
- 22% self-identified as having a reading disability (N=2)
- 6 female (67%) and 3 male (33%)
- Mean Age: 21.12 years. Std. Deviation: 1.48 years. Age range: 19 – 23 years.
- 4 identified as African American, 2 as Asian, and 3 as White/Caucasian

Measures

- **Stroop Task**:
  - Three lists of 35 words.
  - Participant is instructed to say the ink color.
  - First list: ink color is same as color word. This is the congruent condition.
  - Second list: ink color is different from color word. This is the incongruent condition.



- **Spatial Incompatibility Task:**
  - Participant responds to arrow appearing on the screen.
  - Arrow will appear on left or right side of screen.
  - Arrow points straight down or diagonally down towards the opposite side of the screen.
  - Participant presses the key that the arrow is pointing towards (see image).



- Participants completed additional measures of cognitive abilities, reading abilities, and phonological processing.

Procedures

- Participants completed the tasks in a quiet room with a desk and a computer. The Stroop task and Spatial Incompatibility task were always performed consecutively, and the order of the two tasks was counterbalanced.

Results

Task			Mean	Std. Deviation
Spatial Incompatibility Task	Incongruent	Accuracy	.91	.13
		Time	546.00	94.74
	Congruent	Accuracy	.99	.02
		Time	522.61	88.97
Stroop Task	Incongruent	Score	34.67	.52
		Time	33.67	6.68
	Congruent	Score	35.00	.00
		Time	22.00	4.94

- Accuracy did not differ between congruent and incongruent conditions for either task as shown by a paired-samples t-test.
- Time taken was longer for the incongruent condition compared to the congruent condition for both tasks as shown by a paired-samples t-test.
- Due to small sample size and the need to remove outliers, analyses involving reading disability and comparisons of the two tasks did not have sufficient statistical power to detect differences.

Significance

Results suggest that both the Stroop Task and the Spatial Incompatibility Task measure inhibition as they are intended to do. Inhibition involves suppressing a prepotent response, which takes more time than the prepotent response alone. This is particularly important for the Spatial Incompatibility Task because that task was developed for this study and has not been used before.

Data is still being collected for this study. A total of 100 participants are expected to be recruited, approximately half of which will self-identify as having a reading disability. With that many participants, statistical analyses will be more powerful and informative.

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