Where is the Bilingual Advantage in Preschoolers’ Stroop Task Performance?

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Inhibition and the Bilingual Advantage

- **Bilingual advantage**
  - Multilingual compared to monolingual individuals perform better on tasks of controlled attention (Hernández et al., 2003).
  - Found in Stroop Tasks with adults, such as the classic Stroop, but not in preschool children tested with age-appropriate variants, such as the Day/Night task (Hernández et al., 2010; Martin-Flatin & Bialystok, 2005).

Day/Night Coding

- **Incongruent** (left): Red Text, Blue Moon
- **Congruent** (right): Green Text, Yellow Moon

**WHY?** Possibly the distinction between interference suppression and response inhibition.

- The bilingual advantage is found when tasks involve choosing between two stable perceptual stimuli: interference suppression (Bialystok et al., 2000).
- Example: Classic Color-Word Stroop task, pictured above, in which color words are printed in an ink color that is incongruent to the word such as the word “blue” printed in red ink (Jones, 1960).
- In contrast, response inhibition is the inhibition of a dominant or prepotent response.
- Example: Day/Night task, pictured above, in which children respond to a picture of the sun with the word “night” and the moon with the word “day” (Kerem et al., 2008).
- **Interference suppression** resembles the everyday experience of being bilingual (Hernández & Fagen, 2010).

- Bilingual advantages are found in Stroop tasks with conflicting perceptual stimuli, but not in tasks typically used with preschoolers.

- **Do preschoolers fail to show the bilingual advantage with Stroop tasks because the adapted tasks involve response inhibition rather than interference suppression?**

The Need for a New Conflict Task

- The Bivalent Shape Task was created to measure interference suppression in bilingual and monolingual preschool age children.
- Children are directed to match the target shape to one of two active buttons at the bottom of the screen. The perceptually distracting color can be either congruent or incongruent.

The Bivalent Shape Task:

- Includes both congruent and incongruent trial items.
- Perceptually distracting stimulus (color).
- Mixed block presentation (incongruent and congruent are in a set random order).
- Does not require reading or number knowledge.
- Is not dependent on word knowledge.
- **Stimuli** (meaning it has distracting perceptual information as well as perceptual features relevant to the required response).
- Runs on free access software: Psychology Experiment Building Language (PEBL; Mueller, 2011, 2010)

The classic Stroop Task:

- Typically includes both congruent and incongruent trial items.
- Perceptually distracting stimulus (color).
- Mixed block presentation (incongruent and congruent are in a set random order).
- Does not require reading or number knowledge.
- Is dependent on word knowledge.
- **Stimuli** (meaning it has distracting perceptual information but no perceptual features relevant to the required response).
- Runs on free access software: Psychology Experiment Building Language (PEBL; Mueller, 2011, 2010).

Results

- No difference between language groups in Day/Night task performance.

Hypotheses

1. No difference between language groups in Day/Night task performance.
2. Monolingual preschoolers would have a larger Stroop Effect (in the form of greater incongruent than congruent errors) compared to bilingual preschoolers in the Stroop Shape Task.
3. The bilingual children would have significantly better performance in the form of fewer incongruent errors compared to monolingual children on the Bivalent Shape Task, but the children would not differ in errors on congruent trials.

**Participants**

- **Total n:** 26 Bilingual, 25 Monolingual
- **Female:** 16 Bilingual, 12 Monolingual
- **Mean months of age (SD):** 49.8 (7.5) Bilingual, 50.1 (8.6) Monolingual

Procedure

**Day Night task:**

- As predicted, there were no language group differences in either Stroop Effect or trial accuracy.

Bivalent Shape Task:

- Monolingual preschoolers had significantly better performance on congruent compared to incongruent trials (Stroop Effect). However, bilingual preschoolers did not show a Stroop Effect.
- In addition, there were no language group differences between bilingual and monolingual preschoolers on congruent trials, but bilingual preschoolers were significantly more accurate on incongruent trials compared to monolingual preschoolers.

Discussion and Conclusions

- Results support a bilingual advantage in interference suppression (BST), but not response inhibition (Day/Night).

- The BST offers an alternative to the currently available Stroop tasks. The Day Night task measure of inhibition does not appear to be measuring the same construct as the Classic Color-Word Stroop. Few bivalent tasks offer both congruent and incongruent trials for comparison and those that do exist require rapid picture naming, putting bilingual children at a possible disadvantage.

- The BST also has the possible advantage of use across the lifespan. In ongoing research with college students, reaction times differ between congruent and incongruent trials (the Stroop effect), and reaction times on the BST and on the Classic Color-Word Stroop are correlated.

Select References


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