What colour is 赤?
Investigating cognitive control in multi-script bilinguals

BILINGUALISM AND EXECUTIVE FUNCTION
AN INTERDISCIPLINARY APPROACH

Santa Vīnerte and Laura Sabourin
University of Ottawa

Background

Bilingualism and Cognitive Control

Mediating between two languages requires cognitive control
- attention, inhibition, conflict resolution

Bilinguals may have a cognitive control advantage[1]
- Experience in managing conflict between two languages competing for limited attentional resources

Advantages have been observed for older bilinguals[1], more proficient and balanced bilinguals,[2] and bilinguals who acquire both languages earlier in life[3]

The bilingual environment may play a role in cognitive control[4]

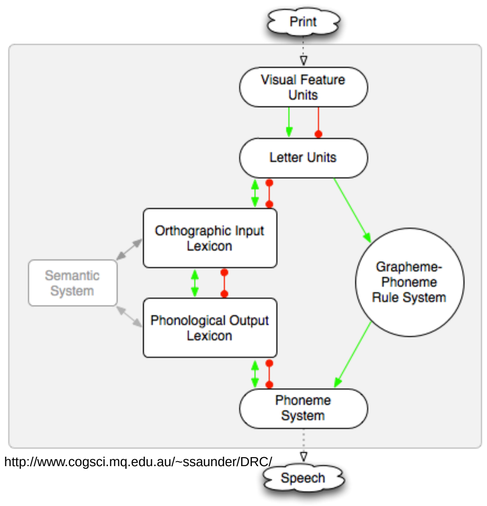
Environment consists of words heard and spoken, and words written and read
- Many studies focused on alphabetic bilinguals

The Japanese Writing System and the Dual Route Cascaded Model

Japanese writing system: hiragana, katakana, and kanji
- Kanji are pictographic representations of the referent (i.e. logographs)
- Multiple pronunciation for each logograph

Dual Route Cascaded (DRC) model[5]: different processing for different scripts

Lexical Route
- Access to the mental lexicon
- Highly interactive
- Whole-word reading by proficient readers



http://www.cogsci.mq.edu.au/~ssaunder/DRC/

Non-Lexical Route
- Access to the mental lexicon only though response buffer
- "Sounding out" words by non-proficient readers

Writing systems may or may not share processing pathways
- Implications for allocation of resources and conflict management
- May impact cognitive control skills

Research Questions

Can differences in script processing, if any, be captured by tasks of cognitive control?

Does experience with multiple scripts impact cognitive control abilities?

Predictions

1. Different scripts will result in different patterns of processing in cognitive control tasks such as Stroop
   - Ultimately lead to different patterns of cognitive control advantages for logographic-alphabetic bilinguals compared to alphabetic-alphabetic bilinguals
2. Magnitude of bilingual advantages dependent on processing:
   - If scripts share processing pathways, greater conflict and greater advantages for multi-script bilinguals
   - If scripts use separate pathways, similar degree of conflict and similar advantages to alphabetic-alphabetic bilinguals

Methods

Participants

7 Japanese-English bilinguals (ages 19-29)

Stimuli and Procedure

Bilingual Stroop Task
- Japanese stimuli written in logographic script only

Control
HOUSE
家

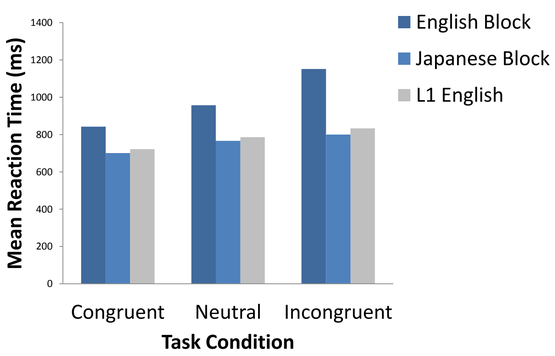
Congruent
RED
赤

Incongruent
RED
赤

	ENGLISH BLOCK	JAPANESE BLOCK	BILINGUAL BLOCK
Fixation cross 250ms	+	+	+
Colour word stimulus Until button press	RED	赤	RED
Fixation cross 250ms	+	+	+
Colour word stimulus Until button press	RED	赤	緑

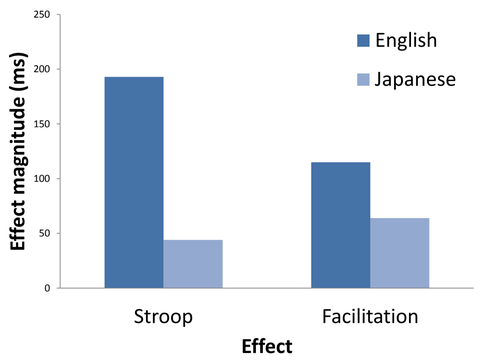
Preliminary Results and Discussion

Mean Reaction Time by Condition



- Expected task effect for speed of processing: Congruent> Neutral > Incongruent (p<.001)
- Present for both English and Japanese

Stroop Interference and Facilitation



- Greater Stroop interference in English than in Japanese (p=.009)
- No significant difference for facilitation

Current Preliminary Results

Generally longer reading times for English
- Slower reading in L2

Greater Stroop effect for English
- Longer processing for L2
- Processing pathways and automaticity

Task order
- Counterbalancing for more accurate measurements

Next Steps

Methodology

Are Proficiency and the Age of Acquisition (AoA) of an alphabetic or logographic script modulating factors?
- What AoA/Proficiency is necessary?

What would Stroop results tell us about processing via the DRC?
- Relative magnitude of interference gives insight to processing pathways

References

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Contact
svinerte@uottawa.ca