

The Role of Working Memory and Language for Bilingual Chinese in Complex Mental Multiplication

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Introduction

Different working memory systems are involved in mentally solving complex multiplication problems. This involvement depends on presentation format for Chinese (Imbo & LeFevre, 2010):

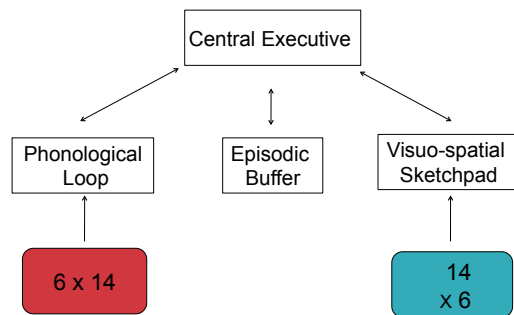


Figure 1. Working memory model of Baddeley & Hitch (1974) and Baddeley (2000).

○ Purpose:

Examine whether different working memory (WM) systems are recruited depending on presentation format and language of response.

○ Hypotheses:

- Regardless of language of response, participants are more likely to rely on phonological WM for horizontal problems, and visual WM for vertical problems.
- Additional phonological WM resource is required from L1 to L2 due to the language translation process.

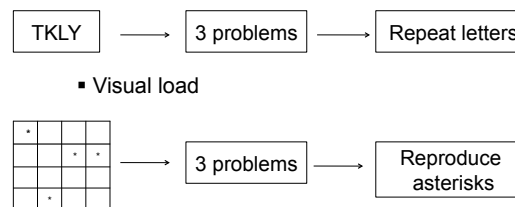
Method (N = 26; Mean age = 24 years)

Primary task:

- Two-digit x One-digit multiplication problems in 2 language (L1, L2) blocks
 - Problem complexity: easy; hard
 - Presentation format: horizontal; vertical

Secondary task:

- 3 conditions per language block
 - No load (control)
 - Phonological load



Results: Secondary task (accuracy)

Phonological task	L1 > L2
Visual task	L1 = L2

Primary task (Easy problems):

- Horizontal:** L2 was always slower than L1; phonological load effect was greater than the visual load effect.
- Vertical:** Although L2 was slower than L1, the visual load effect was much larger than the phonological load effect.

Results (Cont'd)

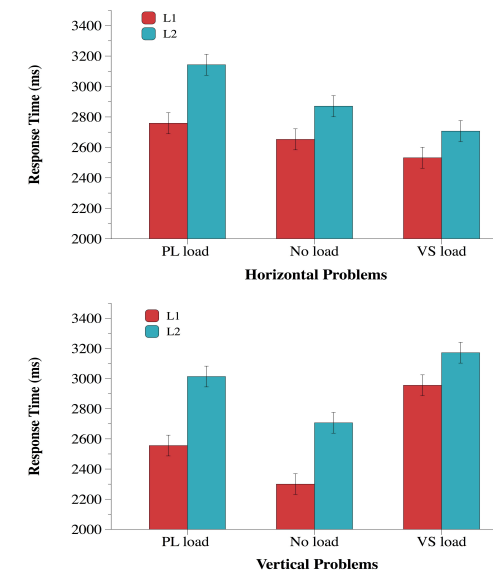


Figure 2. Mean RT for WM conditions across L1 (Chinese) and L2 (English) for horizontal and vertical presented, easy problems.

Primary task (Hard problems):

No consistent relations with the working memory variables because participants found the problems too difficult.

Conclusion

The results are consistent with Imbo and LeFevre's findings (2010). Further, mental multiplication in L2 requires additional phonological load, specifically on translation of numbers from L2 to L1.