Language Dominance Affects Working Memory in English-Spanish Bilinguals

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Introduction

1. Working memory in bilinguals:
   - Bialystok (2009): no difference in WM between monolinguals and bilinguals.
   - Kaushanskaya & Yoo (2012): bilinguals perform better in verbal WM tasks.
   - Nicoletta (2021): Second Language Learners (L2) perform significantly better on Reading WM tasks than both Heritage Speakers (HSs) and monolinguals.

2. The Problem:
   Prior research does not examine the effect of language dominance on success in WM tasks.

3. The Present Study:
   It is hypothesized that English-Spanish bilinguals will perform better on WM tasks in their dominant language.

   - Participant Groups:
     • Heritage Speakers (HSs)
     • Second Language Learners (L2)

   HSs are bilinguals who have acquired their home/heritage language and societally language, English, simultaneously, but possess a stronger knowledge of the English language. Meanwhile, L2 learned English as their second language.

Method

Participants

Participants (see Table 1)

Session 1 – Spanish
   Recruited from the CSI SONA subject pool
   - 1 Heritage Spanish-English Bilinguals (HSs): 10 participants
   - 2 participants returned for Session 2 in English
   - 2 L1 Spanish-L2 English Bilinguals (L2): 8 participants
   - 4 participants returned for Session 2 in English

Session 2 – English
   From the CSI SONA subject pool, 12 different from the Spanish session
   - 1 Heritage Speakers: 13 participants
   - L2: 5 participants

Note on the Between-Participants Design:
The original design of this study was intended to be Within-Participants with the anticipation that all participants would complete both sessions. Due to unforeseen issues, only 6 participants completed both sessions, therefore resulting in a switch to a Between-Participants design.

Design and Materials

Spanish Reading WM Task: read blocks of 2-to-5 sentences, memorize and recall the last word of each sentence in correct order

Block 2: 2 sentences (see Example of Spanish Reading WM Block 2)

Block 5: 5 sentences

Spanish Proficiency Task: read 30 sentences, one at a time, and choose the word or phrase that best completes the sentence from four choices (see Example of Spanish Proficiency).

Spanish Month Ordering Task: hear 2 blocks of 2-to-9 months spoken in a random order, memorize and recall the months in order of a standard calendar year.

Block 2: 2 months (see Example of Spanish Month Ordering Block 2)

Block 9: 9 months

Method (cont.)

Session 1 – Spanish
   Example of Spanish Reading WM Block 2

Block 2: 2 sentences (81 and 52)

Participant reads and then recalls director, absoluto:

S1: Due to his weak performance, his position as director was terminated abruptly.

S2: It is possible, of course, that life did not arise on the earth at all.

Example of Spanish Proficiency Test

The participant would read the following sentence and be presented with the answer choices:

Al oír el accidente de su buen amigo, Pacho se puso director, absoluto.

a. alegre
b. fatigado
c. hambriento
d. desconcertado [correct answer]

Example of Spanish Month Ordering Block 2

Block 2: 2 months spoken

Participant hears and then recalls and orders the months as March, Mayo.

Mayo, March

Session 2 – English
   Example of Reading WM Block 2

Block 2: 2 sentences spoken

Participant reads and then recalls abruptly, all:

S1: Due to his weak performance, his position as director was terminated abruptly.

S2: It is possible, of course, that life did not arise on the earth at all.

Example of Month Ordering Block 2

Block 2: 2 months spoken

Participant hears and then recalls and orders the months March, May.

May, March

Method (cont.)

Procedure
Conducted on online platform FindingFive.com

Session 1 – Spanish
   • Short questionnaire on demographics and language status
   • The reading and working memory capacity task (Daneman & Carpenter, 1980) translated into Spanish
   • A Spanish Proficiency Test (Montrul, 2004)
   • The month ordering task (Goral et al., 2011) translated into Spanish

Note: The study was self-administered, with no experimenter present so there was no guarantee that participants were not cheating (writing down words during the tasks & in recall).

Session 2 – English
   • The same components as in the Spanish session but administered in English.
   • The Spanish Proficiency Test was replaced with a short break.

Results

Reading WM Task
As displayed in Figure 1, a significant difference was found in the accuracy of recall between the English Reading WM task and the Spanish Reading WM task. Bilingual participants who performed the Reading WM task in English were 6% more accurate in recalling last words of sentences than those who performed the Reading WM task in Spanish.

Spanish Proficiency Test
There was no correlation found between Spanish Proficiency Test scores and scores on any of the WM tasks in either language.

Month Ordering Task
There was no significant difference observed in average participant scores between the Spanish Month Ordering task and the English Month Ordering task. Participants who performed the Spanish Month Ordering task only scored 0.2 points more than those who performed the English Month Ordering task.

Discussion

1. Spanish-English Bilinguals performed significantly better in the English Reading WM task than the Spanish Reading WM task. However, there was no difference in performance in the English Month Ordering task and the Spanish Month Ordering task.

2. The findings of this study support those of Kaushanskaya & Yoo (2012) in that bilinguals perform very well in verbal WM tasks as opposed to other WM tasks.

3. Given the difficulties with carrying out the study in the preferred method, the original intent to carry out a Within-Participants study design may have produced different outcomes than the ones observed here. This Between-Participants design yields interesting results, but does not account for the individual differences between participants in either group. Had the same participants performed all tasks in both sessions, these groups would have been the exact same and all individual differences would have been alleviated.

Limitations:
   • Lack of experimenter observation of participants: It may have allowed participants to use assistance that would not be possible in a laboratory setting.
   • Uneven number of participants between sessions: Some participants did not return for Session 2 in English, therefore creating a discrepancy between data.
   • Participant production of invalid data: Some participants did not understand the directions of the experiment, therefore producing invalid data that had to be removed from the data set.

References


