Even in Different Scripts: Bilingual Cross Language Semantic Influences During Visual Word Recognition

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- ***Can semantic processing in one language be affected by bilinguals' other language?***
- ***Does cross-language activation influence different-script bilinguals when one orthography is visually presented?***

➢ A single phonological representation can refer to different semantic representations in different languages

LACHEM לחם ≠ LECHEM לחם

Does the meaning of *meat* influences processing of the word '*lechem*' for speakers of Hebrew/Arabic?

➢ Prior research demonstrated cross-language activation even for visually presented words, but only with same-script bilinguals which use the same orthography, typically the Roman Alphabet (Dijkstra 2005).

➢ Other studies demonstrated cross-language influences via translational links (Degani, Prior, & Tokowicz, 2011; Thierry & Wu, 2007) but not via phonology.

➢ When different-script bilinguals were studied, both orthographies were presented (e.g., masked priming Gollan, Forster, & Frost, 1997)

- ***Why study different script bilinguals?***

➢ Orthography can theoretically serve as a valid cue to language membership

Hebrew	א ב ג ד ה ו ז ח ט י כ ל מ נ ס ע פ צ ק ר ש ת ם ך ף ן ץ
Arabic	ا ب ت ث ج ح خ د ذ ر ز س ش ص ض ط ظ ع غ ف ق ك ل م ن ه و ي ء ئ ؤ ة ى لا

➢ De-coupling of influences from shared orthography vs. shared phonology

➢ There are many different-script bilinguals…

The Current Study

➢ Does Arabic influence performance of Arabic-Hebrew bilinguals in Hebrew?

➢ Can we observe such cross-language influences with little processing time of the visually presented words?

➢ Does second-language (L2) proficiency modulate these cross-language influences?

Participants:

➢ 34 Arabic-Hebrew bilinguals (1 male)

➢ 34 native Hebrew speakers with no knowledge of Arabic (10 males)

Measure	Arabic-Hebrew Bilinguals	Native Hebrew (Control)
Age (in years)*	20.1 (1.07)	26.17 (5.06)
Education (in years)*	12.36 (1.97)	13.98 (2.18)
Arabic reading proficiency	9.62 (0.89)	-
Arabic writing proficiency	9.21 (1.32)	-
Arabic conversation proficiency	9.65 (0.88)	-
Arabic speech comprehension proficiency	9.71 (0.63)	-
Hebrew reading proficiency*	8.25 (1.44)	9.38 (1.74)
Hebrew writing proficiency*	7.38 (1.41)	9.32 (1.75)
Hebrew conversation proficiency*	6.53 (1.61)	9.29 (1.77)
Hebrew speech comprehension proficiency*	8.39 (1.43)	9.47 (1.75)
Hebrew use*	6.10 (2.02)	8.18 (1.33)
Age began learning Hebrew (years)	7.85 (1.52)	-
Time studied Hebrew (in years)	10.56 (1.50)	-

Stimuli:

➢ 42 Targets paired with related critical cognate or control primes ('yes' responses)

➢ 42 Targets paired with unrelated critical false-cognate or control primes ('no' responses)

➢ 78 fillers -- each participant saw only 13% of items with phonological overlap

➢ Critical and control primes were matched on

- ➢ Hebrew length and frequency
- ➢ Semantic & form similarity ratings (1-7) - norming from native Hebrew speakers
- ➢ Form overlap of Arabic Translations

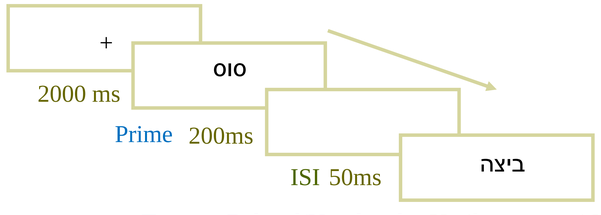
		Cognate (n=42)		False-Cognate (n=42)	
		Critical	**Control**	**Critical**	**Control**
Prime	Presented form	סבון	קצף	סוס	עט
	IPA	/sabon/	/ketsef/	/sus/	/ʔet/
	Hebrew meaning	Soap 	Foam 	Horse 	Pen 
	Arabic meaning	Soap 	N/A	Chick 	N/A
Target	Presented form	מקלחת		ביצה	
	IPA	/miklaxat/		/bejtsa/	
	Hebrew meaning	Shower 		Egg 	
	Arabic meaning	N/A		N/A	
Expected Response		**Yes**		**No**	

Task & Procedure

➢ Semantic relatedness decision (Yes/No) in Hebrew

➢ Language Proficiency Measures:

- Picture naming task (30 pictures per language) (based on Moreno-Martínez & Montoro, 2012)
- Language History Questionnaire (Marian et al., 2007)



Predictions: for Arabic-Hebrew bilinguals, but not native Hebrew speakers:

➢ Arabic meaning should facilitate processing of targets following critical cognate primes

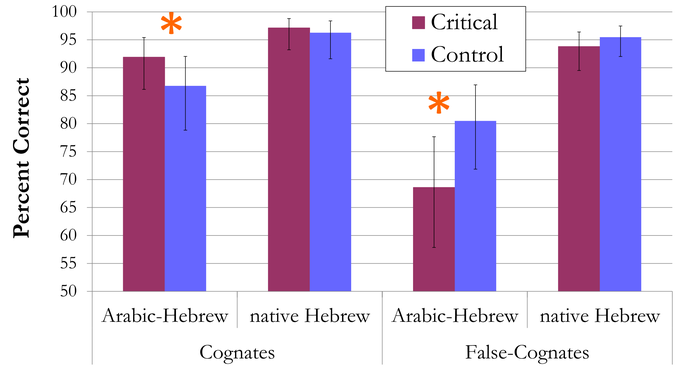
➢ Arabic meaning should interfere with processing of targets following critical false-cognate primes relative to control primes.

Results

➢ Data analyzed using LMEs with participant & item as crossed random factors, and **Group** (native Hebrew vs. Arabic-Hebrew) and **Condition** (critical vs. control) as fixed factors. Separate analyses for 'yes' (cognate) and 'no' (false-cognate) trials.

➢ Initial analyses revealed non-negligible differences between the critical and control items for the native Hebrew control group.

➢ Based on timed semantic relatedness judgment of a separate group of 30 native Hebrew speakers, selected a subset of items with more than 85% correct responses.



➢ **Cognate facilitation:** For cognate primes bilinguals were more accurate and faster at correctly designating the prime and target Hebrew words as semantically related.

➢ **False-cognate interference:** For false-cognate primes bilinguals were more likely to erroneously designate the prime and target Hebrew words as semantically related.

➢ No modulations by Hebrew (L2) proficiency in the current sample.

Discussion

- Activation of L1 Arabic during visual word-processing in L2 Hebrew.
- Bilinguals were unable to limit activation of the non-target language even when a single orthography is presented and in the absence of bottom-up activation for the non-target language → do not use the valid cue to target language identity.
- Cross-language influences that are phonologically mediated, strong enough to lead to erroneous decisions very rapidly (prime-target SOA = 250 ms).
- **Conclusion**: strong evidence for cross-language influences even among different-script bilinguals, suggesting an interconnected dynamic bilingual lexicon

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