University of Haifa — אוניברסיטת חיפה — جامعة حيفا

Multilingual LNL — המעבדה לחקר רב-לשוניות

Language and Numbers Laboratory

Edmond J. Safra Brain Research Center For the Study of Learning Disabilities
מרכז אדמונד י. ספרא לחקר המוח בלקויות למידה
مركز إدموند ج. سفرا لبحوث الدماغ في العسر التعليمي
THE FACULTY OF EDUCATION — הפקולטה לחינוך كلية التربية

החוג ללקויות למידה

What source language do we rely on when speaking in L3:
Does executive control modulate cross-linguistic influence in L3 syntax production?

Razan Silawi, Anat Prior and Tamar Degani

Edmond J. Safra Brain Research Center, Faculty of Education, University of Haifa

Introduction

Production of L3 is a challenging task, especially because it has two previously known language competitors (Puig-Mayenco et al., 2018 ;Wremble, 2010).

Cross-linguistic Influence (CLI) in trilinguals can follow several potential scenarios of transfer (Bardel & Falk, 2007; Hermas, 2010, Slabakova, 2017; Westergaard et al., 2017)
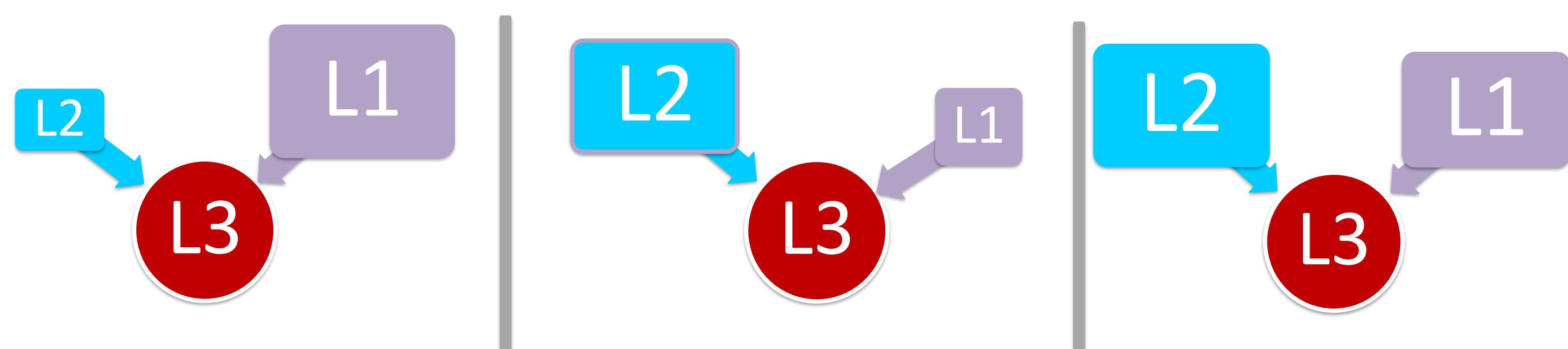
Due to its complexity (Dewaele & Furnham, 2000), managing CLI in L3 syntax production might recruit executive control abilities (Linck et al., 2008), but very little is known about the role of executive control in L3 production processes.

Research questions:

RQ1 : What is the main source of cross-linguistic influence in L3 production?
RQ2: Are individuals with better executive control abilities better at managing CLI in L3 syntax production?

Method

Participants 60 undergraduates (L1 Arabic, L2 Hebrew, L3 English).

Background measures

Syntactic awareness MATAL in L1 and L2

Language proficiency Multilingual naming test (MINT sprint, Gracia & Gollan, 2021), Semantic fluency (Gollan et al., 2002; Kavé, 2005), Receptive vocabulary (Shipley, 1986), Language history questionnaire (Marian et al., 2007).

Experimental measures

Executive control:
- Working memory: Backward color span (Hasselhorn et al., 2012)
- Shifting: Dimensional Card Sort (Zelazo, 2006)
- Inhibition: Anti saccade (Rey-Mermet, 2018) and Double trouble Stroop (Draheim)

CLI in production: Elicited imitation task (Erlam, 2006):
- Task: listen to the sentence, decide if you agree or not, and then repeat it in correct English 🎧 ➡️ 🧑 ➡️ 🗣️
- 80 grammatical and 80 ungrammatical statement-like sentences in L3.
- Binary scoring: 1 repeated correctly (corrected ungrammatical structure/preserved grammatical structure), 0 repeated incorrectly.
- CLI: Ungrammatical sentences reflect 4 conditions of transfer:

| Conditions of transfer	Syntactic structure	Examples of ungrammatical sentences
(L3 = L2) ≠ L1	Possessive marking	In the US, the *president lawyer lives in the white house.
	Superlative - definite article omission	Lions are usually *bravest animals in the world.
(L3=L1) ≠ L2	Comparative form	Some stars are *more hot than the sun.
	Superlative form	Flights to Turkey are *the most cheap during the winter break.
L3 ≠ (L1=L2)	1st person prodrop	Last year, when we met people, *hugged them and kissed them.
	Copula omission	Today, all children *addicted to video games
	Indefinite article omission	The Big Ben *is clock in the United Kingdom.
L3=L2=L1 (Control)	Verb-time expression	Next year people *wear masks in public places.
	Quantifier noun plural agreement	Every house should have five *picture on the walls.

Results

Analyses using lme4 (Baayen, Davidson, & Bates, 2008) in R.
For RQ1:
TargetStructureAccuracy ~ Condition * Grammaticality+ TargetFrequency+ (1 | Subject) + (1 | SentenceID).

Predicting CLI across conditions and grammaticality
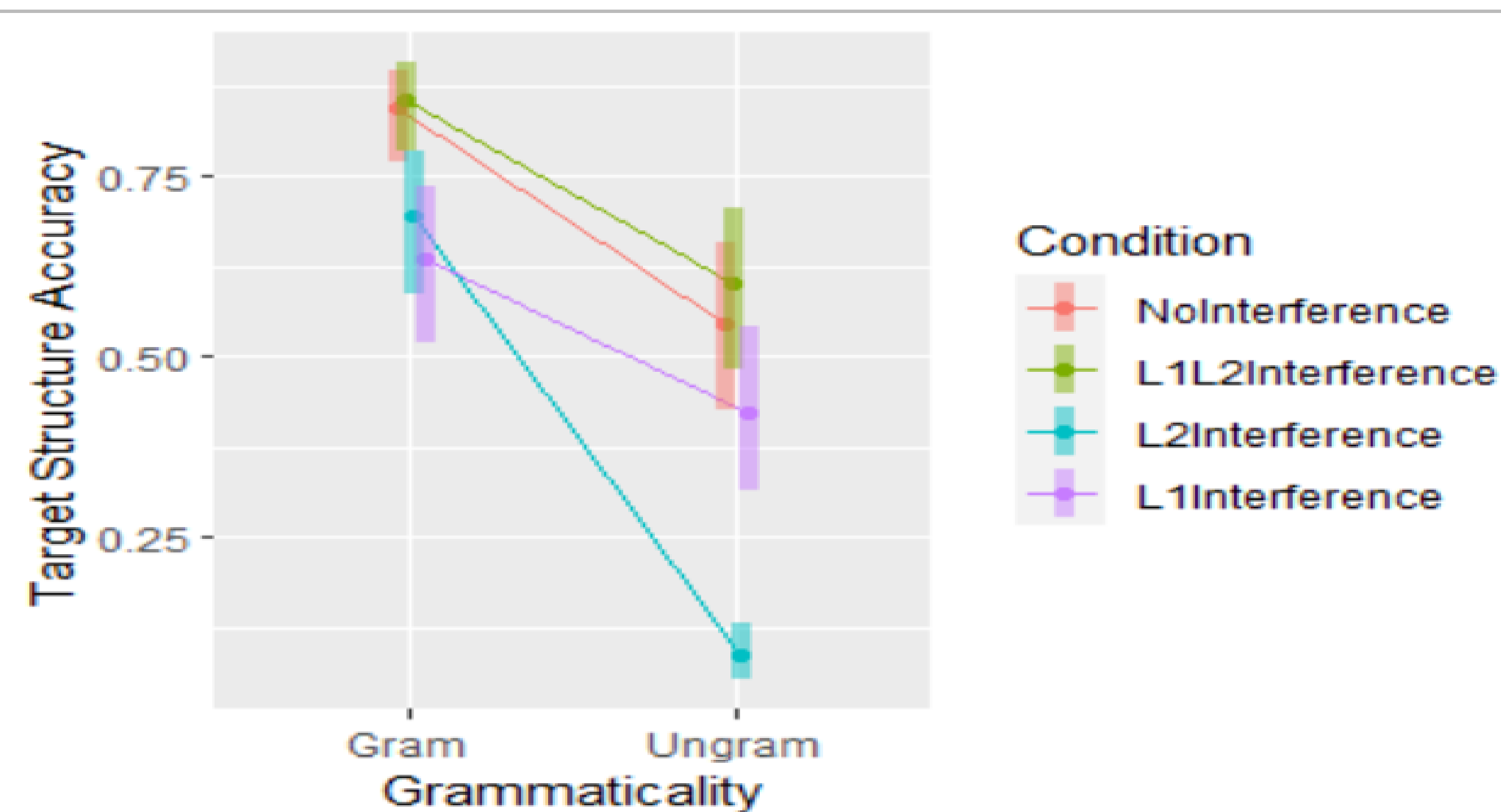
For RQ2:
Principle component analysis (PCA) to compute one executive control component and one English proficiency component.
TargetStructureAccuracy ~ Condition * ExecutiveControl_PCA+ EngProf_PCA+ (1 | Subject) + (1 | SentenceID)

Correlations between executive control measures

Variable	1	2	3
1. WorkingMemory			
2. AntiSaccade	-.01		
3. DoubleTroubleStroop	.32*	-.10	
4. CardSort	.14	-.15	.28*

- Low or no correlations between different executive control measures.
- No significant modulating role for the executive control component on performance in the task.

Conclusions

- In the more difficult task of correcting ungrammatical sentences, participants were more strongly impacted by interference from L2 than from L1. However, when required to repeat intact structures, participants had similarly reduced performance for both L1 interference and L2 interference.
- The results demonstrate transfer from both sources of previous linguistic knowledge during L3 production, suggesting that the interplay between L1-L3 and L2-L3 is dynamically modulated by task demands.
- Differences in transfer patterns between grammatical and ungrammatical sentences may suggest that the grammar of L1 and L2 might be sustained in different memory systems, implicit (L1) and explicit (L2) (Ullman, 2001).
- The preliminary analysis found no modulating role of executive control on managing CLI in language production. This might be due to the specific tasks used in the current research, and warrants further study.

References

Bardel, C., & Falk, Y. (2007). The role of the second language in third language acquisition: the case of Germanic syntax. Second Language Research, 23(4), 459–484..

Dewaele, J. M., & Furnham, A. (2000). Personality and speech production: A pilot study of second language learners. Personality and Individual differences, 28(2), 355-365.

Draheim, C., Tsukahara, J. S., Martin, J., Mashburn, C., & Engle, R. W. (2019, October 3). A toolbox approach to improving the measurement of attention control.

Erlam, R. (2006). Elicited imitation as a measure of L2 implicit knowledge: An empirical validation study. Applied linguistics, 27(3), 464-491.

Hasselhorn, M., Schumann-Hengsteler, R., Gronauer, J., Grube, D., Mähler, C., Schmid, I., ... & Zoelch, C. (2012). Arbeitsgedächtnistestbatterie für Kinder von fünf bis zwölf Jahren:(AGTB 5-12).

Hermas, A. (2010). Language acquisition as computational resetting: verb movement in L3 initial state. International Journal of Multilingualism, 7(4), 343–362. Gollan, T. H., Montoya, R. I., & Werner, G. A. (2002). Semantic and letter fluency in Spanish-English bilinguals. Neuropsychology, 16(4), 562

Kavé, G. (2005). Phonemic fluency, semantic fluency, and difference scores: Normative data for adult Hebrew speakers. Journal of Clinical and Experimental Neuropsychology, 27(6), 690-699.

Linck, J. A., Hoshino, N., & Kroll, J. F. (2008). Cross-language lexical processes and inhibitory control. The Mental Lexicon, 3(3), 349-374.

Marian, V., Blumenfeld, H. K., & Kaushanskaya, M. (2007). The Language Experience and Proficiency Questionnaire (LEAP-Q): Assessing language profiles in bilinguals and multilinguals. Journal of Speech, Language, and Hearing Research. 50, 940–967.

Puig-Mayenco, E., González Alonso, J., & Rothman, J. (2018). A systematic review of transfer studies in third language acquisition. Second Language Research, Slabakova, R. (2017). The scalpel model of third language acquisition. International Journal of Bilingualism, 21(6), 651–665. Ullman, M. T. (2001). The declarative/procedural model of lexicon and grammar. Journal of Psycholinguistic Research, 30(1), 37-69.

Ullman, M. T. (2001). The declarative/procedural model of lexicon and grammar. Journal of Psycholinguistic Research, 30(1), 37-69.

Westergaard, M., Mitrofanova, N., Mykhaylyk, R., & Rodina, Y. (2017). Crosslinguistic influence in the acquisition of a third language: The Linguistic Proximity Model. International Journal of Bilingualism, 21(6), 666–682.

Wremble, M. (2010). L2-accented speech in L3 production. International Journal of Multilingualism, 7(1), 75–90.

Zelazo, P. D. (2006). The Dimensional Change Card Sort (DCCS): A method of assessing executive function in children. Nature protocols, 1(1), 297-301.