

## Classifiers in L1, L2 and Heritage Language processing

- **Native speakers** of Chinese can use classifiers as a cue to predict the upcoming noun (Huetting et al., 2010, Klein et al., 2012, Tsang & Chambers, 2011).
- **L2 learners** of Chinese and Japanese also showed a facilitative effects of the classifier (Lau & Grüter, 2015; Mitsugi, 2018) but potentially relying more strongly on semantic information (Grüter et al., 2020).
- Studies on Spanish and Polish have shown that **heritage speakers** can use grammatical gender as a cue to predict upcoming referents (Fuchs, 2022a; Fuchs, 2022b).
- No published work on processing of classifiers in Vietnamese (but see Ito et al., 2020)

## Research Question

To what extent do home-country raised and heritage speakers of Vietnamese use classifiers to predict upcoming nouns?

## Classifiers in Vietnamese

- “Classifiers are words used to categorize word classes based on an attribute such as shape, function, or animacy” (Pham & Kohnert, 2008, p.1).
- acquired early in Vietnamese (Tran, 2010)

### Obligatory occurrence of classifier

- in expressions of quantity (e.g., *hai con mèo* “two CL cats”)
- with demonstratives (e.g., *cái bàn này* “CL table this”, *cái bàn kia* “CL table that”) or wh-words (*gi* “what”, *nào* “which”), in specific or definite noun phrases (e.g., *cái bàn nào* “CL table which”)
- with question words (*bao nhiêu*, *mấy* “how many”) that require a numeral response (e.g., *có mấy con cá* “how many CL fish”)
- Optional in other contexts (e.g., *anh ấy thích ăn cá* “he likes eating fish”)

### Classifiers used in this study

- The two most common classifier in Vietnamese (Dao, 2012; Tran, 2011):
  - **cái**: generally used with **inanimate** objects (e.g., *cái ghế* “a chair”)
  - **con**: generally used with **animate** objects (e.g., *con chó* “a dog”), but can also be used with **some inanimate** objects (e.g., *con dao* “a knife”, *con thuyền* “a boat”, *con điều* “a kite”)

## References

Dao, L. (2012). The Vietnamese classifiers ‘CON’/‘CÁI’ and the Natural Semantic Metalanguage (NSM) approach: A preliminary study. In *Australian Linguistic Society Conference*. Australian Linguistic Society. <http://hdl.handle.net/1885/9327>

Fuchs, Z. (2022a). Eyetracking evidence for heritage speakers’ access to abstract syntactic agreement features in real-time processing. *Frontiers in Psychology*, 13, 8563. <https://doi.org/10.3389/fpsyg.2022.960376>

Fuchs, Z. (2022b). Facilitative use of grammatical gender in Heritage Spanish. *Linguistic Approaches to Bilingualism*, 12(6), 845–871.

Grüter, T., Lau, E., & Ling, W. (2020). How classifiers facilitate predictive processing in L1 and L2 Chinese: The role of semantic and grammatical cues. *Language, Cognition and Neuroscience*, 35(2), 221–234. <https://doi.org/10.1080/23273798.2019.1648840>

Huetting, F., Chen, J., Bowerman, M., & Majid, A. (2010). Do language-specific categories shape conceptual processing? Mandarin classifier distinctions influence eye gaze behavior, but only during linguistic processing. *Journal of Cognition and Culture*, 10, 39–58.

Ito, A., Nguyen, H. T. T. & Knoeferle, P. (2020). Effects of verb and classifier constraints on expectations in first and second language comprehension. Poster presented at the CUNY Conference on Human Sentence Processing, Amherst, USA. [poster]

Klein, N. M., Carlson G. N., Li, R., Jaeger T. F., & Tanenhaus, M. K. (2012). Classifying and massifying incrementally in Chinese language comprehension. In D. Massam (Ed.), *Count and mass across languages* (pp. 261–282). Oxford, UK: Oxford University Press.

Lau, E. & T. Grüter. (2015). Real-time processing of classifier information by L2 speakers of Chinese. In E. Grillo & K. Jepsen (eds.), *Proceedings of the 39th Annual Boston University Conference on Language Development*, 311–323. Somerville, MA: Cascadia Press.

Le, D. T., & Quasthoff, U. (2016). Construction and analysis of a large Vietnamese text corpus. In *Proceedings of the Tenth International Conference on Language Resources and Evaluation (LREC’16)* (pp. 412–416).

Mitsugi, S. (2018). Generating predictions based on semantic categories in a second language: A case of numeral classifiers in Japanese. *International Review of Applied Linguistics*. (pub- lished online 2018-07-03). Retrieved from <https://www.degruyter.com/view/j/iral.ahead-of-print/iral-2017-0118/iral-2017-0118.xml>

Pham, G. & Kohnert, K. (2008). A corpus-based analysis of Vietnamese ‘classifiers’ con and cái. *Mon-Khmer Studies*, 38, 161–171.

Tran, J. (2010). Child acquisition of Vietnamese classifier phrases. *Journal of Southeast Asian Linguistics Society*, 3, 111–137.

Tran, J. (2011). The acquisition of Vietnamese classifiers. Unpublished doctoral dissertation, University of Hawaii at Manoa.

Tsang, C., & Chambers, C. (2011). Appearances aren’t every- thing: Shape classifiers and referential processing in Cantonese. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 37, 1065–1080.

## Participants

- recruited at the University of Hawai’i and the Vietnamese community in Hawai’i.

Table 1. Participant information (means and ranges)

	Home-country raised speakers (L1 group)	Heritage speakers (HS group)
N	19 (12 F, 7 M)	26 (15 F, 11 M)
Age	35.8 (19-55)	20.7 (18-30)
Self-rated Proficiency Vietnamese (/10)	9 (7-10)	5.5 (1-9)
Self-rated Proficiency English (/10)	7.47 (5-10)	8.96 (6-10)

### Inclusion criteria

- For HS group: 1) placed in a Vietnamese class at UHM; 2) came from Vietnamese-speaking families with at least one parent speaking Vietnamese as a dominant language at home.
- For L1 group: 1) born and raised in Vietnam; 2) AOA to the US: after 18 years old; 3) currently living in Hawai’i.

## Materials

- Classifier-noun pairing test (fill in the blank, 25 items; incl. 12 target nouns)
  - Example: *Tôi có hai \_\_\_\_\_ chó* (I have two \_\_\_\_\_ dogs)
  - Expected answer: *con* [animate classifier]
- Visual world experiment
  - 24 critical trials (16 typical noun trials: 8 SAME cond., 8 DIFFERENT cond.; 8 atypical nouns trials); 16 filler trials

Table 2. List of Typical and Atypical Nouns and their Frequency in the Vietnamese Mixed Corpus (Le & Quasthoff, 2016)

Classifier	TYPICAL Nouns	Classifier	TYPICAL Nouns	Classifier	ATYPICAL Nouns
con (animate)	chó ‘dog’ (77,093)	cái (inanimate)	bát ‘bowl’ (95,239)	con (inanimate)	dao ‘knife’ (129,914)
	mèo ‘cat’ (47,739)		điện thoại ‘phone’ (N/A)		thuyền ‘boat’ (153,961)
	gà ‘chicken’ (184,905)		bàn ‘table’ (997,400)		tem ‘stamp’ (27,001)
	chim ‘bird’ (118,884)		ghế ‘chair’ (152,127)		điều ‘kite’ (18,550)

Figure 1. Sample of Visual Stimuli in Typical Noun Trials

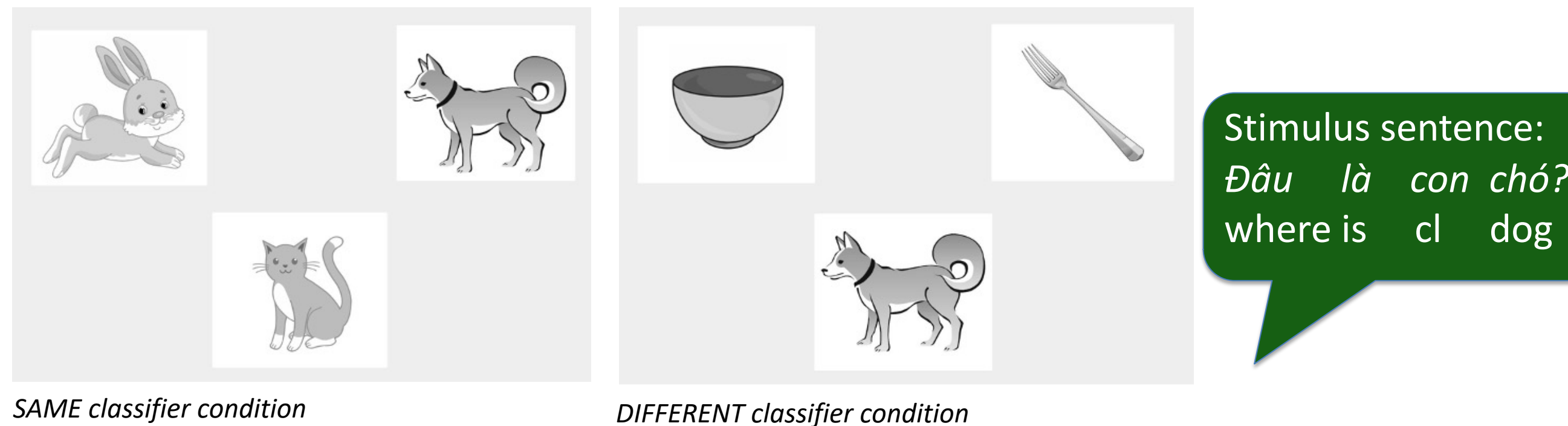


Figure 2. Sample of Visual Stimuli in Atypical Noun Trials

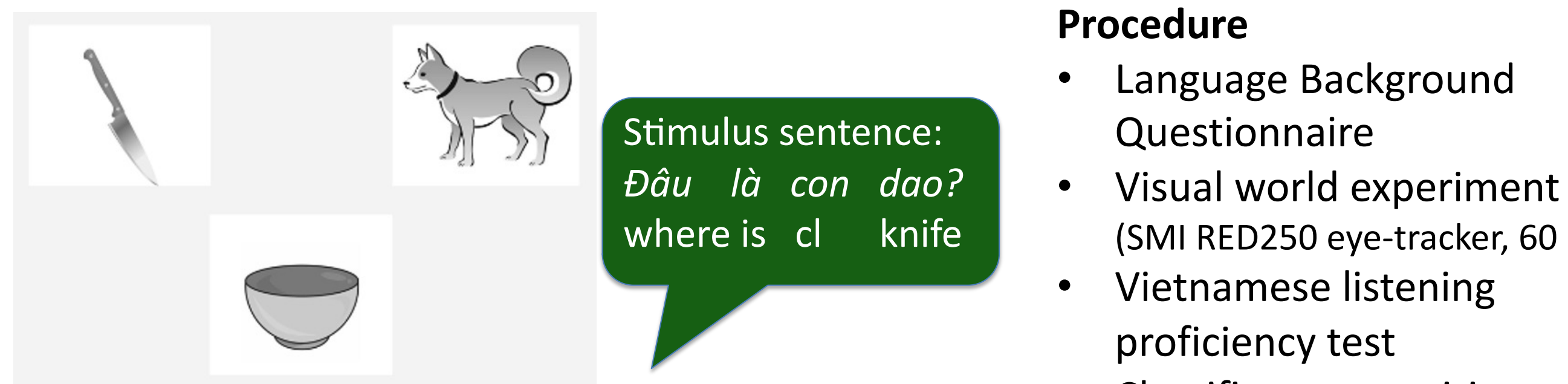
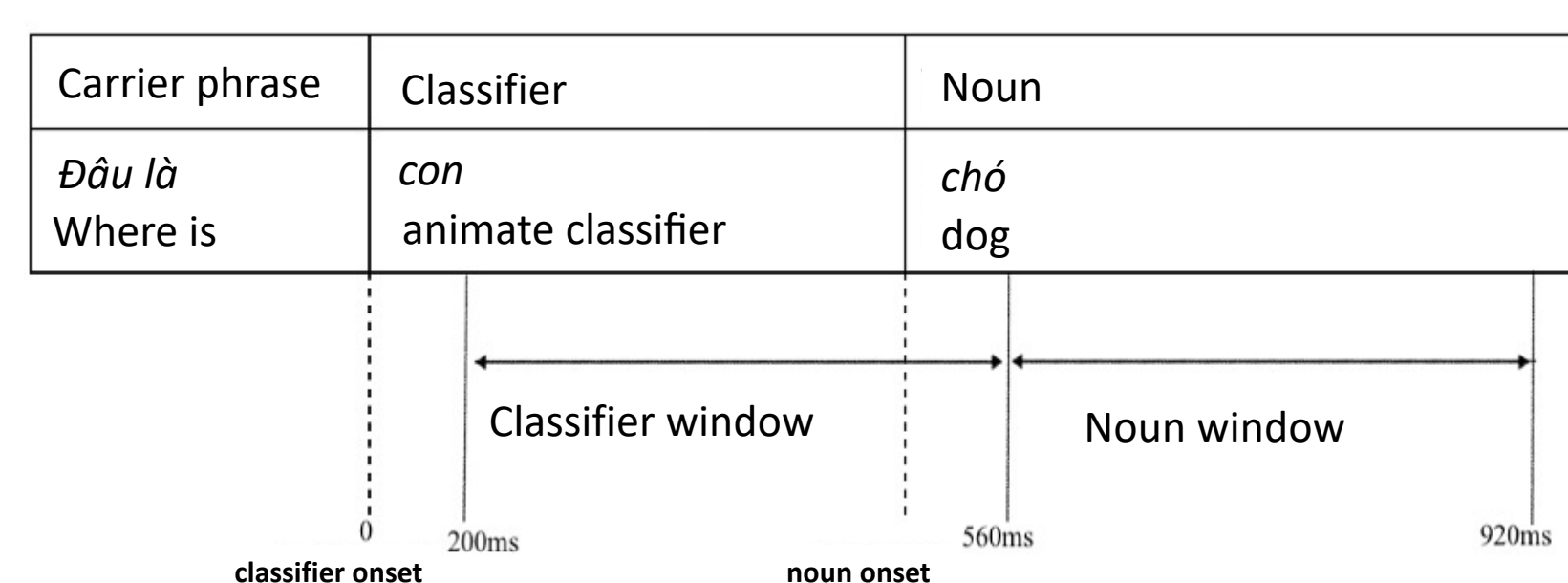


Figure 3. Time Windows for analysis



## TYPICAL nouns

- Accuracy on fill-the-blank test: L1 group: 100%; HS group:  $M=66.9\%$  ( $SD=21.5$ )
- Mouseclick accuracy in VWP task: L1 group: 100%; HS group:  $M=95\%$  ( $SD=5.5$ )
- Eye gaze analysis excludes trials with incorrect mouseclicks and items with incorrect fill-the-blank responses

Figure 4. Typical Nouns: Mean Proportion of Looks to Target by Group, Time Window, and Condition. Error bars indicate 95% CIs.

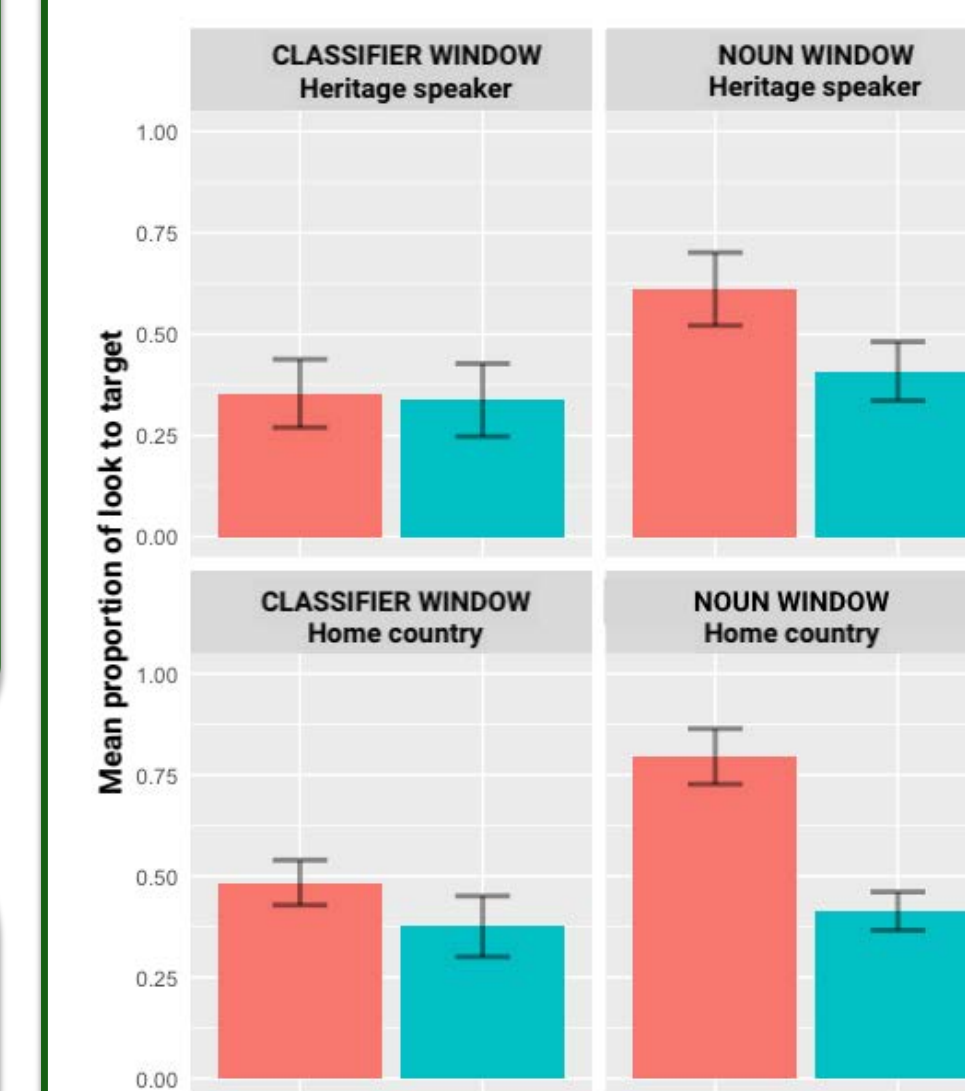
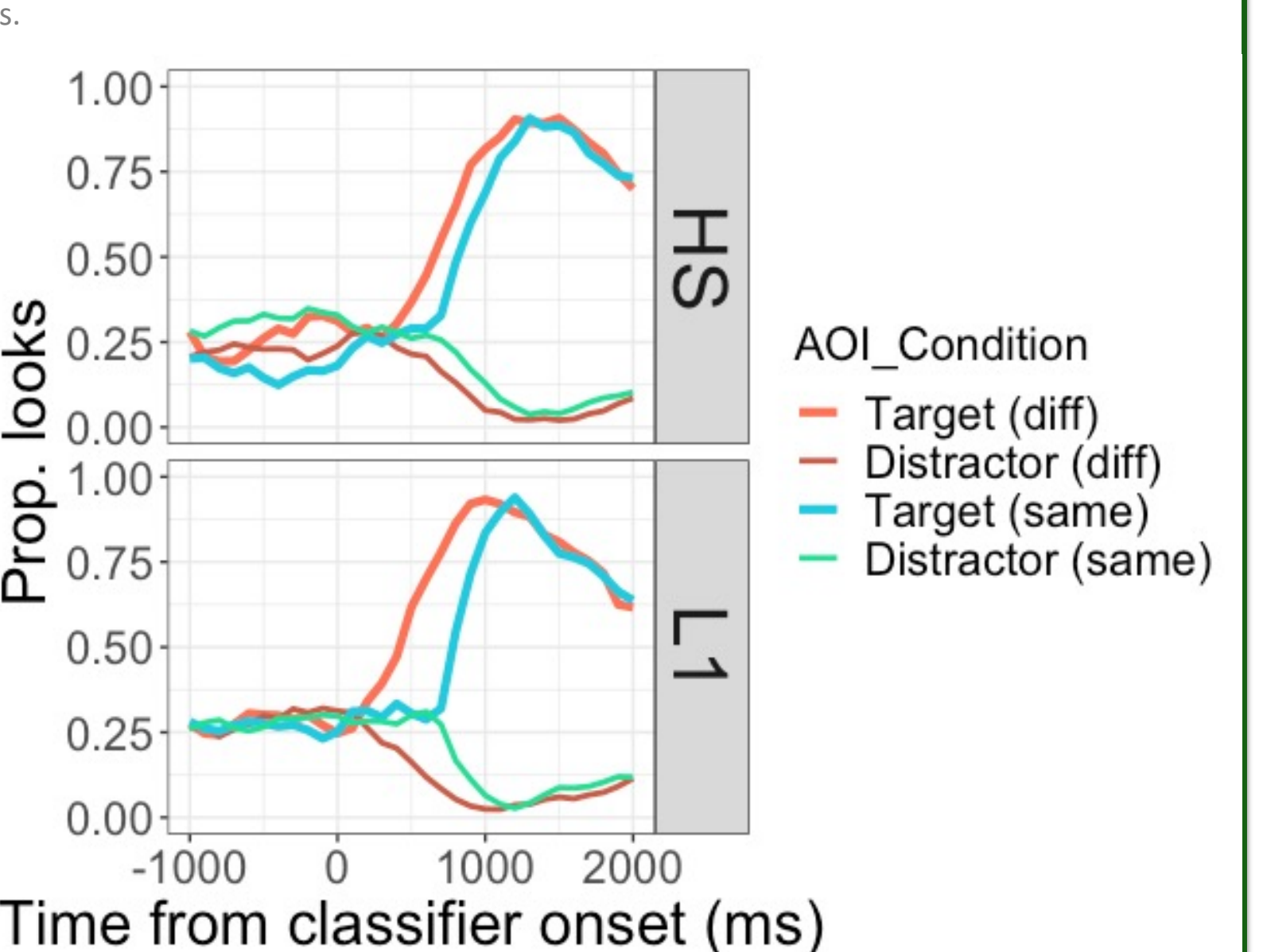


Figure 5. Mean Proportion of Looks over Time (by Group and Condition)



lmer: prop ~ Group \* Condition + (1 | Participant) + (1 | Stimulus)

- **Classifier window**: marginal interaction ( $b = -0.12$ ,  $t = -1.65$ ,  $p = .10$ ); more looks to target in home-country than HS group in the DIFF condition ( $b = .12$ ,  $t = 2.26$ ,  $p = .03$ )
- **Noun window**: significant interaction between condition and group ( $b = -0.20$ ,  $t = -3.05$ ,  $p = .002$ ); significant differences by condition within both groups but larger effect in home-country ( $b = -0.38$ ,  $t = -5.46$ ,  $p < .001$ ) than HS ( $b = -0.18$ ,  $t = -2.49$ ,  $p = .02$ )

## ATYPICAL nouns

- Responses on fill-the-blank test and during debriefing indicated variable knowledge and use of the classifier *con* with these nouns.
- Eye-gaze analysis (exploratory) includes data from all trials (no exclusions)

Figure 6. Atypical Nouns: Mean Proportion of Looks to Target by Group, Time Window, and Condition. Error bars indicate 95% CIs.

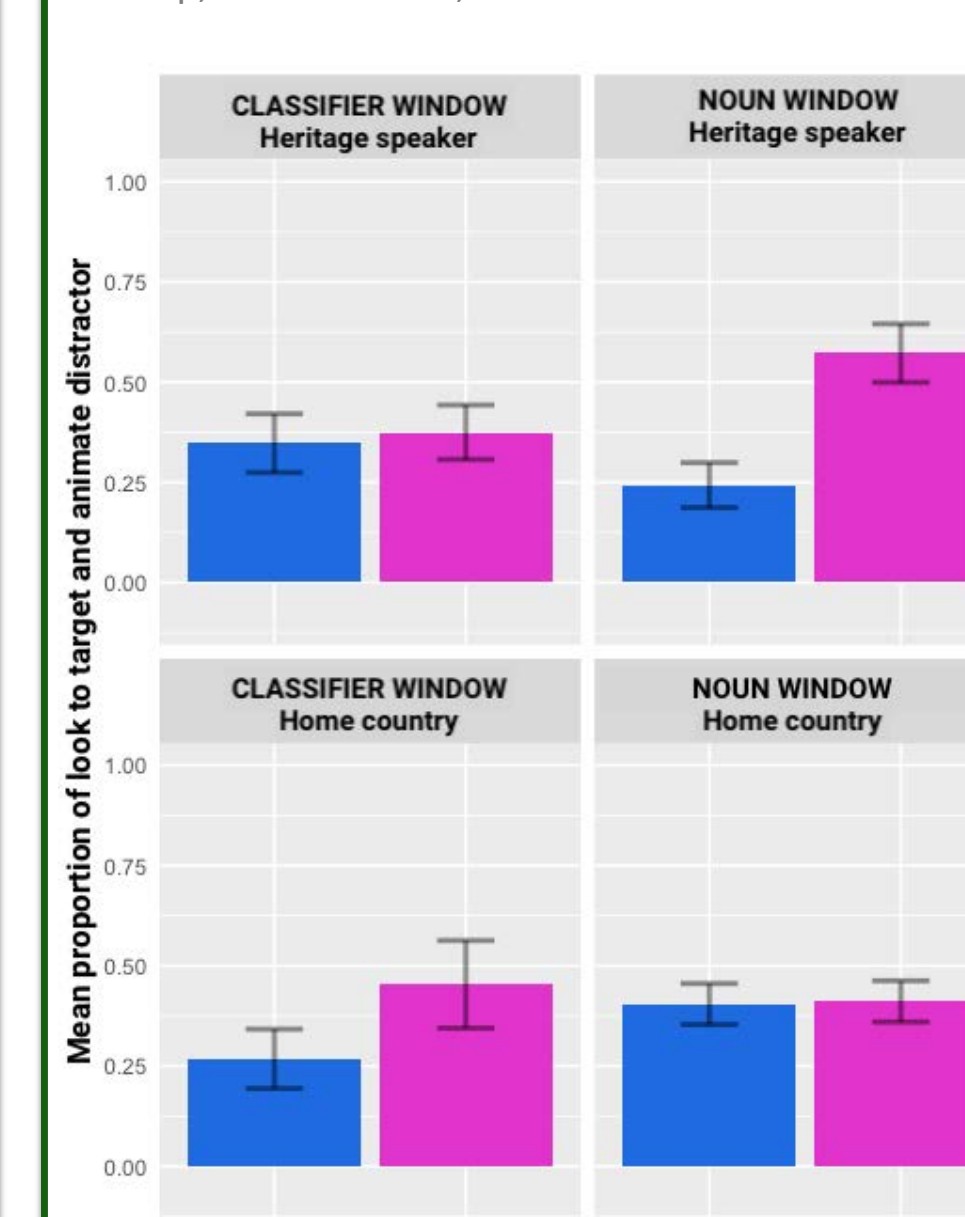
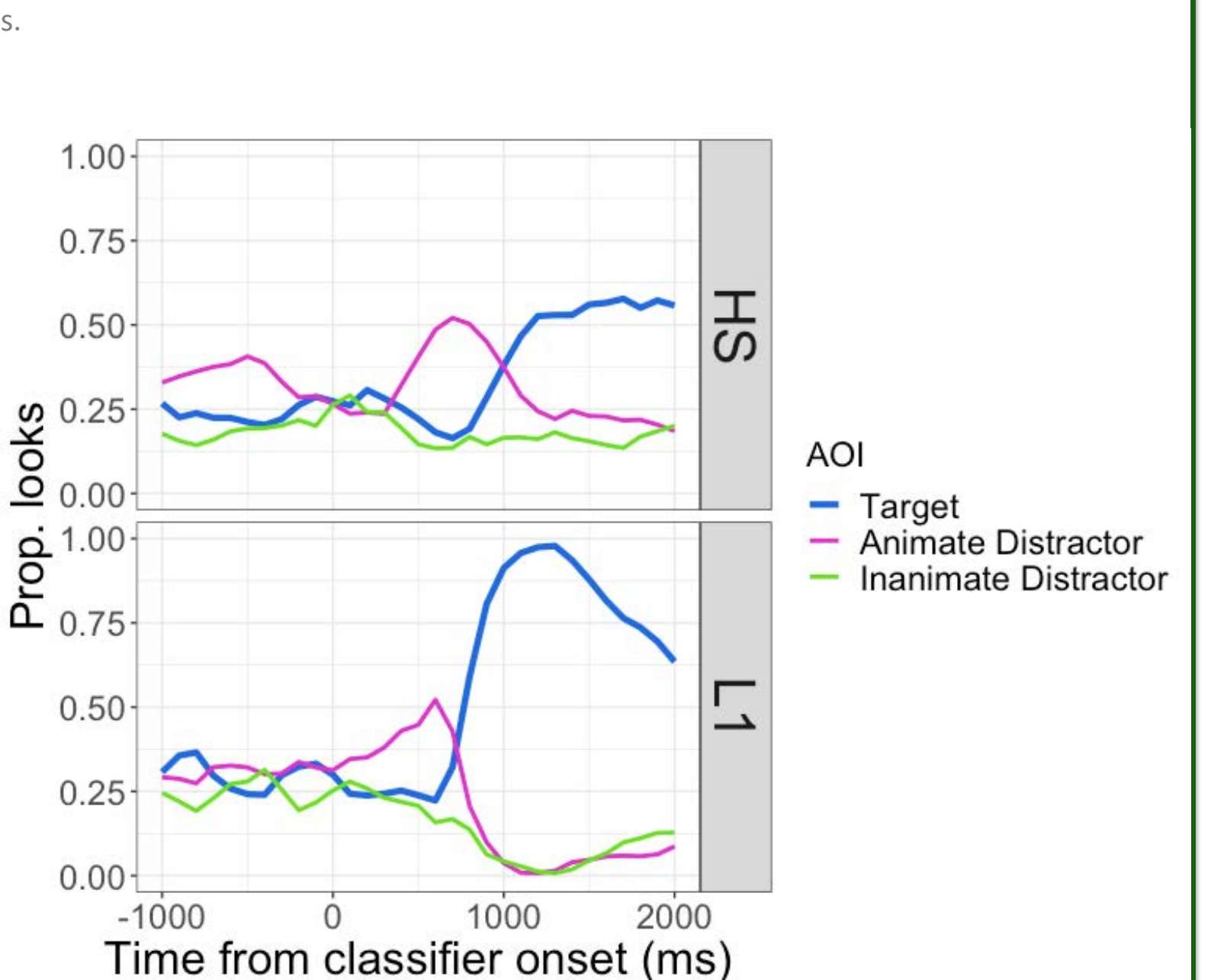


Figure 7. Mean proportion of Looks over Time (by Group)



lmer: log((prop\_target + .5) / (prop\_disAn + .5)) ~ Group + (1 | Participant) + (1 | Stimulus)

- **Classifier window**: no significant effect of group ( $b = 0.17$ ,  $t = 1.55$ ,  $p = 0.13$ )
- **Noun window**: effect of group ( $b = -0.38$ ,  $t = -4.30$ ,  $p < .001$ ); heritage speakers look **more at the animate distractor** than the Home country group.

- Both home-country raised and heritage speakers of Vietnamese use classifiers predictively to create expectations about the animacy of upcoming nouns in real-time processing,
- yet heritage speakers may do so at a slight delay when compared to home-country raised speakers.