

Independent processing of animacy and gender features in Polish: eyetracking evidence

Zuzanna Fuchs (zfuchs@usc.edu)
University of Southern California



USC PoMMLab
Psycholinguistics of Mono- & Multilingualism

Background & Research Questions

- Previous work:** eyetracking studies on facilitative use of grammatical gender show speakers of languages with abstract gender categories can access gender agreement features on pre-nominal elements and integrate them into word recognition of noun. (ex. German: Hopp, 2013; Russian: Sekerina, 2015; Polish: Fuchs, 2022)

[+F]
Gdzie jest zielon-A książka?
Where is green-FEM.NOM book.FEM

- Polish:** agreement morphemes may track more than one feature.
- Agreement with **masculine** nouns in the accusative differs between **animate** and **inanimate** nouns (no such distinctions for feminine or neuter nouns):
Kupiłam zielony długopis. '(I) bought (a) green pen.M.'
Kupiłam zielonego żółwia. '(I) bought (a) green turtle.M.'
- But some inanimate nouns (including loanwords) also behave like "animate" nouns:
Kupiłam zielonego laptopa. '(I) bought (a) green laptop.'
- Debate** in formal literature (based on agreement paradigms) on masculine animate:
 - Constitutes a separate gender category (ex. Corbett, 1983)
 - Constitutes a subcategory of the masculine (ex. Dukiewicz, et al. 1984)
- Psycholinguistics:** Each gender in a language corresponds to a gender node at the lemma level of the mental lexicon that connects and spreads activation to all nouns in that gender category. (ex. Roelofs, 1992)

Background on Polish	
3-gender system	Noun phrase structure
F ta koszula 'this shirt'	• no articles
ta książka 'this book'	• default order: adjective + noun
M ten stół 'this table'	• adjectives inflect for gender (and animacy), number, case
ten wazon 'this vase'	• gender also realized on past tense verbs, demonstratives, numerals, predicative adjectives
N to jajko 'this egg'	
to okno 'this window'	

Adjectival agreement paradigm (in singular)				
	M-I	M-A	F	N
Nominative	zielon-y	zielon-y	zielon-a	zielon-e
Genitive	zielon-ego	zielon-ego	zielon-ej	zielon-ego
Dative	zielon-emu	zielon-emu	zielon-ej	zielon-emu
Accusative	zielon-y	zielon-ego	zielon-ą	zielon-e
Instrumental	zielon-ym	zielon-ym	zielon-ą	zielon-ym
Locative	zielon-ym	zielon-ym	zielon-ej	zielon-ym

Research Question

Are gender and animacy agreement features on pre-nominal adjectives in Polish processed independently of each other?

Processed independently:

[+M] [+ANIM]

⇒ Nouns matching in a single feature (M-I and F-A) are also activated.

Wskaz zielon-EGO żółwia.
Indicate green-M.ANIM.ACC turtle.MASC.ANIM.ACC

Single abstract gender category:

[+M.ANIM]

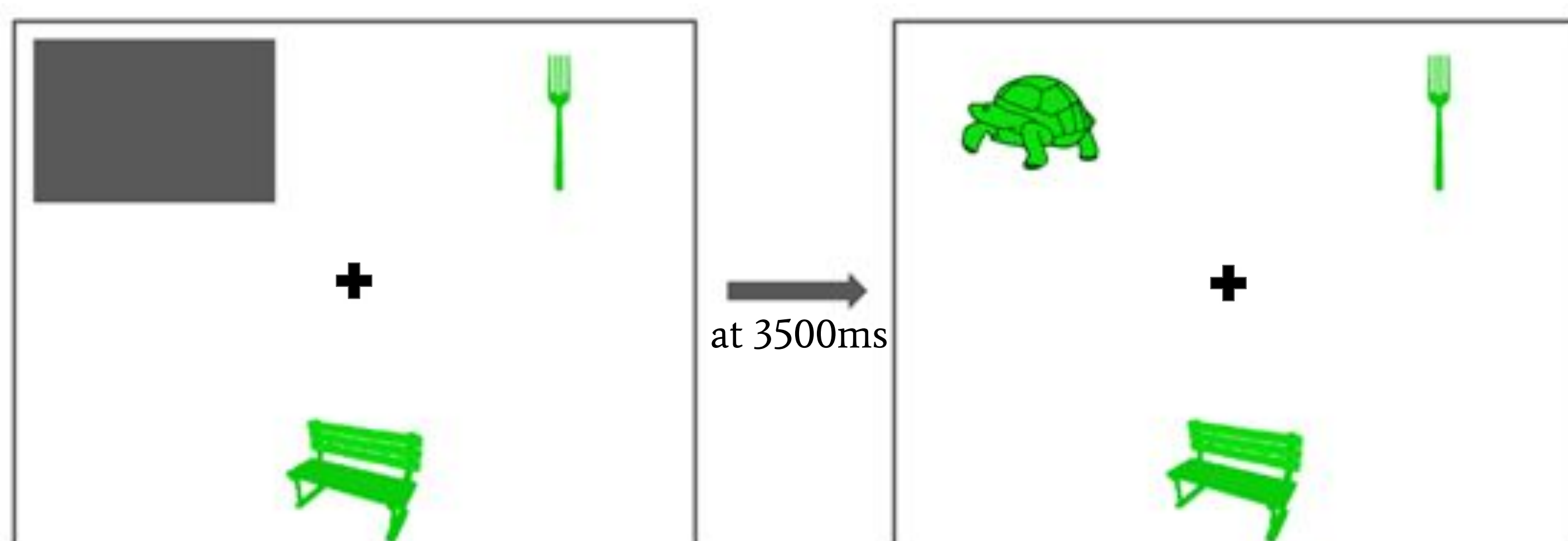
⇒ Partial feature match not possible, only M-A items are activated.

Eyetracking study: Visual World + Covered Box

n=47 native Polish speakers born, raised, and living in Poland at time of testing

320 displays balanced for gender & animacy of items; split into 2 lists

40 nouns 20 masc. (10 anim., 10 inanim); 20 fem. (10 anim., 10 inanim); no neuter



	Critical conditions					
	(Boxed) target		Competitor		Distractor	
	Gen.	Anim.	Gen.	Anim.	Gen.	Anim.
full match	M	A	M	A	F	I
test	M	A	M	I	F	I
test	M	A	F	A	F	I
no match	M	A	F	I	F	I
full match	M	I	M	I	F	A
test	M	I	M	A	F	A
test	M	I	F	I	F	A
no match	M	I	F	A	F	A

Auditory prompt

Wskaz
Indicate

{ różow-
zielon-
brązow-
color }
{ -ą (F-A/F-I)
-y (M-I)
-ego (M-A)
-gender.ACC } [NOUN.ACC].

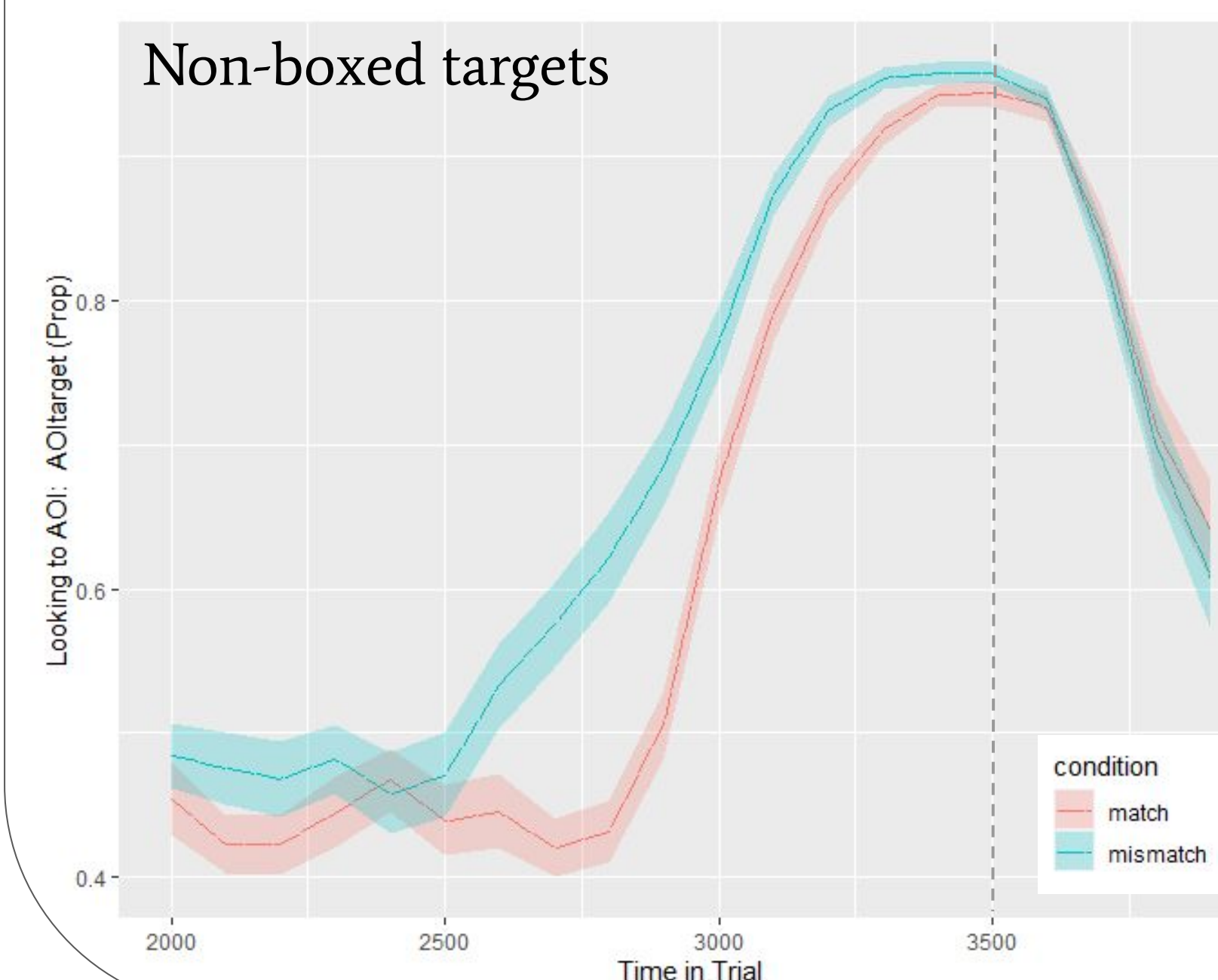
Selected references: Corbett, G. (1983). The Number of Genders in Polish. *Papers and Studies in Contrastive Linguistics*, 16, 83–89. Dukiewicz, L., Urbańczyk, S., & Polskiego, I. J. (1984). *Gramatyka współczesnego języka polskiego*. Warsaw: PWN. Fuchs, Zuzanna. 2022. Eyetracking evidence for heritage speakers' access to abstract syntactic agreement features in real-time processing. In Bayram, F., Kubota, M. & Soares, S. (Eds.), *The Next Phase in Heritage Language Studies: Methodological Considerations and Advancement* [Special Issue]. *Frontiers of Psychology*, 13. Hopp, H. (2013). Grammatical gender in adult L2 acquisition: Relations between lexical and syntactic variability. *Second Language Research*, 29(1), 33–56. Roelofs, A. (1992). A spreading-activation theory of lemma retrieval in speaking. *Cognition*, 42, 107–142. Sekerina, I. A. (2015). Predictions, fast and slow. *Linguistic Approaches to Bilingualism*, 5(4), 532–536. Schwarz, F., Bill, C., & Romoli, J. (2019). Reluctant Acceptance of the Literal Truth: Eye Tracking in the Covered Box Paradigm. *Proceedings of Sinn Und Bedeutung*, 20, 61–78.

Acknowledgments: For logistical support during participant recruitment and data collection, I am indebted to Aneta Mięksiz and the rest of the Department of Psychology at the University of Warsaw. For helpful discussion and feedback I am grateful to Masha Polinsky and Athulya Aravind. All errors are my own.

Results

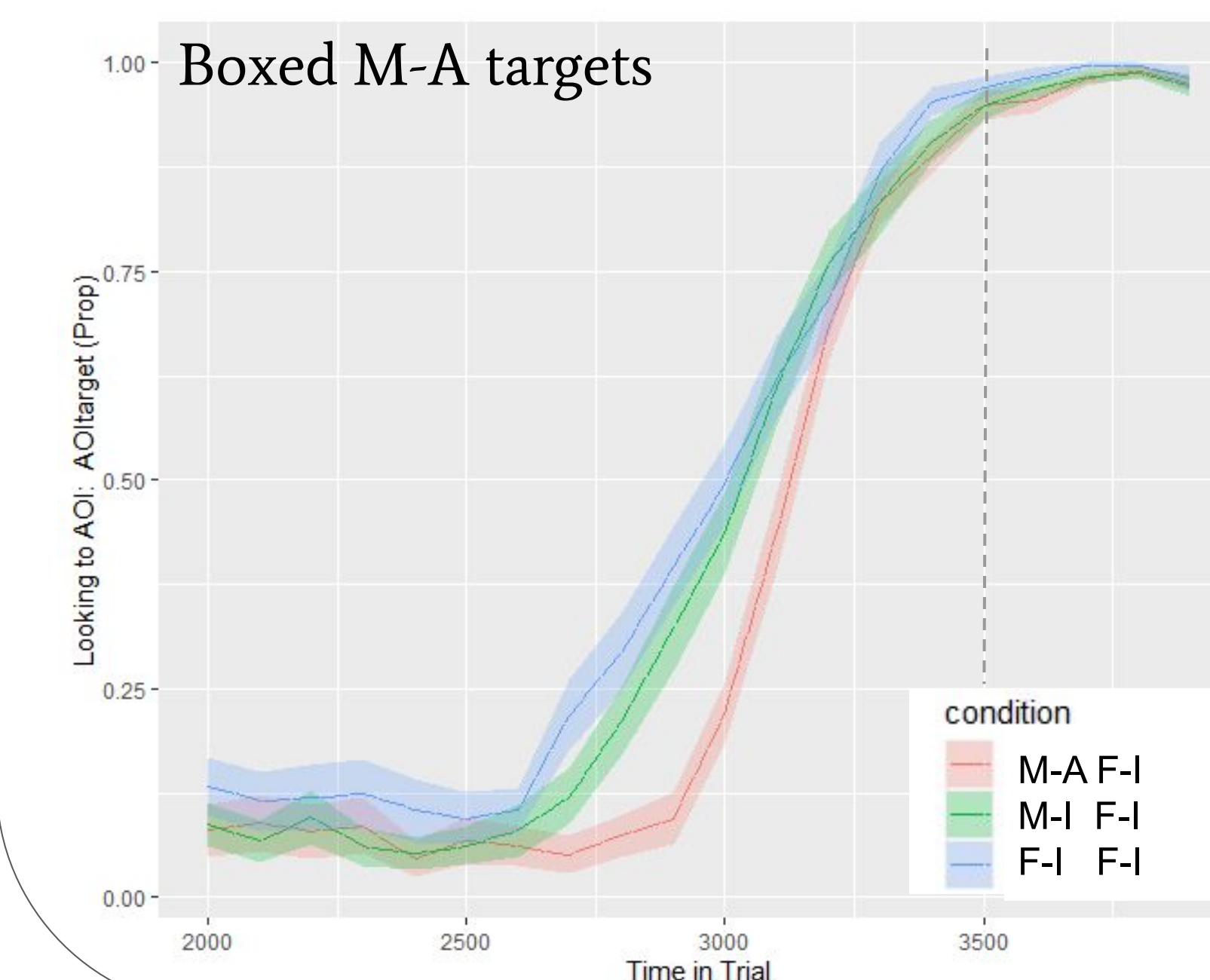
Replication

- Looks to (non-boxed) targets are more likely when (non-boxed) competitor is of different gender than when it is of the same gender. Growth curve analysis (GCA) shows main effect of match vs. mismatch ($\beta=0.44$, $SE=0.15$, $p=0.003$).
- Replicates Fuchs (2022).



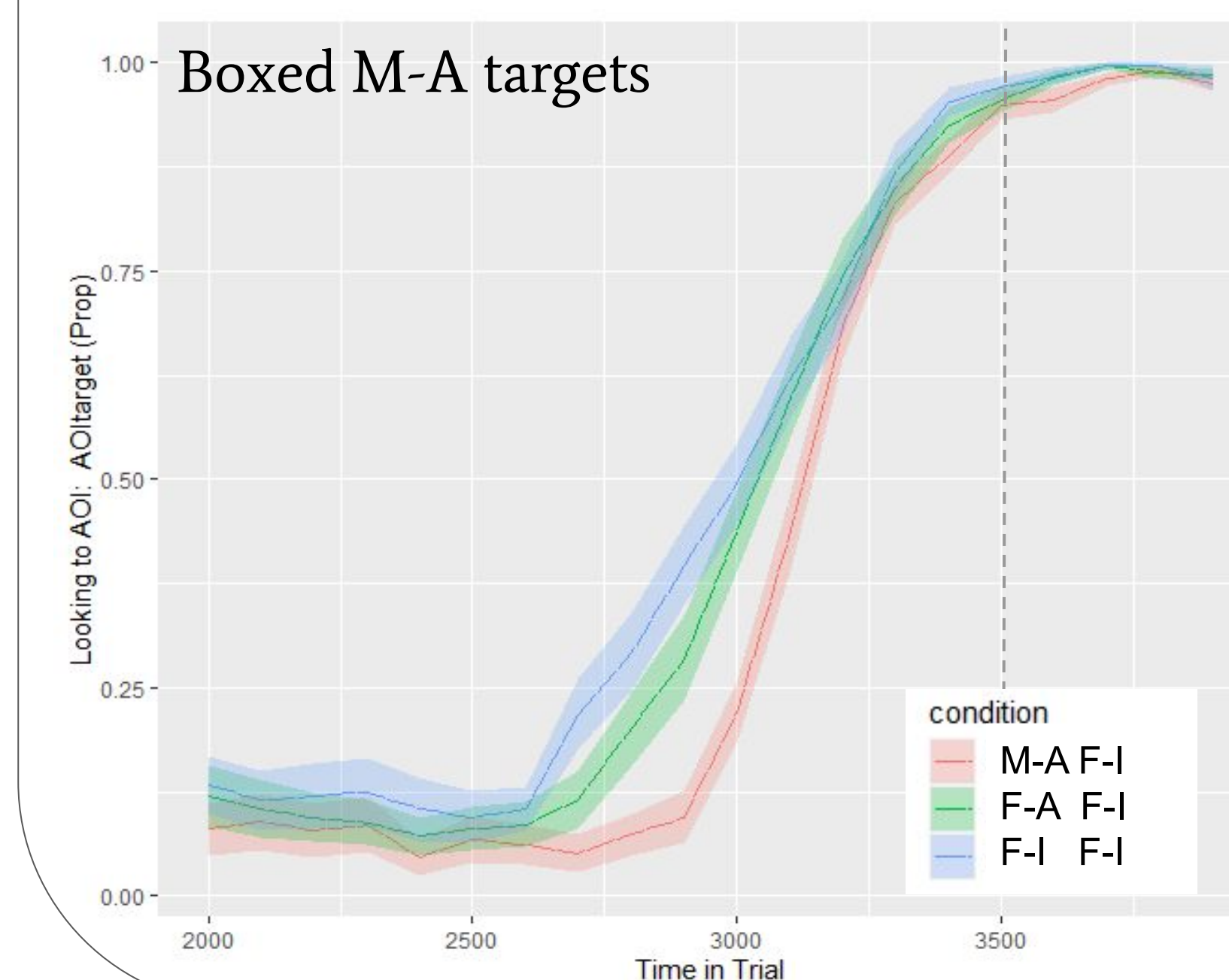
Partial match: M

- Looks to boxed M-A targets in trials with M-I competitors are ...
 - more likely than in full-match trials (M-A | F-I) GCA: significant interaction between condition and the quadratic term ($\beta=-1.92$, $SE=0.27$, $p<0.001$)
 - less likely than in no-match trials (F-I | F-I) GCA: significant interaction between condition and the quadratic term ($\beta=-0.72$, $SE=0.28$, $p=0.012$)



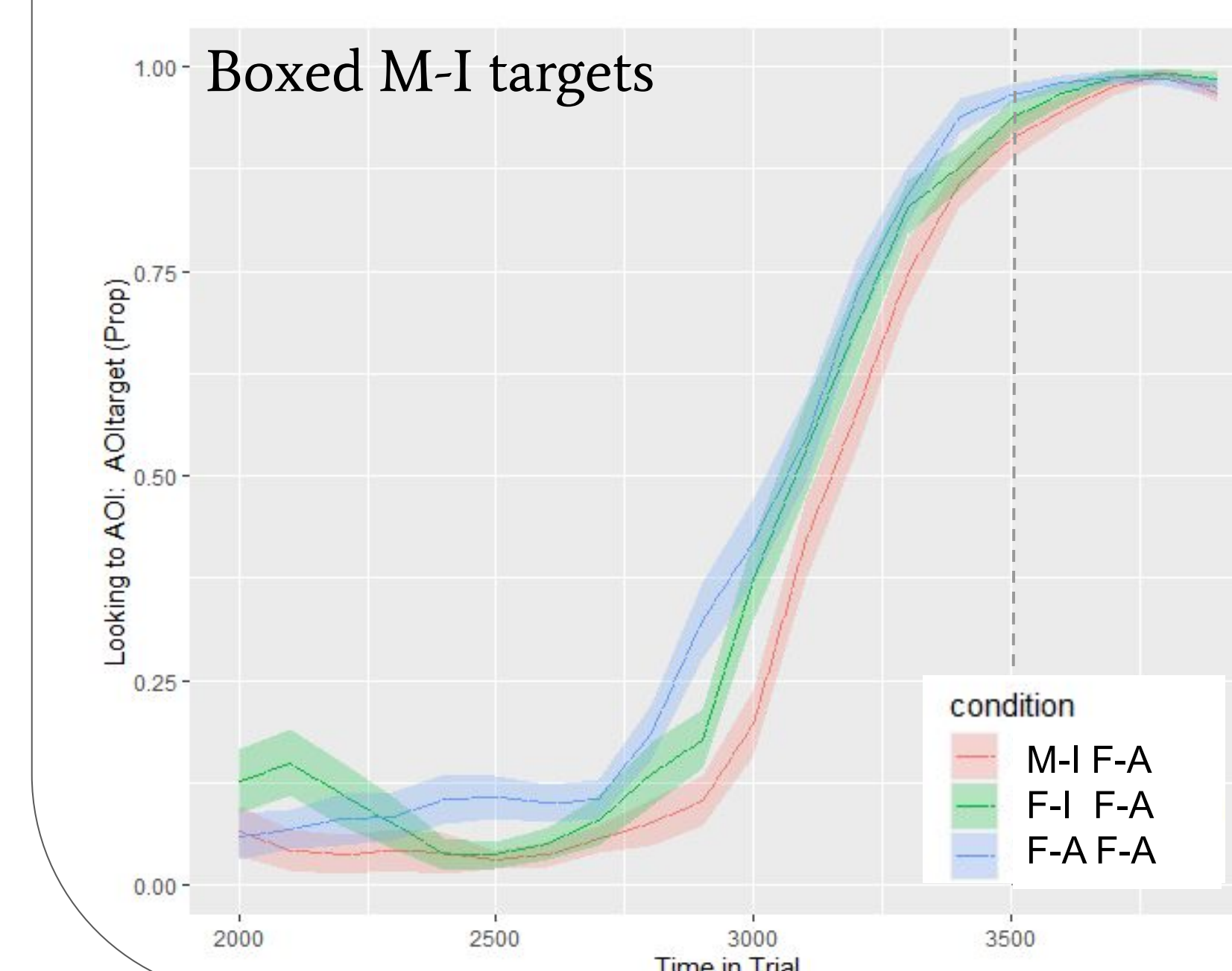
Partial match: +Animacy

- Looks to boxed M-A targets in trials with F-A competitors are ...
 - more likely than in full-match trials (M-A | F-I) GCA: significant interaction between condition and the quadratic term ($\beta=-1.57$, $SE=0.27$, $p<0.001$)
 - less likely than in no-match trials (F-I | F-I) GCA: significant interaction between condition and the quadratic term ($\beta=-1.05$, $SE=0.28$, $p<0.001$)



Partial match: -Animacy

- Looks to boxed M-I targets in trials with F-I competitors are ...
 - more likely than in full-match trials (M-I | F-A) GCA: significant interaction between condition and the quadratic term ($\beta=-0.74$, $SE=0.26$, $p=0.005$)
 - less likely than in no-match trials (F-A | F-A) GCA: significant interaction between condition and the quadratic term ($\beta=-1.47$, $SE=0.27$, $p<0.001$)



Conclusions

F-A competitors slow looks to M-A targets.

M-I competitors slow looks to M-A targets.

F-I competitors slow looks to M-I targets.

Psycholinguistics:
Gender and animacy agreement features are activated independently of each other.

Formal:
Masculine animate is a subcategory of masculine (rather than a separate abstract gender category).