The Psycholinguistics of Grammatical Gender  
In the Polish Diaspora

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What is linguistics?

- The scientific study of language
- I am producing sound waves, that you are turning into meaning in mere fractions of seconds.
- Children learn language, computers still don’t “know” language!

- Psycholinguistics: the study of how language is processed and represented in the brain.
What is heritage linguistics?

- Traditional language group distinctions: children, adults, L2 learners
- New-ish category: heritage speakers
  - Why #1: demographic shifts due to globalization
  - Why #2: heritage speakers in language classrooms
“Native speakers”

- Scientifically speaking, heritage speakers are native speakers because they learned the language at home.
- Culturally speaking, being a “native speaker” is more than just linguistic ability

A heritage speaker is a type of native speaker.
Big-picture goal of the field

Aide heritage speakers in navigating their linguistic and cultural identities and in achieving their language goals.
Immediate goal of the field

In order to know how to help heritage speakers achieve their goals, we need to understand what they *know*. 
My goal today

Use eye-tracking to determine what heritage speakers know about grammatical gender and how they use that information.
OUTLINE

1. Motivation for this study
2. Grammatical gender
3. Eye-tracking and predictive use of gender
4. Eye-tracking study
5. Wrap-up
Why study heritage languages?

Some statistics...

- 12% of the American population can be considered second-generation immigrants.
- 23% of students (10.9 million students) in public schools come from immigrant households.
Heritage speaker profiles: Points of variation

Points of variation:

● the heritage language
● the dominant language
● simultaneous/sequential bilingualism
● # years of exposure to the home language
● # parents who speak the home language
● other family/community who speak the home language
● birth order
● formal schooling in the HL
● visits to the country of origin
● ....
Heritage speaker profiles

Alex

- Born in Poland, immigrated to the US with her parents at age 5
- Attended Saturday Polish lessons at cultural center
- Goes back to Poland every year
- Most Poles cannot tell she lives in the US
Heritage speaker profiles

Andrea

- Born in the US
- Mother from Poland, father is American
- Has been to Poland three times
- Spoke Polish when she was younger
- Now, her mother speaks Polish to her, she responds in English
Heritage speaker profiles

**Julius**

- Born in the US
- American mother, Polish father, three younger siblings
- Spoke Polish with his father, English with his mother and other relatives
- Feels comfortable speaking and writing both Polish and English
Heritage speaker: A working definition

“an early bilingual who grew up hearing and speaking the heritage language and the majority language either simultaneously or sequentially in early childhood (roughly up to age 5; see Schwartz 2004, Unsworth 2005) ...

...but whose L2 became their primary language at some point during childhood, typically after the onset of schooling”

Benmamoun et al. (2013)
Heritage Language Acquisition

- Mastery vs. Time
- monolingual
- heritage
## Heritage Language Acquisition

<table>
<thead>
<tr>
<th>Acquisition is...</th>
<th>L1</th>
<th>Heritage</th>
<th>L2</th>
</tr>
</thead>
<tbody>
<tr>
<td>early</td>
<td>✔</td>
<td>✔</td>
<td>✘</td>
</tr>
<tr>
<td>naturalistic</td>
<td>✔</td>
<td>✔</td>
<td>✘</td>
</tr>
<tr>
<td>convergent</td>
<td>✔</td>
<td>✘</td>
<td>✘</td>
</tr>
<tr>
<td>independent of sociological factors</td>
<td>✔</td>
<td>✘</td>
<td>✘</td>
</tr>
</tbody>
</table>
Heritage proficiency spectrum

OVERHEARERS  NEAR-BASELINE*
Heritage language and its baseline

What/who is the “baseline”?

- Monolingual speakers in the country of origin
- (1st-generation) immigrants in the new country
  - Their language serves as input for heritage language acquirers
  - We might also call them “controls”
Goals of heritage linguistics

What do heritage speakers know? What do they struggle with?

- Phonology
- Semantics
- Morphology
- Syntax
- ...

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Today: Gender in heritage languages

An investigation of grammatical gender in heritage languages can...

- refine our understanding of the morphosyntax of grammatical gender
- indicate what affects the maintenance of a particular feature or structure in a HL
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What is grammatical gender?

Grammatical gender (henceforth just “gender”) is a categorizing feature on nouns which is reflected in the behavior of dependent words which match the feature of the noun (Hockett 1958; Corbett 1991; Kramer 2015)
Signs of gender

*la manzana*  
Spanish ‘apple.FEM’

*el libro*  
Spanish ‘book.MASC’

*el papel blanco*  
Spanish ‘the white.MASC paper’

*la sal blanca*  
Spanish ‘the white.FEM salt’
Leaving the semantic core behind
Arbitrariness of gender

*el libro*  Spanish  ‘the book.MASC’

*książka*  Polish  ‘(the) book.FEM’

*das Buch*  German  ‘the book.NEUT’
Gender in acquisition

- Adult monolinguals have no problems with gender comprehension or production (Pérez-Pereira 1991).
- Children generally learn gender by age 3 (Corbett 1991).
  - With lingering small subclasses resisting acquisition up to age 7 (see Gvozdev 1927/1961 for Russian, Smoczyńska 1985 for Polish, among others)

but...

- Heritage speakers consistently struggle with gender assignment and agreement, both in comprehension and in production (Montrul 2016 and Polinsky 2018, and references therein).
Research question

- What do heritage speakers know about grammatical gender in their HL?
- How do they use this information in online tasks?
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Methodology

Choosing methodology for heritage speaker studies is important.
Methodology

Low rates of formal schooling and literacy in HL.

HS perform poorly on tasks targeting explicit knowledge and/or literacy.
Methodology

Heritage speaker performance on a task is dependent on the modality of the task

- HS perform better on oral picture-naming task than L2s, but worse on written recognition and written comprehension tasks (Montrul 2008)
- HS perform worse than L2s on grammaticality judgment tasks (Montrul 2016, Polinsky 2018, and references therein)

Recurrent theme: tasks that require metalinguistic competence and awareness put heritage speakers at a disadvantage
Eye-tracking

**ASSUMPTION:** our eye-movement reflects our linguistic processing

**ADVANTAGE:** an implicit measure of linguistic ability
Eye-tracking

- Participant views images on a screen while listening to auditory stimuli
  - Optional response such as a click
- Very sensitive measure
- Has been tested on HSs in work by labs headed by Holger Hopp and Irina Sekerina
Eye-tracking + gender = **predictive use of gender**
How it works

Visual World Paradigm
Task: to look at the item they are asked about as quickly as possible.
How it works: MATCH

¿Dónde está la...?
Where is the...?
How it works: MISMATCH

¿Dónde está la...?
Where is the...?
How it works

- **Dependent measure:** time of first fixation after the onset of the gender-marked article.
- **Predictive looks:** fixating on the target item faster in mismatch conditions than in match conditions.

“Using gender predictively” = using the gender information on the article to anticipate the target item and make predictive looks.
What this looks like (Spanish)

Controls replicate previous findings.
What this looks like (Heritage Spanish)

Mixed effects linear model with random intercepts and slopes for participants.
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# From Spanish to Polish

<table>
<thead>
<tr>
<th></th>
<th>Spanish</th>
<th>Polish</th>
</tr>
</thead>
<tbody>
<tr>
<td># genders</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Determiners</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Order of constituents in the noun phrase</td>
<td>N-Adj</td>
<td>Adj-N</td>
</tr>
</tbody>
</table>
Gender in Polish

Three genders: feminine masculine neuter

Morphological correlates: -a C -o

(7-case system)
Gender in Polish

Concord in the noun phrase:

star**a**  czerwona  książka
old.F      red.F      book.F

stary      czerwony  stół
old.M      red.M      table.M

stare      czerwone  jabłko
Predictions for Heritage Polish

Predictions:

If HS can use gender predictively → first fixation on target item will be faster for mismatch condition than match condition.

If HS cannot use gender predictively → first fixation on target item will be about equal for mismatch and match conditions.
Experimental design: Polish

target gender
mismatch
distractor
gender

match

\[
\begin{array}{ccc}
  & F & \\
 m & n & \\
\end{array}
\]

match

\[
\begin{array}{ccc}
  & M & \\
 f & n & \\
\end{array}
\]

match

\[
\begin{array}{ccc}
  & N & \\
 m & f & \\
\end{array}
\]
Experimental design: Polish

Gdzie jest zielona książka? [feminine, nominative singular]
Where is green.F book.F
“Where is (the) green book?”

Match
MismatchM
MismatchN
Experimental design: Polish

Gdzie jest zielona książka? [feminine, nominative singular]
Where is green.F book.F
“Where is (the) green book?”
Experimental design: Polish

Gdzie jest czerwony czajnik? [masculine, nominative singular]
Where is red.M teapot.M
“Where is (the) red teapot?”

Match
MismatchN
MismatchF
Experimental design: Polish

Gdzie jest niebieskie mydło? [neuter, nominative singular]

Where is blue soap?

“Where is the blue soap?”
Experimental materials: Polish

- auditory recorded by male speaker of Polish, immigrated from Poland in the last year
- spliced to match the timing of the Spanish sentences
  - Ease in statistical analysis
  - Allows for future comparisons and follow-ups
Experimental materials: Polish

Each trial lasted 6 seconds, with 1 second in between.
Experimental materials: Polish

3 genders x 3 conditions = 9 conditions

9 conditions x 12 lexical items = 108 trials

(balance across three colors)
Experimental tasks: Polish

Pre-tasks

- LEAP-Q (translated into Polish by Ewa Brzezińska)
- Vocabulary task

Eye-tracking task

- 2 x 54 trials
- Unlimited break

Total time: ~45 minutes

Participants were compensated for their time
Participants: Polish

55 Participants

- **23 controls** (18+ years in country of origin)
- **18 heritage** (<8 years in country of origin)
- **14 not useable**
  - 3 participants over the age of 50
  - 1 L2 speaker of Polish
  - 1 simultaneous heritage speaker of Spanish
  - 1 corrupted data file
  - The rest belong to “1.5 generation”
Proficiency measures: Polish
Data cleaning and analysis: Polish

- For each participant, eliminated those trials for which participant did not know a lexical item or their responses did not match the intended lexical item.
- Because of 3x3 conditions, it’s easier to analyze three sets of conditions, based on gender of target noun.
Results: Feminine target gender

- Participants have no trouble making predictive eye movements
- No difference between M and N distractors
Results: Masculine target gender

- Participants do make predictive eye movements
- But these predictions are slowed down in the distractor is neuter
Results: Neuter target gender

- Participants can make predictive eye movements if the distractor is feminine.
- No predictive eye movements if the distractor is masculine.
Putting it all together

- F is “on its own”, so the main contrast is between F and “everything else”
- N slightly interferes with M.
- However, M interferes with N.
Results: Putting it all together

- F is “on its own”.
- N slightly interferes with M.
- However, M interferes with N.
Traditional analysis of Polish gender
Hierarchical geometry of Polish gender
Hierarchical geometry of Polish gender
Evidence from morphology

The hierarchical analysis is the psycholinguistic reality of what we see reflected in declension paradigms.
Interim Summary: Polish

- Polish controls can use gender on prenominal adjectives predictively.
- HS can also use gender predictively, on par with controls.
- Asymmetrical interference between M and N gives psycholinguistic evidence for notion that Polish genders are organized hierarchically, not as a flat set of categories.
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Conclusions

- Polish heritage speakers use grammatical gender information in the same way as control speakers do!
- Using better methodology to target speaker knowledge allows us to tease apart surface differences in production from true linguistic ability.
- The representation of gender in the brain is hierarchical for both monolingual and heritage speakers.
Thank you!

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