

# Grammatical Gender in Child and Adult Heritage Russian in Contact with Hebrew

## What Do We Learn About the Trajectories of Heritage Language Development?

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**Abstract** The current study investigated trajectories of HL-Russian grammatical development in the domain of morpho-syntax by considering (a) monolingual-like development, (b) divergent attainment (previously referred to as incomplete acquisition), (c) attrition, and (d) a birth of a new language variety in a contact situation. Adult and child HL-Russian speakers were compared to monolingual child and adult Russian-speaking baseline controls. The adjective-noun elicitation task, which taps gender assignment/agreement in real words in Russian, was used. The results of the current study bring evidence for a monolingual-like trajectory in HL-Russian speakers, albeit protracted, in the acquisition of grammatical gender.

**Keywords** Grammatical gender. Heritage Language. Russian. Divergent attainment. Attrition.

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## 1 Introduction

### 1.1 HL Speakers and their Grammars

The term ‘Heritage Language’ (hereafter HL) denotes a minority language spoken at home that is not the Societal Language (hereafter SL) of the society.<sup>1</sup> HL speakers are bilinguals who are often (though not always) weaker in their HL and dominant in the SL. They are typically second- or third-generation immigrants who acquire their HL from birth until the onset of schooling, usually at age 4-5, through naturalistic exposure to native input.

Although HL speakers acquire HL as their native language during childhood, their linguistic performance exhibits significant deviation compared to the baseline (the language as spoken in the country of origin or the language spoken by first-generation immigrants who are dominant in that language). Divergences and innovations observed in HL grammars are believed to be systematic (e.g., Hopp, Putnam 2015; Montrul 2008; Rothman 2009), but the precise mechanisms of HL acquisition and the trajectory of HL development are subjects of ongoing intense debate in formal theoretical linguistics, psycholinguistics, and neurolinguistics (refer to the recent keynote papers by Polinsky, Scontras 2019; 2020, and the commentaries at the *International Journal of Bilingualism*). The current study aims to address the question of developmental trajectories in HL grammars by investigating the grammatical gender system in HL speakers of Russian in contact with SL-Hebrew.

### 1.2 HL Grammar Development Trajectories

Previous studies have shown an intricate interplay between the age of onset of bilingualism (hereafter AoB), also known as the length of uninterrupted acquisition, and the timing of acquisition of specific linguistic phenomena (Tsimpli 2014). Linguistic phenomena vary in terms of their timing of acquisition in both monolingual and bilingual children: some are acquired early, while others emerge later. Therefore, when discussing the trajectory of HL development and the effect of AoB, it is important to consider the monolingual trajectory of acquisition and differentiate between early-acquired and late-acquired phenomena. Based on AoB and the timing of acquisition of specific linguistic phenomena, the literature suggests the following trajectories in HL development:

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<sup>1</sup> Benmamoun, Montrul, Polinsky 2013; Montrul 2016; Polinsky 2018; Rothman 2009.

*T1: Monolingual-like development (albeit delayed)*, where bilingual children exhibit a linguistic phenomenon on par with monolinguals or with a slight delay. Previous studies indeed show that HL child and adult speakers might perform similarly to their monolingual peers, or their development may be delayed, with HL children performing lower than monolingual peers but HL adult speakers not exhibiting a gap compared to monolingual adult baseline speakers. For example, Martínez-Nieto and Restrepo (2023) compared four- and eight-year-old HL-Spanish speakers to age-matched Spanish-speaking monolingual controls. Older HL speakers were more accurate than younger HL speakers, leading the authors to conclude that while HL speakers may differ from monolinguals, their grammatical development is similar, yet protracted.

*T2: Intake failure (previously referred to as incomplete acquisition)* is a scenario under which a linguistic phenomenon is simply not acquired due to interruptions in HL acquisition.<sup>2</sup> This scenario emphasizes the role of AoB and predicts that early-acquired phenomena remain intact, while late-acquired phenomena are absent in both child and adult HL grammars. For example, Montrul (2018) examined differential object marking in four groups of participants and found significant differences between monolingual child Spanish-speaking controls and both child and adult HL-Spanish speakers in the US, indicating intake failure.

*T3: Attrition* is a scenario, wherein a linguistic phenomenon is acquired in childhood but gradually lost over time due to diminished input.<sup>3</sup> Under this scenario, child HL speakers are expected to demonstrate intact acquisition of early-acquired phenomena and be indistinguishable from monolingual child controls, while adult HL speakers are predicted to deviate from the baseline due to the loss of this structure. A study by Cuza et al. (2013) provided evidence for this developmental trajectory by examining Spanish tense and aspect marking in child and adult HL speakers. Younger children and adults exhibited similar tendencies, while older children showed differences. Similarly, a study by Polinsky (2011) investigating relative clauses in HL-Russian in contact with English found that child HL speakers were indistinguishable from monolingual child peers, whereas adult HL speakers performed significantly lower than both monolingual adults and child HL speakers. Polinsky (2011) concludes that divergent performance in HL adult speakers is a result of attrition.

<sup>2</sup> Montrul 2008; Putnam, Sánchez 2013; Polinsky 2006; 2008.

<sup>3</sup> Polinsky 2011; Karayayla, Schmid 2019; Hicks, Dominguez 2020; Schmid, Köpke 2017.

*T4: The emergence of a new linguistic variety in a contact situation*, such as a new dialect (Kupisch, Rothman 2018). This perspective posits that HL grammar should not be seen as ‘broken’ or ‘incomplete’ but rather as a new variety that emerges in a contact situation. It suggests that HL speakers should be considered native speakers of their HL variety. Under this scenario, trajectories of HL speakers are not specifically linked to AoB, as divergences in HL grammars are already observable at the onset of HL development, including early-acquired phenomena in HL child grammars, which persist into adulthood, giving rise to a new contact variety. For example, Meir, Avramenko, and Verhovceva (2021) found that both child and adult HL-Russian speakers differed from child and adult monolinguals in their production of the accusative case, indicating divergence from childhood that continues into adulthood, thus suggesting the emergence of a new language variety (i.e., Israeli Russian).

To hypothesize about the trajectories of HL development (T1-T4), studies directly comparing child and adult HL speakers are necessary. While such studies exist, they are limited.<sup>4</sup> In the domain of lexicon, a study by Fridman and Meir (2023) demonstrated that elements of all trajectories can be observed for noun and verb production in HL-Russian speakers in the USA and Israel. The present study aims to address the question of developmental trajectory in HL speakers by examining grammatical gender agreement.

### 1.3 Gender Systems of Russian and Hebrew

Russian is a language with a three-way gender system, distinguishing between masculine, feminine, and neuter genders. Gender is marked through dedicated inflections on adjectives, participles, numerals, determiners, quantifiers, certain cardinal numbers, and verbs, using noun-controlled concord or agreement in the singular form. However, gender distinctions disappear in plural forms (Corbett 1983). Please refer to Table 1 for further details.

**Table 1** Adjectival inflections in singular and plural form in Russian

Gender	Singular	Plural
Masculine	<i>golub-ozont</i> ‘blue.M umbrella.M’	<i>golub-yie zont-y</i> ‘blue.PL umbrella.M.PL’
Feminine	<i>golub-aja sumk-a</i> ‘blue.F bag.F’	<i>golub-yie sumk-i</i> ‘blue.PL bag.F.PL’
Neuter	<i>golub-oje kryl-o</i> ‘blue.N wing.N’	<i>golub- yje kryl-ja</i> ‘blue.PL wing.N.PL’

<sup>4</sup> See Cuza, Pérez-Leroux, Sánchez 2013; Fridman, Meir 2023; Meir, Avramenko, Verhovceva 2021; Montrul 2018; Montrul, Sánchez-Walker 2013; Polinsky 2011; Rothman, Treffers-Daller 2014.

Nouns are unequally distributed across the three gender values in Russian: masculine 46%, feminine 41%, and neuter 13% (Corbett 1991). Gender assignment is generally transparent in Russian: nouns ending in non-palatalized consonants (-C) are usually masculine, nouns ending in *-a* or *-ja* are typically feminine, and nouns ending in *-o* or *-e* are likely to be assigned the neuter gender. However, some nouns are considered opaque in terms of gender assignment. For example, nouns ending in a palatalized consonant (-C') and nouns ending in unstressed *-a* and *-o* do not reliably indicate gender based on morpho-phonological cues.

Furthermore, Russian features nouns ending in *-a/-ja* (e.g., *papa* 'father', *dedushka* 'grandfather') that denote human males and require agreement in the masculine gender. There are also nouns, particularly those denoting professions and occupations (e.g., *vrac* 'doctor'), which can exhibit semantic agreement, either feminine or masculine. Finally, hybrid nouns (e.g., *sirota* 'orphan', *plaksa* 'crybaby', *molodec* 'good boy/girl') can also show semantic agreement. However, these nouns are not the focus of the present study.

Hebrew is a two-way gender language, which differentiates between feminine and masculine. Similarly to Russian, in Hebrew most masculine nouns end in a consonant (*shulxan* 'table.M'), while most feminine nouns end in *-a* (*siml-a* 'dress.F') (Schwarzwald 1982; Ravid, Schiff 2015). Some feminines in Hebrew also end in *-et/at/it* (*rakevet* 'train'). Opaque classes are present in Hebrew, e.g., feminine nouns ending in a constant (*regel* 'leg'). Gender agreement in Hebrew is realized with dedicated inflections on verbs, pronouns, and adjectives, (e.g., *sefer gadol* 'book.M.S. big.M.S' vs. *siml-a gdol-a* 'dress.F.S big.F.S'). Unlike in Russian, plural forms in Hebrew are gender marked, *sfar-im gdol-im* 'book.M.PL. big.M.PL' vs. *smal-ot gdol-ot* 'dress.F.PL big.F.PL'.

Thus, the two languages, Russian and Hebrew have very similar morpho-phonological cues which participate in grammatical gender classification and in gender agreement.

#### 1.4 Gender Acquisition in Russian in Monolingual and Bilingual Speakers

A chapter by Ivanova-Sullivan et al. (forthcoming) on Slavic gender acquisition provides the most comprehensive overview of monolingual and multilingual child and adult gender acquisition in Slavic languages, with a particular emphasis on Russian, which has been extensively investigated compared to other Slavic languages.

In Russian-speaking monolingual children, gender agreement begins to emerge around the age of two (e.g., Gvozdev 1961), while the acquisition of certain less frequent and opaque nouns continues

into the school years (Cejtlin 2000; 2009). The acquisition of neuter gender is delayed in monolinguals compared to masculine and feminine genders. Between the ages of 3;0 and 4;0, transparent neuter forms are produced without errors, while opaque neuter forms are acquired at around the age of six. Derived diminutive forms disambiguate the gender of the nouns and facilitate gender acquisition of opaque nouns (compare *kost* 'bone.F' vs. *kostočk-a* 'bone.DIM.F'): Russian-speaking monolinguals are more accurate on derived non-ambiguous forms compared to simplex opaque nouns (see Kempe et al. 2007). Interestingly, Russian-speaking children aged 2-3 disregard semantic gender and rely on morpho-phonological cues even with female names with *-ok/ -ik* suffixes (e.g., *Svetik* \**prosnulsja* 'Svetik.F.S woke-up.M.S'), showing sensitivity to morphonological cues early on and rely on these cues in the choice of agreement (see Rodina 2014).

Mitrofanova et al. (2018) conducted a study on gender agreement in 107 monolingual Russian-speaking children aged 3-7, using real and novel word tasks. In the real word experiment, monolingual children exhibited lower accuracy on neuter nouns (both transparent and opaque), as well as on opaque feminine nouns (e.g., *kost* 'bone.F'). In the novel word experiment, monolingual children showed considerable success in assigning gender based on morpho-phonological cues. However, it should be noted that although monolingual children were able to assign gender to novel words using gender cues, their performance was more accurate for real words compared to novel words.

Under HL acquisition, a seminal study by Polinsky (2008) provided evidence of restructured gender representations in adult HL-Russian speakers in the United States, resulting in a two-gender grammatical system instead of the traditional three-gender system. However, this divergence was not consistently observed in child HL-Russian speakers. For example, Antonova Ünlü and Wei (2018) reported that gender agreement in a bilingual Russian-Turkish child, dominant in Turkish, was monolingual-like: the child demonstrated mastery of gender agreement at the age of 3. Studies on the production and comprehension of child HL-Russian speakers revealed the facilitative role of transparency, frequency, and regularity,<sup>5</sup> which aligns with findings in monolingual children influenced by the same factors. Neuter nouns (both transparent and opaque) and opaque feminine nouns were found to be challenging for HL-Russian speakers with SL-Norwegian (see Mitrofanova et al., 2018). The authors reported that bilingual children tended to default to the masculine form in non-masculine conditions, and this preference was associated with exposure to Russian. The preference for the masculine gender is not surprising,

<sup>5</sup> E.g., Janssen 2016; Rodina, Westergaard 2012; 2017; Rodina et al. 2020; Mitrofanova et al. 2018.

as the masculine value is the most frequent gender, it is morphologically unmarked, it attracts most borrowings and is associated with the default declension class in languages with a case system (Corbett 2007), and therefore the masculine is considered to be the linguistic default. Linguistic defaults play a significant role in language acquisition as they demand less cognitive effort during processing and are generally acquired more swiftly compared to other linguistic forms (Tsimpli, Hulk 2013).

Subsequent studies on gender acquisition in child HL-speakers, aiming to evaluate the impact of SL properties on HL gender maintenance in Russian, have yielded conflicting evidence. Schwartz et al. (2015) compared groups of bilingual HL-Russian child speakers with different SLs (English, German, Hebrew, and Finnish) and found that participants whose SLs had grammatical gender performed better on adjective-noun agreement tasks in their HL (specifically speakers of SL-Hebrew and SL-German) than those whose SLs did not (SL-English and SL-Finnish). In contrast, Rodina et al. (2020) tested production accuracy on the adjective-noun agreement task among HL-Russian speakers with different SLs (English, German, Hebrew, Norwegian, Latvian) and did not find evidence of a facilitative cross-linguistic influence effect. Instead, the study pointed to exposure factors influencing gender agreement.

Similarly to Polinsky (2008), Rodina et al. (2020) also provided evidence for restructured gender systems in some but not all child HL-speakers. In the majority of child HL speakers, the three-way masculine-feminine-neuter distinction is maintained. Only a few children encountered challenges in acquiring neuter or grammatical gender altogether. Reduced two-way gender systems, differentiating masculine and feminine (and other variants of the two-way gender values), or no-gender systems, displaying only the use of masculine forms, were associated with exposure variables such as family type, age at kindergarten enrollment, and current exposure to HL-Russian instruction.

Regarding adult HL-Russian acquisition, HL-Russian speakers were found to exhibit non-divergent performance in gender agreement situations where morpho-phonological and lexical cues align, suggesting that the mechanism of gender agreement remains intact in adult HL grammars (see Laleko 2018; 2019). Furthermore, in the line of research exploring the potential influence of SL properties on gender acquisition and maintenance in HL, Fridman, Polinsky and Meir (2023) demonstrated an advantage for Hebrew-dominant bilinguals over English-dominant ones in gender agreement in HL-Russian. This was attributed to the influence of SL-Hebrew, which employs a two-way gender system, unlike English, which has no grammatical gender. The results, when comparing two varieties of HL-Russian, corroborated previous findings in children, highlighting

advantages for masculine and feminine over neuter, as well as better performance on transparent nouns compared to opaque ones.

## 1.5 The Present Study: Research Questions and Hypotheses

The present study has four objectives. First, it is devised to shed light on the trajectory of gender acquisition in HL-Russian by “connecting the dots” (as stated by Montrul 2018) between child and adult HL speakers and child and adult monolingual controls. As outlined in 1.1, four hypotheses were tested by formulating specific predictions, see Table 2.

**Table 2** HL developmental trajectories and specific prediction for the four groups

Trajectory	Prediction
T1: Monolingual-like trajectory	(Mono-ADULT = HL-ADULT = HL-CHILD = HL-CHILD) or (Mono-ADULT = HL-ADULT) > (HL-CHILD = HL-CHILD)
T2: Divergent attainment / intake failure (previously referred to as incomplete acquisition)	Mono-ADULT > (Mono-CHILD = HL-ADULT = HL-CHILD)
T3: Attrition	(Mono-ADULT = Mono-CHILD = HL-CHILD) > HL-ADULT
T4: New Language Variety in a Contact Situation	Mono-CHILD > (HL-ADULT = HL-CHILD)

Second, in addition to examining quantitative differences or similarities in performance among child and adult HL speakers and monolingual controls, the study aims to investigate non-target responses to observe any qualitative differences, if present. Non-target responses are expected to provide further insights into the nature of divergence, if any, in HL speakers.

Third, the study aims to explore how the gender system is restructured in HL speakers, if divergence occurs. Based on previous findings, divergent 2-way gender systems following Polinsky (2008) are expected to be observed in HL speakers, i.e., restructured gender systems that differentiate between masculine and feminine forms (FEM-MASC, no NEUT). Furthermore, additional system configurations, although less frequent, as reported by Rodina et al. (2020), are anticipated, such as a gender system that does not mark grammatical gender, using only masculine forms (only MASC).

Finally, the study aims to evaluate the link between gender accuracy production and age, age of onset of bilingualism, and proficiency.



## 2 Methodology

### 2.1 Participants and Procedure

A total of 100 participants were recruited for the study, including two adult groups and two child groups (see Table 3). The current study is part of a larger ongoing project aimed at investigating the characteristics of HL-Russian among adult and child speakers in Israel and the USA.

The monolingual adult group (hereafter referred to as Mono-Adult) and the monolingual child group (hereafter referred to as Mono-Child) of Russian speakers were recruited in the Russian Federation, Belarus, and Kazakhstan. All the monolingual Russian-speaking controls reported Russian as their mother tongue and the language of their daily communication.

The HL group of adults (hereafter referred to as HL-Adult) and children (hereafter referred to as HL-Child) were recruited in Israel. They were all raised in Russian-speaking families in Israel, but the age of onset of bilingualism (AoB) to SL-Hebrew varied.

There was no significant difference in sex distribution across the groups ( $X^2=7.055$ ,  $p=0.70$ ). As intended, there were group differences in age ( $F(3.96)=134.73$ ,  $p<.001$ ). Post hoc pairwise comparisons indicated that the child groups did not differ in age ( $p=1.00$ ). Furthermore, the results indicated that the HL groups, both child and adult, did not differ in AoB ( $F(1.57)=1.078$ ,  $p=.304$ ).

**Table 3** Background information on participants

	Monolingual		HL-Speakers	
	Mono-Adult	Mono-Child	HL-Adult	HL-Child
	N=21	N=20	N=30	N=29
Sex	18f/3m	10f/10m	17f/13m	20f/9m
Age	40(14)	6(1)	26(4)	6(2)
AoB	n/a	n/a	1.3(1.6)	1.8(1.9)

Prior to participating in the study, adult participants signed a consent form available in both Russian and Hebrew. They also filled out a background questionnaire. For children, parents signed parental consent forms, and oral assent was obtained from each child before each task. The sessions were audio-recorded for later transcription and coding. This study received approval from the Institutional Review Board of Bar Ilan University, Israel.

## 2.2 Materials

### 2.2.1 Proficiency

To assess lexical proficiency, an expressive noun-production subtask from Fridman and Meir (2023) was administered to all participants. The subtask included a total of 51 nouns of varying frequency and varying age of acquisition. The stimuli for the task were taken from the “Noun and Object: Stimuli Database” (Akinina et al. 2015). Figure 1 presents the performance of the four groups. The results indicated a significant effect of Group ( $F(3.96)=42.375, p<.001$ ). Post hoc pairwise comparisons revealed the following significant group differences: MONO-ADULT > MONO-CHILD > HL-ADULT > HL-CHILD. Thus, the four groups differed with respect to their proficiency as measured by lexical abilities.

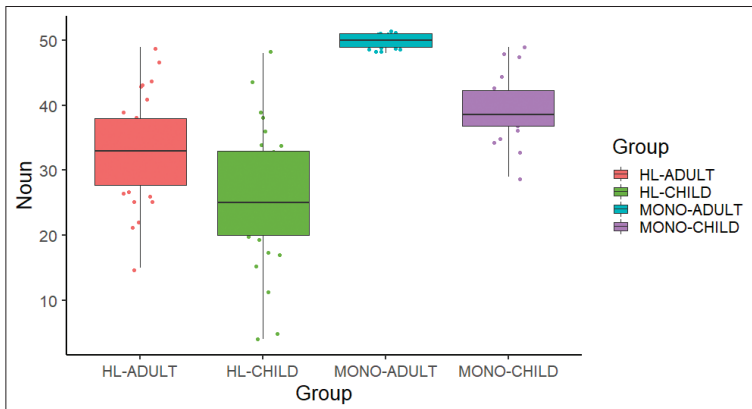


Figure 1 Performance across the groups on noun production

### 2.2.2 Experimental Adjective-Noun Agreement Task

The adjective-noun agreement task (Rodina et al. 2020; Mitrofanova et al. 2018) was administered to all participants. The task includes 30 nouns divided equally across six conditions: feminine, masculine, and neuter nouns with transparent and opaque gender cues (see Table 4 below). In order to avoid a gender match across the languages, we chose only nouns whose translation equivalents in SL-Hebrew had a different (non-congruent) gender (e.g., Russian: *sumka*(F) vs. Hebrew: *tik*(M) ‘bag’).

**Table 4** Experimental stimuli

Transparent			Opaque		
Masculine	Feminine	Neuter	Masculine	Feminine	Neuter
<i>zont</i> ‘umbrella’	<i>sumka</i> ‘bag’	<i>krylo</i> ‘wing’	<i>remen</i> ‘belt’	<i>kost</i> ‘bone’	<i>jabloko</i> ‘apple’

Pictures of the target nouns were presented as PowerPoint slides on a laptop screen. Then, one of the members of the pair disappeared, and the participants had to name the disappearing object. Since it differed from the remaining one in color, they had to use the relevant color term. To denote the colors of the missing objects, we consistently used end-stressed adjectives (*zolotOJ* ‘gold’ or *golubOJ* ‘light blue’), which made gender marking unambiguous. The accuracy measure was coded as 1 for target production (e.g., *golubaja sumka* ‘blue.F bag.F’) and 0 for non-target production (e.g., *goluboj sumka* ‘blue.M bag(M)’ / *goluboje sumka* ‘blue.N bag(F)’). Next, a detailed analysis of non-target responses was carried out, noting the non-target use of masculine, feminine, and neuter.

### 2.3 Statistical Analysis

The analysis was conducted using RStudio (R Core Team 2020). A binomial mixed-effects logistic regression model was fitted, given the binary nature of the task (1 = Target, 0 = Non-Target). The model was built by adding random and fixed variables in a step-by-step procedure, starting with an intercept-only model as a baseline. The null models included both by-subject random intercepts and by-stimulus random intercepts.

First, the language-internal factors were added Gender (3 levels: MASC, FEM, NEUT) and Transparency (2 levels: Transparent, Opaque). Then, Group (4 levels: MONO-ADULT, MONO-CHILD, HL-ADULT, HL-CHILD) was included. Interactions between the language-internal factors (Gender and Transparency) and Group were also added. The variables and interactions were kept in the model only if they significantly improved the fit and resulted in a reduced AIC-value. Results from the highest-level model that converged are reported (Barr et al. 2013). We also present results from pairwise post-hoc comparisons with Tukey-adjusted significance levels.

### 3 Results

Figure 2 presents the target performance across the four groups by grammatical gender and noun transparency.

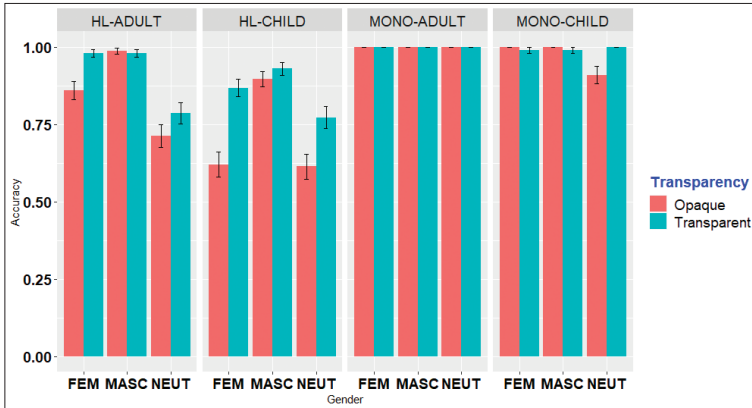


Figure 2 Performance on noun-adjective phrases per Group, Transparency and Gender

The final analysis for production accuracy is presented in Table 5. The model indicated that the inclusion of the three-way interaction Gender\*Transparency\*Group improved the fit of the models, suggesting that groups performed differently across different conditions [tab. 5].

First, the main effects are discussed (e.g., Group, Gender, and Transparency) which are visualized in Figure 3 in panels A-C. Starting with the group effect, the *emmeans* function indicated that only the HL-CHILD Group stood out, while all the other groups performed similarly overall: MONO-ADULT=MONO-CHILD>HL-ADULT>HL-CHILD. There were also differences in accuracy among the three genders: MASC > FEM > NEUT. Additionally, gender agreement on adjectives for transparent nouns was more likely to be accurate compared to opaque nouns.

**Table 5** Predictors of performance on the adjective-noun agreement task

**Formula: Accuracy ~ (1 | Code) + Gender + Transparency + Group + Gender:Transparency + Gender:Group + Transparency:Group + Gender:Transparency:Group, Data: ADJ, Control: glmerControl(optimizer = "bobyqa")**

Predictors	Odds Ratios	CI	p
(Intercept)	12.35	5.79 – 26.32	<0.001
Gender [MASC]	17.69	3.63 – 86.14	<0.001
Gender [NEUT]	0.29	0.14 – 0.57	<0.001
Transparency [Transparent]	11.45	3.00 – 43.72	<0.001
Group [HL-CHILD]	0.16	0.06 – 0.44	<0.001
Gender [MASC] * Transparency [Transparent]	0.06	0.01 – 0.59	0.016
Gender [NEUT] * Transparency [Transparent]	0.15	0.04 – 0.67	0.012
Gender [NEUT] * Group [HL-CHILD]	3.37	1.41 – 8.09	0.006
Random Effects			
$\sigma^2$		3.29	
Observations		2998	
Marginal R <sup>2</sup> / Conditional R <sup>2</sup>		0.930 / 0.956	

Note: Only significant effects and interactions are presented in this table.

The three-way interaction indicated that there were group differences across different conditions (see Figure 3). These differences were further explored using the *emmean* R functions to identify the source of the interaction. The analysis showed that the HL-CHILD group was significantly lower in accuracy compared to the other groups. Specifically, the HL-CHILD group had significantly lower accuracy on transparent feminine, opaque masculine, and opaque feminine conditions. Differences in other conditions did not reach significance. It is important to note that while the accuracy rate on transparent masculine and feminine nouns conditions reached the ceiling in the MO-NO-CHILD group, there was some variation in the transparent and opaque neuter conditions.

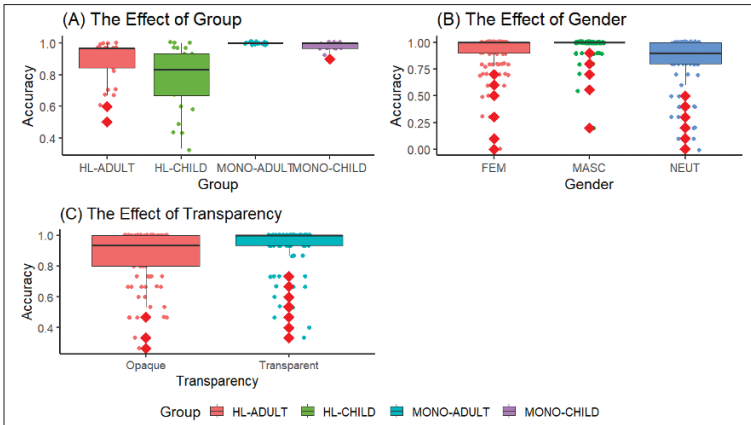


Figure 3 Visualization of the fixed effects

The distribution of non-target responses is presented in Figure 4. Looking more closely at non-target responses on transparent neuter nouns, both HL groups resorted to the masculine form (e.g., *\*golubOJ oknO* 'blue.M window.N') and some to the feminine form (e.g., *\*golubAJA oknO* 'blue.F window.N'). Some child and adult HL speakers used the masculine form with transparent feminine nouns (e.g., *\*zolotOJ klubnIka* 'gold.M strawberry.F'). Transparent masculine forms were also found with feminine forms (e.g., *\*zolotAJA zont* 'gold.F umbrella.M'). It should be mentioned that all transparent nouns in our study had a different gender in the HL speakers' second language (SL). For example, in Hebrew *mitriya* 'umbrella' is feminine, these non-target responses in HL-Russian with transparent gender cues might be attributed to cross-linguistic influence from Hebrew.

Turning to non-target responses on opaque feminine nouns, both HL groups (HL-ADULT, HL-CHILD) defaulted to the masculine form (e.g., *\*golubOJE ten'* 'blue.M shadow.F') and occasionally to the neuter form (e.g., *\*golubOJ ten'* 'blue.N shadow.F') for feminine nouns. No non-target responses were detected for opaque masculine and feminine nouns in the MONO-CHILD group. On opaque neuter nouns, the HL groups as well as the MONO-CHILD group, predominantly used the feminine form (e.g., *\*zolotAJA slitə* 'gold.F sieve.N') and to a lesser degree the masculine form in the HL groups. Interestingly, feminine forms (*\*golubAJA fonar'* 'blue.F flashlight.M') and neuter were erroneously used with opaque masculine nouns in child speakers only (*golubOJE fonar'* 'blue.N flashlight.M') in both child and adult HL speakers. Whereas the use of feminine with opaque masculine forms is expected, as these forms are ambiguous between masculine and feminine, the choice of neuter can be attributed to the syntactic default in Russian. Neuter is considered to be the syntactic default.

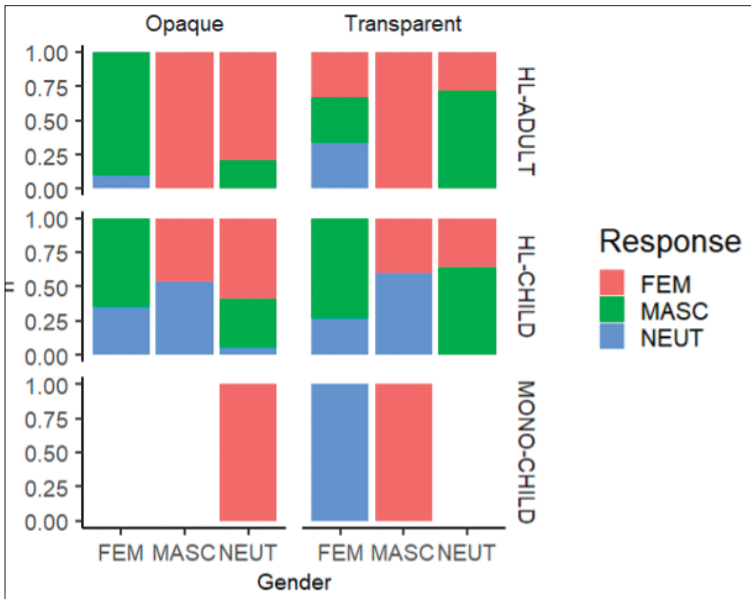
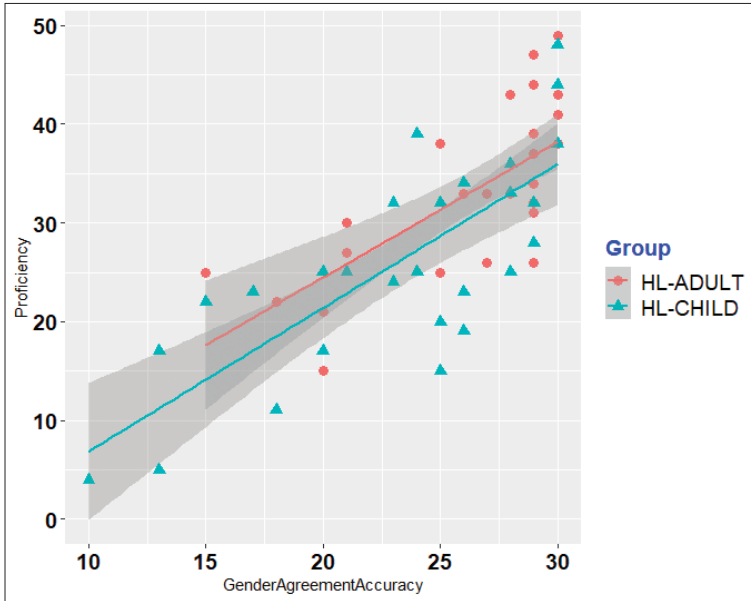


Figure 4 Non-target responses (Note: non-target responses were not observed in the MONO-ADULT group)

Furthermore, when examining gender accuracy across the groups, individual patterns were observed in the HL-CHILD and HL-ADULT groups. A cut-off of 0.33 was determined as the chance-level performance on gender accuracy. In the HL-ADULT group, three participants (3/30, i.e., 10%) exhibited performance at or below chance level on neuter nouns, indicating that the gender systems of these three participants were reduced to two-way gender systems, differentiating only between masculine and feminine. In the HL-CHILD group, one participant (1/29, i.e., 3%) displayed a reduction in both feminine and neuter genders, suggesting a restructured system that does not differentiate grammatical gender, and the only form that is used across all conditions is masculine. In Russian, similarly to many other languages, e.g., Hebrew, masculine is unmarked and is the default, i.e., the first to be acquired and the one assigned to borrowings and loanwords.

Finally, Pearson correlational analyses were conducted to examine the relationships between gender accuracy production, age, AoB, and proficiency (as indexed by noun accuracy production) in the HL child and adult groups. The results revealed weak correlations between age and gender accuracy ( $r = .281$ ,  $p = .031$ ), indicating that older individuals tended to exhibit higher gender accuracy. However, no significant correlations were found between gender accuracy and age of onset of bilingualism ( $r = .153$ ,  $p = .248$ ). Strong correlations were observed between gender accuracy and proficiency ( $r = .773$ ,  $p < .001$ ).

Figure 5 illustrates that gender agreement accuracy increases with proficiency, as indexed by vocabulary size: both children and adult HL speakers who produce more target nouns demonstrate higher accuracy in gender agreement.



**Figure 5** Scatterplot for gender agreement accuracy and proficiency as a function of Group (HL-CHILD vs. HL-ADULT)

#### 4 Discussion

The presented study investigated the developmental trajectories of gender agreement in HL-Russian in contact with SL-Hebrew. The first research question examined the trajectory of gender acquisition in HL speakers by comparing child and adult HL speakers to monolingual controls. Based on the literature, four trajectories were considered: monolingual-like development (T1), intake failure (T2), attrition (T3), and the emergence of a new linguistic variety in a contact situation (T4). The results of the current study pointed at a monolingual-like trajectory (T1), albeit protracted, for gender agreement acquisition in HL-Russian in contact with Hebrew. No evidence for divergent attainment or intake failure (T2), attrition trajectory (T3), or the emergence of a new linguistic variety in a contact situation (T4) was detected.



The monolingual-like trajectory (T1) was evidenced in the lower performance of the child HL speakers compared to the rest of the groups (i.e., MONO-ADULT=MONO-CHILD=HL-ADULT>HL-CHILD). Adult HL speakers in this study were on par with monolingual adult controls, reiterating the findings by Laleko (2018, 2019) for HL-Russian speakers dominant in SL-English. This is important, since the proficiency test, as indexed by lexical abilities, showed that HL adult speakers were lower than monolingual Russian-speaking children. The results point to different developmental trajectories for morpho-syntax and lexical abilities in HL. Adult child HL speakers might achieve target-like grammatical representations as their monolingual adult peers. In contrast, child HL speakers showed the lowest proficiency in the lexical proficiency, and they also were lower in grammatical gender-accuracy production. To be more specific, the performance of the HL-CHILD group was significantly lower on opaque masculine and opaque feminine forms, which is in line with previous monolingual acquisition data for Russian (Cejtlin 2005; Gvozdev 1961; Mitrofanova et al. 2018). The HL child speakers were also lower on transparent feminine nouns.

Furthermore, the analysis of non-target responses also indicated that HL child and adult speakers relied on the same types of cues as monolingual peers. For example, both HL child and adult speakers used non-target feminine forms with neuter nouns. Additionally, opaque feminine nouns with palatalized consonants were often paired with masculine forms of adjectives, which aligns with findings from the Russian-monolingual acquisition literature. However, there were instances where HL speakers defaulted to masculine forms, especially in neuter cases, which is less frequent among monolingual speakers. The strategy of defaulting to masculine has been observed in Russian-Norwegian bilinguals (see Mitrofanova et al. 2018), which points to a profound gender-system restructuring in some HL speakers, as discussed below.

Interestingly, in a study investigating accusative case acquisition using a somewhat similar design, Meir, Avramenko, and Verhovceva (2021) reported that case morphology in HL-Russian in contact with Hebrew shows divergence in both child and adult HL speakers. The authors suggested that the divergence starts early in life and is maintained into adulthood, thus suggesting the emergence of a new language variety (Israeli Russian).

So, why would some phenomena show one trajectory and others a different one? Both accusative case morphology and gender agreement are early acquired phenomena. One plausible explanation is the effect of the properties of the SL. When it comes to gender agreement, Russian and Hebrew rely on very similar cues (-a marking feminine: Russian -*sumka*-a 'bag.F'; Hebrew, *siml*-a 'dress.F'; consonants marking masculine: Russian - *stol* 'table.M'; Hebrew: *tik* 'bag.M'). Although accusative case is marked in both languages, different lexical

realizations of the accusative case are used (inflections in Russian; particle *et* in Hebrew). Furthermore, in the two languages, the accusative case is bundled with different features. In Russian, it is bundled with gender and animacy, whereas in Hebrew, it is bundled with definiteness. The properties of the SL seem to explain the discrepancy in the developmental trajectory for the accusative case (Meir, Avramenko, Verhovceva 2021) and gender agreement (the current study) in HL-Russian in contact with Hebrew.

However, if we consider other language combinations, this explanation will not hold. The monolingual-like developmental trajectory was noted for HL-Russian in contact with Turkish (Antonova Ünlü, Wei 2018). However, unlike Hebrew, which, as explained above, has similar gender cues to Russian, Turkish does not mark grammatical gender. So, the findings by Antonova Ünlü and Wei (2018) cannot be solely attributed to a facilitative effect of the SL. Similarly, Martínez-Nieto and Restrepo (2023) provided evidence for a monolingual-like protracted trajectory for gender agreement in HL-Spanish in contact with English, which also does not mark grammatical gender.

The discrepancy between the results and their interpretation might be related to exposure variables which, in combination with the effect of SL properties, shape the trajectory of HL acquisition. For example, Mitrofanova et al. (2018) showed that individual differences in HL exposure predict the HL gender system for Norwegian-Russian bilinguals. Similarly, Rodina et al. (2020) demonstrated that exposure variables predicted the HL gender system configurations for bilingual HL-Russian-speaking children with different SLs (English, German, Hebrew, Norwegian, Latvian). In the current study, no significant correlations were detected between Age of Bilingualism (AoB), which determines the age of uninterrupted HL acquisition, and gender agreement accuracy. However, strong correlations were found between gender agreement accuracy and proficiency (as indexed by noun naming). Thus, sufficient HL exposure results in larger vocabularies and more target-like grammatical systems. Another possible explanation is the type of input that children are exposed to. Does the linguistic phenomenon under investigation show divergence in the input providers? This question is left for future studies.

In the current study, the majority of HL child and adult speakers developed three-way gender systems in their HL-Russian. Only a small number of participants showed a restructuring of the gender system. Three participants in the HL-ADULT group (10% of the subject pool) had a restructured two-way gender system with only feminine and masculine values. These results confirm previous findings by Polinsky (2008) for American Russian, which demonstrated a restructured (shrunk) grammatical gender system, where the differentiation between masculine and feminine is determined by a binary system of morpho-phonological cues (consonants vs. vowels).

Furthermore, in the HL-CHILD group, one participant (3% of the subject sample) exhibited a restructured system that does not differentiate grammatical genders, with only the masculine form used across all conditions. The defaulting to masculine has been previously reported for some Russian-Norwegian bilingual children (Mitrofanova et al. 2018). Preference for the masculine can be attributed to the fact that the masculine is unmarked, it is the most frequent, and therefore it is considered to be a default form in Russian, as well as in many other languages (Corbett 2007). Additionally, evidence for the absence of grammatical gender marking in HL-Russian has been noted in a small number of children who speak different second languages (i.e., English, German, Hebrew, Norwegian, Latvian). Thus, a restructured gender system in HL-Russian occurs in only very few children and adults. The vast majority of HL-Russian speakers develop target gender configurations, at least for nouns with transparent cues.

In conclusion, the results of the current study provide evidence for a monolingual-like trajectory, albeit protracted, in the acquisition of grammatical gender. Both child and adult HL-Russian speakers develop the target three-way gender system in their HL-Russian for nouns with transparent cues. The gender assignment of opaque cues might be divergent as it requires more exposure and memorization of gender values for specific lexical items.

The results for HL-Russian child speakers are consistent with previous findings in monolingual Russian-speaking children, which indicate that neuter (transparent and opaque) nouns and opaque feminine nouns pose greater challenges. A small number of HL-Russian speakers exhibit restructured systems, either demonstrating a two-way gender system or a system with no grammatical gender, defaulting to masculine. The masculine forms in Russian and in Hebrew (the dominant language of HL speakers in the current study) are unmarked forms and are considered as defaults. Future studies should expand research on defaults across different populations and different languages (for more information on defaults in language acquisition see Tsimpli, Hulk 2013).

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