Monolingual and Heritage Speakers' Grammatical Processing: An ERP investigation of the Hebrew Accusative Marker

Dana Plaut-Forckosh, David Anaki, Irina Sekerina, and Natalia Meir

Background. This study investigates grammatical processing in Hebrew monolinguals and Russian-Hebrew bilinguals, where Russian serves as the heritage language (HL) and Hebrew as the dominant societal language, focusing on the Hebrew accusative marker. The study is motivated by the distinct case-marking systems of Hebrew and Russian, particularly in the accusative case, providing a unique lens for exploring cross-linguistic influences and bilingual language processing. In Hebrew, the nominative case is unmarked for nouns, while the accusative marker *et* appears only before definite objects[1], allowing both the canonical SVO order and the less common OVS, with *SVS and *OVO being ungrammatical[1]. In contrast, Russian features a robust case system, where accusative marking involves a gender-dependent suffix, accommodating all S-V-O combinations, though SVO remains the preferred structure[2]. Integration, a crucial concept in language processing, involves merging linguistic elements into larger phrases and clauses[3]. For accusative case violations (*SVS/*OVO), monolinguals typically show P600/N400 effects compared to grammatical counterparts (SVO/OVS)[4]. However, HL speakers display inconsistent patterns for integrating linguistic information[5,6]. This study seeks to clarify how HL speakers integrate the accusative marking in Hebrew, their dominant societal language—an area that remains underexamined.

Design. We tested Russian-Hebrew bilinguals (N=40) and Hebrew monolinguals (N=40) with an auditory EEG task, where participants rated the grammaticality of transitive sentences (see Table 1). Brain signals were recorded from 64 channels across 328 items split into two lists.

Analysis. Behavioral data were analyzed using mixed-effects logistic regression models, with Participant as a random intercept and Condition (SVO, OVS, SVS, OVO) and Group (monolinguals, HL-Russian) as fixed factors. EEG data were analyzed using linear mixed-effects models, with ERP amplitudes from 200ms pre- to 1200ms post-onset of ACC1/2 as the dependent variable, Time (continuous), Condition, and Group as fixed effects,

Results and Discussion. Behavioral data indicated that HL speakers performed similarly to monolingual controls but with more pronounced differences in response times and rating patterns (see Fig.1 and 2). This heightened sensitivity could be due to greater morphosyntactic awareness[6], cross-linguistic transfer[7], leading to a bilingual advantage[8]. In the ERP data, both groups showed more positive amplitudes for subject-first sentences than object-first in ACC1, highlighting their shared processing patterns (see Fig 3.). However, in ACC2, the ERP responses diverged: monolinguals exhibited a P600 effect for ungrammatical constructions, suggesting they primarily processed accusative violations as syntactic errors. In contrast, HL speakers displayed an N400 effect, implying they interpreted the same violations as semantic mismatches.

These findings highlight unique cognitive strategies in bilingual language processing. Specifically, while HL speakers performed comparably to monolinguals behaviorally and in ACC1, their ERP responses in ACC2 revealed fundamental differences in processing mechanisms, by processing accusative violations through a semantic lens rather than a syntactic one. This suggests that bilingual language processing is shaped by a combination of cross-linguistic influences and adaptive neural strategies, emphasizing the nuanced ways bilinguals navigate grammatical processing in their dominant language.

Table 1. Stimuli examples for ERP experiment

Condition	AdvP	*ACC1/* silence1	NP1	Verb	AP	*ACC2/* silence2	NP2
SVO	*baboker*, in-the morning		*ha-more* **DEF**-teacher	*yecayer* will-draw	*maher* quickly	*et* **ACC**	*ha-leycan*. **DEF**-clown
* SVS	*baboker*, in-the morning		*ha-more* **DEF**-teacher	*yecayer* will-draw	*maher* quickly		*ha-leycan*. **DEF**-clown
OVS	*baboker*, in-the morning	*et* **ACC**	*ha-more* **DEF**-teacher	*yecayer* will-draw	*maher* quickly		*ha-leycan*. **DEF**-clown
* OVO	*baboker*, in-the morning	*et* **ACC**	*ha-more* **DEF**-teacher	*yecayer* will-draw	*maher* quickly	*et* **ACC**	*ha-leycan*. **DEF**-clown

Fig 1. Grammaticality judgment *scores* per group and condition

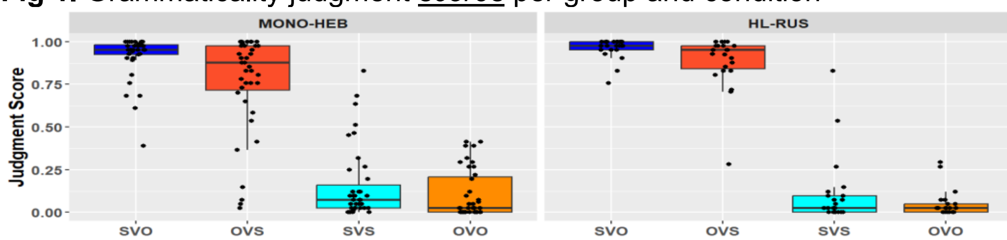


Fig 2. Grammaticality judgment *RTs* per group and condition

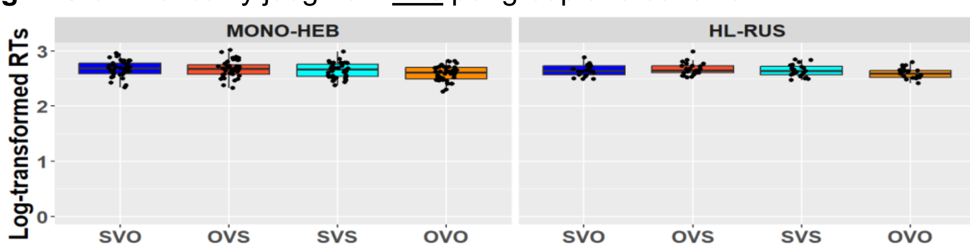
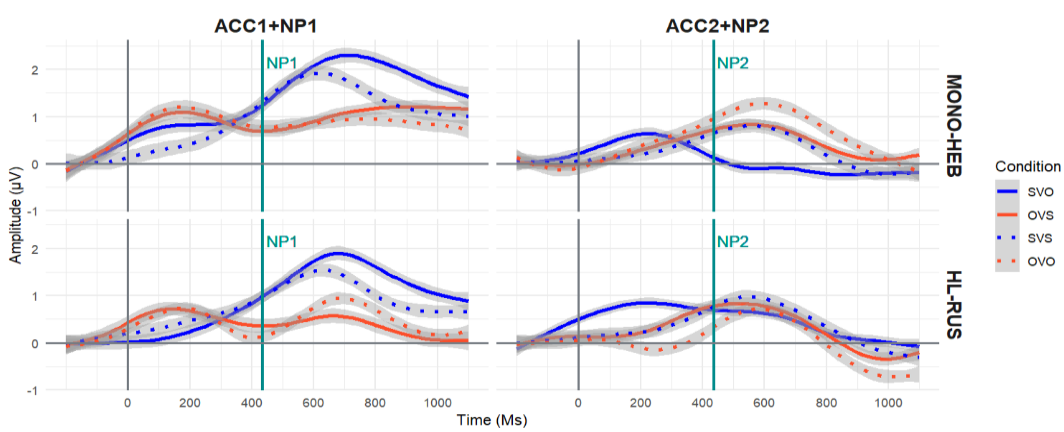


Fig 3. Grand-average ERP waveforms at the critical ACC1/silence1+NP1 and ACC2/silence2+NP2, per condition and group (onset marked by a vertical line at 0ms). The turquoise horizontal line indicates the onset of NP1/NP2. Negativity is plotted downward.



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