An eye-tracking study of ergativity processing in West Circassian

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Background: Bilingual language systems are subject to cross-linguistic influence, and sustained use of one language may lead to the weakening of the properties of another language [1]. Ergative alignment systems could be weakened [2] or restructured, especially under the influence of a dominant accusative language. For instance, in the study of split-ergativity in Hindi [3] it was shown that bilinguals with Hindi as a non-dominant language show instability with morphological case, unlike balanced Hindi-English bilinguals.

This study involves bilingual speakers of Russian, which exhibits nominative–accusative alignment, and West Circassian, a minority ergative polysynthetic SOV language spoken mostly in the West Caucasus. We examined ergativity processing using case-marking violations. Our hypothesis was that speakers with higher proficiency in West Circassian would exhibit longer reading times in case of ungrammaticality, reflecting their sensitivity to ergative case violations, which can be detected in online reading measures.

Method: All 46 participants (42 women; $M_{age} = 37.3$, $SD = 14.3$, range = 17–62) provided informed consent prior to taking part in the study. Speakers' proficiency was measured using the West Circassian version of the LexTALE test [4]. The total score could range from -60 to 60, reflecting the penalty-based scoring procedure of the test. Participants achieved a mean score of 25.53 ($SD = 13.71$) ranging from -4 to 50.

The experiment included 32 stimuli and 32 fillers. All target sentences had the same structure: an ergative animate subject (or absolutive, rendering the sentence ungrammatical, see (2)), an absolutive object, and a verb, see (1). While more subtle manipulations (e.g., gradient acceptability) may show finer-grained processing differences, categorical violations offer a necessary first step in establishing whether the relevant feature is accessible during processing. We varied object animacy so that in half of the stimuli argument roles were easy to identify *without* reading case markers, see (2). That was made in order to check the assumption that readers would rely on the differentiation between agent-like and patient-like arguments for sentence interpretation, independently of the alignment. All stimuli were presented in full on the screen. The object was selected as a region of interest because the violation could only be detected after the object case had been processed. Eye movements were recorded using EyeLink Portable Duo (SR Research, Canada), with a sampling rate of 1000 Hz. Two eye-movement measures were selected: first run reading time (FR) reflecting early word processing, and total reading time (TT) reflecting late word processing.

Results: The results showed that FR on the object decreased as proficiency increased ($Est. = -0.17$, $SE = 0.05$, $CI = -0.27{-}{-}0.07$, $p = .003$), see Fig. 1. Grammatical sentences were read faster than ungrammatical (TT: $Est. = -0.09$, $SE = 0.03$, $CI = -0.15{-}{-}0.03$, $p = .014$), see Fig. 2. The interaction between the LexTALE score and grammaticality was not significant, see Tables 1 and 2.

Discussion: Regardless of grammaticality, an object was read faster with increasing proficiency in West Circassian, as reflected in early eye-movement measures. Ergativity violations were detected irrespective of proficiency, as reflected in late eye-movement measures, which are associated with reanalysis. In other words, sensitivity to case violations does not systematically vary with proficiency. Thus, the results do not provide clear evidence for comprehension-level ergativity attrition within the tested sentences. One possible explanation is that ergativity is a robust feature, which is resistant to attrition within relatively transparent case contrasts; these may be sufficient to trigger grammatical sensitivity

even in speakers with lower proficiency. Alternatively, the observed effects may not reflect the robustness of ergativity per se, but rather a general requirement for the distinctness of core arguments in transitive constructions.

(1) wəneʔʷətə-**m** χʷəŋčʼaḳʷe-**r** qəλeвʷəв a-r qešʼtaв
housekeeper-**ERG** **thief**-ABS saw that-ABS frightened
'The housekeeper saw a thief. He/she was frightened.'

(2) wəneʔʷətə-**r** *bžʼəвe-**r** qəλeвʷəв a-r qešʼtaв
housekeeper-**ABS** **spot**-ABS saw that-ABS frightened
Intended meaning: 'The housekeeper saw a spot. He/she was frightened.'

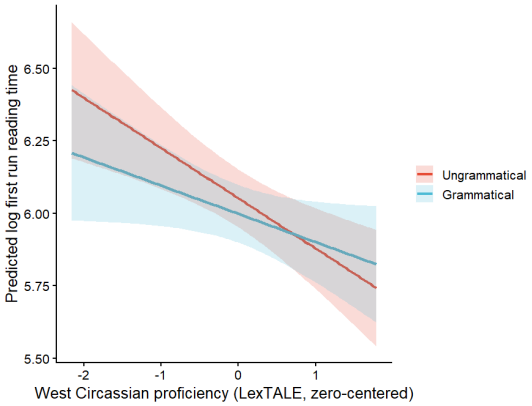

Figure 1: Interaction plot for LexTALE score and grammaticality (first run reading time).

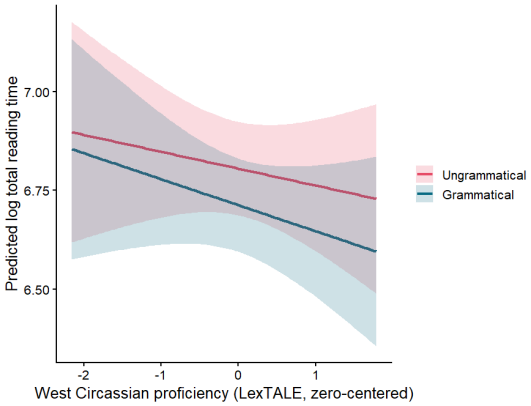

Figure 2: Interaction plot for LexTALE score and grammaticality (total reading time).

	FR			
Predictors	Est.	SE	CI	p-value
Intercept [ungrammatical, animate, LexTALE = 0]	6.05	0.05	5.95 –6.15	<0.001
Grammaticality [grammatical]	-0.05	0.04	-0.13 –-0.02	0.539
LexTALE (zero-centered)	-0.17	0.05	-0.27 –-0.07	0.003
Animacy of an object [inanimate]	-0.01	0.04	-0.09 –0.07	0.744
Grammaticality [grammatical] * LexTALE	0.08	0.04	-0.00 –0.15	0.226
LexTALE * Animacy [inanimate]	0.05	0.04	-0.03 –0.13	0.539

Table 1: The output for the model of first run reading time.

	TT			
Predictors	Est.	SE	CI	p-value
Intercept [ungrammatical, animate, LexTALE = 0]	6.81	0.06	6.69 –6.92	<0.001
Grammaticality [grammatical]	-0.09	0.03	-0.15 –-0.03	0.014
LexTALE (zero-centered)	-0.04	0.06	-0.16 –0.07	0.911
Animacy of an object [inanimate]	-0.07	0.03	-0.13 –-0.01	0.112
Grammaticality [grammatical] * LexTALE	-0.02	0.03	-0.08 –0.04	0.911
LexTALE * Animacy [inanimate]	-0.04	0.03	-0.10 –0.02	0.601

Table 2: Interaction plot for LexTALE score and grammaticality (total reading time).

Note: This work is an output of a research project implemented as part of the Basic Research Program at HSE University.

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