Distributional regularity of suffixes facilitates acquisition of gender: Eye-tracking evidence from two closely related languages

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Russian and Bulgarian both have three genders and agreement between an ADJ and a N but differ in how transparent form-to-meaning mapping is in terms of gender suffixes. In Russian, inanimate nouns of all genders can be transparent (*-a* for FEM, consonant for MASC, stressed *-o* for NEUT) or opaque (palatalized consonant for FEM and MASC, unstressed -o for NEUT), whereas in Bulgarian, only FEM nouns can be transparent (*-a*) or opaque (consonant).

Some scholars suggest that fewer form-to-meaning mappings facilitates acquisition of gender [1]. If gender in Russian features more form-to-meaning mappings than in Bulgarian, then [1] predictc that Russian children should have more problems with opaque nouns than Bulgarian children. An alternative hypothesis based on distributional learning [2,3] predicts that opaque nouns in Russian will be easier because of the more regular distribution of these nouns in all genders in Russian. The density of cues in each gender class results in a more complex gender system but provides more evidence in the input and should be easier to acquire.

In two experiments (production and eye-tracking in comprehension), we tested these two hypotheses. Participants were 4-to-6-year-old Russian (N=22) and Bulgarian (N=22) children. In both experiments, the same children viewed two images side-by-side of two objects while listening to instructions. In the production experiment, the objects contrasted in color (red vs. green shovel/pedal). When one of the objects disappeared on the screen, the participants had to name the one that remained, e.g. *What disappeared?* Russian children significantly outperformed Bulgarian children in producing correct ADJ-N agreement for the FEM opaque nouns (94.5% vs. 49.5%). In the Visual World comprehension experiment, the objects were of the same color, named by the transparent or opaque noun (*lopata*-FEM 'shovel' vs. *pedal'*-FEM 'pedal'), and paired with a transparent competitor in either a different gender (DIFF: *stul*-MASC 'chair') or in the same gender (SAME: *mašina*-FEM 'car'). Children had to point to the correct image, e.g., *Show where here [is] red-FEM car/pedal-FEM* (30 items in total).

Similar to the production accuracy, eye-movement analysis of the proportion of looks for the FEM nouns in the Noun + Silence regions (Table 1) revealed that the Russian children looked significantly more to the target (.76) than the Bulgarian children (.68). The Language effect interacted with Condition: no difference in looks in the FEM-DIFF condition, but fewer looks in Bulgarian in the FEM-SAME condition which indicates that FEM is more distinct in Russian regardless of the suffix transparency. Thus, we found support for the Distributional Regularity over the Form-to-Mapping hypothesis: presence of a large number of opaque nouns across all gender classes facilitates processing of gender by Russian children in contrast to the asymmetrical distribution of opacity in the Bulgarian gender system.

Table 1.	Russian	Statistics	Bulgarian	Statistics
Opaque, DIFF	.75		.64	
Opaque, SAME	.79	No effects	.61	Effect of
Transparent, DIFF	.75		.76	Condition: *p*=.008
Transparent, SAME	.75		.72	

REFERENCES: **[1] Brouwer, Sprenger, & Unsworth (2017).** Processing grammatical gender in Dutch: Evidence from eye movements. *J of Exp Child Psychology, 159* **[2] Reeder, Newport, & Aslin (2017).** Distributional learning of subcategories in an artificial grammar. *JML, 97.* **[3] Hall & Owen Van Horne (2018).** Distributional learning aids linguistic category formation in school-age children. *J Child Lang 45.*