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# The impact of interlingual correspondences on cognate recognition in Slavic intercomprehension

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**Abstract**
The present paper is devoted to the problem of cognate recognition in an intercomprehension setting, in which the target language is not directly known to the readers, but is closely related to their native language. Previous research has shown that once context is accounted for, intelligibility is partially predicted by measures of interlingual proximity such as Levenshtein distance. Taken alone, however, such measures are insufficient to fully explain empirical data. It has thus been suggested that specific interlingual correspondences may have a more conspicuous impact than others. To verify this hypothesis, 163 East Slavic-speaking learners of L2 Polish were asked to translate a set of non-words, obtained by manipulating a set of Russian words with respect to a single segment (e.g. initial consonant). All non-words were consistent with Polish phonotactics; however, some modifications matched existing phonological correspondences between Polish and Russian, while others did not. Target items were presented in writing through an online survey, initially in isolation, subsequently within a meaningful sentence.

The results show that the presence of a meaningful context significantly improves the chances of cognate recognition. Further, non-words containing systematic sound correspondences resulted in a higher recognition rate than non-words comprising arbitrary modifications. Within the latter group, finally, modifications to consonants in word-initial and word-medial position as well as diverging positions of the stress resulted in significantly lower recognition scores.

**Аннотация**
Настоящая статья посвящена проблеме распознавания когнатов в условиях взаимопонимания, в которых исходный язык не известен пользователю напрямую, но тесно связан с его родным языком. Предыдущие исследования показали, что после учета контекста разборчивость частично предсказывается степенью межъязыковой близости, такой, например, как расстояние Левенштейна. Однако сами по себе эти параметры недостаточны для полного объяснения эмпирических данных. Таким образом, было высказано предположение, что одни межъязыковые соответствия могут иметь более заметное влияние, чем другие. Чтобы проверить эту гипотезу, 163 восточносла-

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вянских курсанта, изучающих польский язык как иностранный, были попрошены перевести набор несуществующих в польском языке слов, полученных путем манипулирования одного звука (например, начальная согласная) в реальных русских словах. Хотя все такие искусственные слова были согласованы с польской фонотактикой, некоторые модификации соответствовали существующим фонологическим соответствиям в польском и русском языках, другие - нет. Слова для перевода были представлены в письменной форме через онлайн-опрос, сначала изолированно, а затем в осмысленном предложении.

Результаты показывают, что наличие контекста повышает шансы узнавания когнатов. Кроме того, искусственные слова, содержащие систематические польско-русские звуковые соответствия, приводили к более эффективному распознаванию, чем те, которые содержали произвольные модификации. В этой последней группе модификации согласных в начале и середине слова, а также различное положение ударения, значительно препятствовали распознаванию когнатов.

## 1 Introduction

The present paper investigates the effect of various interlingual correspondences between pairs of cognates (i.e. etymologically related words) as a possible predictor of their recognisability by speakers of related languages. This in turn is a crucial skill in the context of intercomprehension (IC), here defined as

> "a relationship between languages in which speakers of different but related languages can readily understand each other without intentional study or extraordinary effort. It is a form of communication in which each person uses his/her own language and understands that of the other(s)" (European Commission, 2012).

The definition quoted above may be adapted to cases in which the target language is read, rather than listened to. For each speaker, comprehension is made possible by the knowledge of another language related to the target language – often, though not necessarily, the speaker's L1. Indeed, IC based on the knowledge of an L2 has been shown to be possible and effective. In the Slavic domain, for instance, Branets et al. (2020) showed that speakers of Estonian (a non-Indo-European, non-Slavic language) were quite successful at understanding Ukrainian thanks to their knowledge of L2 Russian, while Saturno (2020) demonstrated that L1 Italian students of L2 Russian were quite effective at producing Polish inflectional morphology after only a few hours' course in comparative Slavic linguistics. The effectiveness of minimal teaching interventions to improve existing IC skills is also argued for by Golubović (2016).

Numerous factors have been shown to affect the overall efficacy of IC. The two most crucial variables, i.e. one's plurilingual repertoire (Berthele, 2011; Vanhove & Berthele, 2017) and overall exposure to the target language (Gooskens et al., 2018) are of extra-linguistic nature and produce "acquired", rather than "inherent", intelligibility (Bahtina & ten Thije, 2012). A further variable that was shown to have a powerful role in predicting IC success is the presence of a meaningful context. However, precisely as a consequence of its paramount importance in IC, it is usually excluded from empirical studies in order to focus on other predictors that would otherwise be overshadowed by it. Nevertheless, Berthele (2011, p. 216) suggested that due to the "artificial and decontextualized nature of the word list data", no sufficient insights on the cognate recognition process can be extracted from them, whereas

> "in naturalistic situations, there would be additional, contextual information available that contributes in significant ways to this decision, most notably the semantic fit of the item within the co- and context".

A precise account of the impact of context is complicated by the fact that this variable is very hard to model and control for in an experimental design. Within the Slavic language family, Heinz (2009) pointed out that even correct lexical inferences may be revised if the result is not deemed suitable to the context. This observation is echoed by Jágrová et al. (2019), who found that even close cognates or nearly identical internationalisms were not always translated correctly for the same reason. Based on an investigation of Germanic IC through a think-aloud protocol, Möller and Zeevart's (2015, pp. 344–345) concluded that "the normal way of proceeding is characterized by interaction between inferring and perception of similarity", in which "even the phonetic intuitions that turned out to be available in the recognition of isolated words seem to take a back seat as soon as semantic context is available".

In a study on the written comprehension of Russian and Romanian by speakers of French, Castagne (2011) argued that results improve when contextual information is added, while co-text seems less essential. Muikku-Werner (2014) observed that the number of similar word forms that a readers might consider suitable translations of a target word decreases as more context is provided, since potential options have to fit a narrower syntactic and semantic frame. She also found that the presence of a meaningful context facilitates the guessing of a frequent collocate of a word.

Within the Inconslav project, the role of context was initially explored using 3-gram models, which first count the occurrences of all three-word combinations in a corpus and then statistically assess the predictability of a word given the two preceding words. Jágrová (2018) highlighted a significant correlation between the intelligibility of Polish by Czech speakers and 3-gram surprisal for Polish noun-adjective order, which is somewhat more flexible than in Czech. Jágrová and Avgustinova (2023) showed that 3-gram predictability contributes to the intelligibility of target words in sentence-final position. In a further study aimed to overcome the limitations of 3-gram models, i.e. the fact that context is only operationalized as the two adjacent words, Jágrová et al. (2021) improved previous results using models based on surprisal, which incorporate information from the entire sentence. However, since the correlation with intelligibility were still weak, the authors (2021, p. 12) conclude that "surprisal as a representation of predictability in context does not reach the level of the correlations with the linguistic distance that was many times demonstrated in previous research".

With Stenger et al. (2020, p. 46), however, one may argue that "even though it may seem artificial to test individual words without context, since the latter may provide helpful information, […] cognate recognition is a precondition of success in reading intercomprehension". Indeed, the percentage of cognate words in the two related languages and the formal similarity between the cognates have been shown to be major determinants of cross-linguistic intelligibility (Gooskens, 2007; Tang & van Heuven, 2015). Overall distance between linguistic items is typically measured using various versions of the Levenštein (1966) algorithm, defined as the minimum number of operations (insertion (I), deletion (D), or substitution (S) of segments) required to turn a string into another. The raw Levenshtein distance is the sum

**Table 1** Levenshtein distance between Polish *Warszawa* and Italian *Varsavia* 'Warsaw', written mode

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| string a | w | a | r | s | z | a | w | – | a |
| string b | v | a | r | s | – | a | v | i | a |
| operation | S | = | = | = | D | = | S | I | = |

**Table 2** Levenshtein distance between Polish *Warszawa* and Italian *Varsavia* 'Warsaw', aural mode

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| string a | v | a | r | ʃ | a | v | – | a |
| string b | v | a | r | s | a | v | j | a |
| operation | = | = | = | S | = | = | I | = |

of the number of operations performed, i.e. 4 in Table 1. However, it is often more useful to consider the "normalised" distance, computed as the raw Levenshtein distance divided by the total length of the alignment, i.e. the number of cells comprised in the matrix used to compare the two strings (9 in Table 1). Thus, the normalised distance between the orthographic Polish *Warszawa* and its Italian counterpart *Varsavia* is 4 / 9 = 0.45. This value is independent of the length of the strings considered and may be compared to other values computed in the same manner.

Orthographic Levenshtein distance has been successfully used in linguistic research to investigate the distance between related varieties in various language families (Gooskens & Heeringa, 2004; Heeringa, 2004; Kessler, 1995; Tang & van Heuven, 2015; Van Bezooijen & Gooskens, 2005; Zulu et al., 2008). Levenshtein distance can also be computed for phonological words based on phonetic transcription (Heeringa et al., 2006). Computing distances based on written or aural data may produce radically different results because of the possible discrepancies between the phonological structure of a word and its graphical representation (Table 2). The normalised distance between the pronunciation of Polish *Warszawa* and Italian *Varsavia* is 2 / 8 = 0.25, as opposed to 0.45 in the written mode. Note that the length of the alignment has changed as well (from 9 to 8).

Concerning the Slavic language family, correlations between IC success and several linguistic predictors, including Levenshtein distance, was attempted within two large projects, neither of which regrettably considered the language combination Polish-Russian. Within the "Inconslav" project, Stenger et al. (2017) found a significant correlation between normalized Levenshtein distance (at the orthographic level) and intelligibility, although other measures of linguistic distance, such as word adaptation surprisal and conditional entropy, were found to be better predictors (Mosbach et al., 2019). Indeed, one of the limits of Levenshtein distance is its symmetricity, which does not necessarily reflect linguistic reality: several works have highlighted numerous cases of asymmetric distances among Slavic languages (e.g. Jágrová et al., 2017), showing that cognate recognition may be easier for speakers of one of the languages involved (e.g. Golubovic & Gooskens, 2015; Stenger et al., 2017).

Within the "MICReLa" project, devoted to mutual intelligibility within the Romance, Germanic, and Slavic families (Golubovic & Gooskens, 2015), Gooskens et al. (2018) showed that spontaneous comprehension is lower in the Slavic language family than in the other language families considered (27.6% against 40.0% in Germanic and 36.4% in Romance), although no statistically significant effect was uncovered. Exceptions to the low intelligibility scores (below 20% in half the cases) are Czech-Slovak (92.7% and 95.0%, depending on the reader's L1), Croatian-Slovenian (43.7% and 79.4%) and Polish-Slovak (40.7% and 50.7%). Further, Gooskens and van Heuven (2019) demonstrated that by far the most influential predictor of IC success was exposure to the target language, while linguistic distance hardly improved the model. When extra-linguistic predictors are excluded, the Slavic language family exhibits the highest correlation between affix distance and intelligibility by listeners with no prior exposure to the test language, probably due to the rich inflectional system of these languages. Lexical, phonetic and orthographic stem distances also correlated highly. In a regression analysis, orthographic affix and phonetic distances together explain 80% of the variance. Interestingly, the authors also point out that

> "In the Slavic area there is so little exposure to the other languages that we are in fact dealing with inherent intelligibility, i.e. intelligibility in situations where listeners received no previous exposure to the test language but are still able to understand it to some extent because it resembles their native language" (Gooskens & van Heuven, 2019, p. 26).

Despite the correlation between phonetic distance intelligibility, Gooskens and van Heuven (2019, p. 26) also note that measurements of linguistic distance should "to a larger extent take into account communicatively relevant distances by weighting linguistic difference that are important for communication more heavily than differences that are less important". Indeed, in a study on Dutch-German intelligibility by children, Gooskens et al. (2015) found that minor phonetic details that could hardly be captured by Levenshtein distances sometimes had a notable impact on the intelligibility of isolated words. van Heuven (2008) suggested a set of qualitative, rather than quantitative predictors, highlighting a more conspicuous role for consonants over vowels, consonant substitutions over insertions or deletions, and word onset over other parts of the word.

In an experiment on Germanic IC, Berthele (2011) found a negative correlation of cognate intelligibility and the distance between the target item and the L2 English cognate (but not the L1 German cognate). A distance threshold around 0.22 was identified, above which intelligibility drastically decreases. Even below that threshold, however, radically different intelligibility scores may correspond to the same value of Levenshtein distance, so much so that

> "the lack of clear correlations and the unexplained patterns […] raise the question whether it is not mere distance/difference, but rather particular types of differences that are the key to the empirical differences across the items in this interlingual guessing puzzle" (Berthele, 2011, p. 202).

The subsequent explorative analysis concluded that consonants are a more important predictor of successful inference than vowels, coherently with the results of van Heuven (2008) cited above. In the case of vowels, intelligibility seemed to even benefit from differences. Modifications affecting word onsets proved particularly deleterious.

Alongside a weak but significant correlation between intelligibility and Levenshtein distance, Möller and Zeevart's (2015) experiment on Germanic IC showed that subjects converged on a set of translations characterised by equal Levenshtein distance with respect to the target cognate. In a multiple-choice task, alternatives differing from the target in the quality of a segment were preferred to those differing in the number of segments they comprised. Again, a preference was found for those alternatives in which the first segment remained unchanged. Finally, when asked to decide whether two words were cognates or not, participants displayed a greater rejection rate for phonological correspondences extraneous to the Germanic language family. No obvious tendency could be identified in this task relatively to the locus of the modification within the word. Similarly, the only difference between modifications affecting consonants and vowels proved to be a greater tolerance to phonetic deviations in the case of the latter.

Levenshtein distance does not typically account for suprasegmental traits. However, it has been shown that lexical stress can have a significant impact on cognate recognition. Valentini and Grassi (2016) asked 35 L1 Italian participants with no experience of Slavic languages to translate a set of 120 Polish words, all of which had an etymological cognate in Italian. The authors identified a powerful role for two phonological variables, i.e. "phonological identity" – whether the Polish stressed syllable was composed of the same phonemes as the corresponding Italian syllable – and "accentual pattern" – whether lexical stress fell on the same syllable in the Italian and Polish cognate. The statistical analysis proved that both variables are important predictors of recognition success, although the impact of phonological identity seems more conspicuous. Since Polish and East Slavic significantly differ in terms of stress patterns, the impact of this feature should be kept in mind in the present research.

## 2 Research questions and hypotheses

The paper pursues the following research questions:

RQ1: do systematic and unsystematic sound correspondences exert a differential impact on cognate recognition?
HYP1: it is expected that compared to unsystematic differences, systematic sound correspondences between the L1 word and its counterpart in the target language will facilitate cognate recognition.
RQ2: do specific change patterns affect cognate recognition in a differential manner?
HYP2: changes involving consonants are expected to make cognate recognition more difficult than changes involving vowels.
RQ3: to what extent does the presence of a meaningful context impact on the accuracy of interlingual inferences?
HYP3: the presence of a meaningful context will most probably facilitate the identification of the target interlingual cognate.
RQ4: what is the impact of Levenshtein distance?
HYP4: the greater the Levenshtein distance, the greater the difficulty of cognate recognition is expected to be.

## 3 Comparative Polish/Russian phonology

The present section will briefly outline the phonological differences between Russian and Polish that are directly relevant for the purposes of the paper. For a more comprehensive description of the languages in question, the reader is referred to other publications (e.g. Cubberley, 2002, Chap. 2; Gussman, 2007; Yanushevskaya & Bunčić, 2015).

To start, Polish has fixed stress on the penultimate syllable, with the only exception of a few clitics and learned words, e.g. *kupiliśmy* /kuˈpiliɕmɨ/ 'we bought', *fizyka* /ˈfʲizɨka/

**Table 3** Non-systematic items, change patterns

| | initial C | medial C | final C | initial V | medial V |
|---|---|---|---|---|---|
| *rubaška* | *tubaszka* | *rubaczka* | *rubaszta* | *rabaszka* | *rubiszka* |
| /ruˈbaʃka/ | /tuˈbaʃka/ | /ruˈbaʧka/ | /ruˈbaʃta/ | /raˈbaʃka/ | /ruˈbiʃka/ |
| Russian | non-word 1 | non-word 2 | non-word 3 | non-word 4 | non-word 5 |

'physics', although in contemporary use strong analogical tendencies make pronunciations like /kupiˈliɕmɨ/ and /fʲiˈzɨka/ increasingly common. In Russian, on the other hand, stress is free and may change even within the paradigm of a word, e.g. *ruk-a* /ruˈka/ 'hand-NOM.SG' vs. *ruk-u* /ˈruku/ 'hand-ACC.SG'.

Further, the pronunciation of the Russian phonemes /o/ and /e/ is determined by their position relative to the accented syllable. The farther they occur from it within the word, the more reduced their phonetic realization. To exemplify, *chorošo* /xoroˈʃo/ 'well' is pronounced [xərʌˈʃo], while *peredel* /pʲerʲeˈdʲel/ 'subdivision:NOM.SG' is pronounced [pʲɪrʲɪˈdʲeɫ]. Similar considerations apply to other sounds as well, such as /a/ preceded by a palatalized consonant as in *ljaguška* /lʲaˈguʃka/ 'frog:NOM.SG', pronounced [lʲɪˈguʃkə]. Finally, several Russian phonemes have a systematic, but phonetically different functional counterpart in Polish, e.g. /rʲ/ – /ʒ/ in Rus. *reka* /rʲeˈka/, Pol. *rzeka* /ˈʒeka/ 'river'.

# 4 Methodology

## 4.1 Target items

Studying the determinants of transparency using real words is problematic from various points of view. First, different languages may graphically represent the same sounds using different strategies. To exemplify, the palatalisation of consonants is represented using vocalic graphemes in Russian, but diacritics in Polish (on diacritics, see Marcet et al., 2020). Second, the graphical representation of a word may reflect older pronunciations, as in English, or its phonological, rather than phonetic realisation, as is the case with the Russian vowel reductions described in Sect. 3. If the languages considered use different alphabetic systems, there is the additional obstacle of transliteration (Heeringa et al., 2014). Finally, cognates do not necessarily differ in a systematic manner, so that it may be difficult or impossible to focus on a single predictor without the disturbance of others, such as analogy, synchronically unsystematic correspondences, foreign models etc.

Therefore, in order to manipulate the predictors of interest more thoroughly, and also to make sure that participants could not translate the target items based on their knowledge of Polish, a set of 33 non-words was elaborated from an equal number of Russian three-syllable words with no Polish cognate, e.g. Rus. *rubaška* /ruˈbaʃka/, cfr. Pol. *koszula* /koˈʃula/ 'shirt'. For each Russian model word, five non-words were created, each differing from the original by an arbitrary sound change in one of the five locations detailed in Table 3. Word-final vowels were not manipulated because they typically encode the inflectional morpheme and are thus subject to change in inflection, e.g. *rubašk-a* 'shirt-NOM.SG' vs. *rubašk-i* 'shirt-GEN.SG' or 'shirt-NOM/ACC.PL'.

Non-words have been used before (e.g. Möller & Zeevaert, 2015) to investigate the role of variables that it may be impossible to thoroughly manipulate using real words. However, the possibility exists that items consistent with the systematic Polish/Russian sound correspondences may be processed differently from non-words containing arbitrary modifications (although all target items were consistent with Polish phonotactics). To verify this hypothesis, non-words were divided into two groups, i.e. "systematic" and "arbitrary" based on whether or not they contained one or more Russian phonemes that systematically correspond to a phonetically different Polish counterpart. Thus, the Russian sound patterns /dʲi/ and /tʲe/ (as in *voditel'* /voˈdʲitʲelʲ/ 'driver') systematically correspond to Polish /ʥi/ and /ʨe/, respectively (as in *rodzicielski* /roʥiˈʨelski/ 'parental'). Applying these systematic correspondences to the Russian word *voditel'* /voˈdʲitʲelʲ/ 'driver' results in the Polish systematic non-word *wodziciel* /voˈʥiʨel/ 'driver'. In contrast, in a Russian word like *rubaška* /ruˈbaʃka/, no sound pattern has a systematic, phonetically different Polish counterpart. The resulting non-word **tubaška* /tuˈbaʃka/ is arbitrary in that the /r/-/t/ correspondence cannot be predicted based on Russian/Polish comparative phonology.

In "systematic" words, all sounds with a Polish counterpart were modified, so that these target items may contain more than one modification. Not unexpectedly in light of the relative poverty of Russian/Polish systematic vowel correspondences, all modifications concerned consonants. In contrast, arbitrary words display only one modification. The only exception is the additional modification of consonant palatalisation resulting from some vowel manipulations, e.g. **rubiszka* /ruˈbʲiʃka/ from Rus. *rubaška* /ruˈbaʃka/ 'shirt'. The total number of arbitrary and systematic target words is 17 and 16, respectively.

Target words were also classified with respect to the position of the lexical stress. Since stress is fixed in Polish, choosing a Russian model word accented on a syllable other than the penultimate automatically results in a manipulation of this parameter. Three categories were identified. In "identical" items, the stress falls on the same syllable (the penultimate) in both Russian and the Polish non-word, e.g. Rus. *bumaga* /buˈmaga/ 'paper', cf. non-word **rumaga* /ruˈmaga/. In the "reductions" category, the stress falls on the same syllable, but because of Russian phonology, some of the vowels are pronounced differently in the model and the non-word, e.g. Rus. *bol'nica* /bolʲˈnʲiʦa/ 'hospital', pronounced [bʌlʲˈnʲiʦa], cf. non-word **tolnica* /tolˈnʲiʦa/. In "divergent" items, finally, the stressed syllable differs in the model and the non-word, e.g. *babočka* /ˈbaboʧka/ 'butterfly', cf. non-word **babonka* /baˈbonka/.

Although target words were elaborated based on their phonological representation, as shown above, they were presented to the participants using Polish orthography. The goal of this choice is two-fold. First, it reinforced the impression that the target items were indeed Polish words unknown to the learner, rather than non-words. Second, it avoided difficulties related to the use of different spelling conventions within a single alphabet. This rationale is also defendable in light of previous studies. Word recognition research suggests that in reading, graphic input is converted into a phonological representation (Rastle & Brysbaert, 2006). Further, Möller and Zeevart's (2015, p. 321) think-aloud protocol confirms that "to a great extent it is not the graphic form of the item that guides the search for cognates but its phonological representation. […]". More specifically, "The grapheme-phoneme correspondence rules of the L1 are applied", although one "cannot exclude that grapheme-phoneme correspondence rules of other known languages play a role, too". Thus, although all items appeared in writing, the activation of their phonological form when reading makes it possible to use them to study the impact of phonological manipulations.

**Table 4** Computation of articulatory distance among consonants

| substitution | place of articulation | manner of articulation | voicing | palatalisation | mean |
|---|---|---|---|---|---|
| ʑ / n | 0.5 | 0.5 | 0 | 1 | 0.5 |

**Table 5** Computation of articulatory distance among vowels

| substitution | backness | height | roundedness | mean |
|---|---|---|---|---|
| e / u | 1 | 0.5 | 1 | 0.83 |

For the most part, target words can be categorized as very common lexical items, so that they should be known to most L2 speakers of Russian. In addition, they have a cognate in the other East Slavic languages, e.g. Rus. *černila*, Ukr. *čornylo*, Blr. *čarnila* ‘ink’. The complete list of target items can be found in Table 8 in the Appendix.

Non-words were randomly subdivided into five different sets comprising 33 non-words each, in such a way that each participant would be only exposed to one non-word for each Russian model word.

Non-words were randomly subdivided into five different sets comprising 33 non-words each, in such a way that each participant would be only exposed to one non-word for each Russian model word.

## 4.2 Computing Levenshtein distance

A weighted Levenshtein distance value was computed between each non-word and its Russian model in order to account for the articulatory distance between the two items. Since the weighting is based on articulatory parameters, this measure was computed based on the phonological transcription of the Russian model word and the Polish non-word. The weighting procedure is inspired by earlier work (Heeringa, 2004; Nerbonne & Heeringa, 2009 and references therein), although a custom-made system was developed for the present research. Alignments were checked manually in order to avoid linguistically implausible, though mathematically legitimate solutions (Heeringa et al., 2006).

Since the manipulations introduced to the Russian model words consisted of substitutions of homogenous segments (vowels with vowels and consonants with consonants), as opposed to insertions or deletions, the weight of modifications was operationalized as the mean of the scores relative to the articulatory traits that describe a segment, as exemplified in Table 4 and Table 5. For each trait, a score of 0 was assigned to identical values, while 1 was assigned for completely different values and 0.5 for partially different values. This last category was categorised as follows: for vowels, adjacent values of backness (e.g. central vs. front or back, as opposed to back vs. front) and height (e.g. middle vs. low or high as opposed to low vs. high); for consonants, adjacent place of articulation (e.g. dental vs. pre-palatal, as opposed to dental vs. velar) and continuous/non-continuous mode of articulation (i.e. stops and affricates, on the one hand, vs. fricative, lateral, trill, approximant, on the other hand). Only 0 and 1 were assigned for voicing, palatalisation, and roundedness.

## 4.3 Procedure

Participants were asked to provide the most likely translation of 33 non-words, presented as existing Polish words. All items appeared first in isolation (1a), then in a meaningful context (1b). In both cases, participants were required to translate only the individual nonword highlighted using capital letters (here **powozok* /poˈwozok/ from Rus. *povodok* /povoˈdok/ ‘leash’).

(1) a. POWOZOK
b. *Mój pies przegryzł wczoraj POWOZOK*
‘yesterday my dog bit though its *powozok’

Data collection took place through a specially designed online form, which also contained a few questions designed to elicit information on the participant language repertoire (based on self-evaluation). Participants were randomly assigned to one out of five different versions of the form, in such a way as to obtain a reasonable number of responses for each non-word (recall that target items were divided into five different sets, see Sect. 4.1). The data were then manipulated using MS Excel, R (R Core team, 2021) and its package *tidyverse* (Wickham et al., 2019)

### 4.4 Participants

Participants were recruited at a large university based in Warsaw through their L2 Polish instructor. Out of the 170 respondents, 102 (60%) declared native competence in Russian, often alongside Ukrainian or, more rarely, Belarusian, though other combinations are also attested. Out of the remaining 68 respondents, 27 (16%) declared advanced competence (C1 or higher, e.g. *do perfekcji'* ‘to perfection’) in Russian. 11 failed to provide a satisfactory answer, while 30 (18%) seemed not to have any competence in Russian. Of these, one declared native competence in an unspecified non-Slavic L1, 6 identified themselves as speakers of Belarusian, the rest as speakers of Ukrainian. Since Russian is a very common second language in both Belorussia and Ukraine (Hentschel, 2017; Levčuk, 2020), East Slavic participants’ declared lack of proficiency in Russian may be due to confusion as to one’s actual language use, national (rather than linguistic) self-identification, or indeed a form of protest against the current state of conflict, which had already begun at the moment of data collection. In any case, the Russian model words had direct cognates in the other East Slavic languages, so that the rationale of the study can be thought to hold even if participants had knowledge of East Slavic languages other than Russian. For this reason, the L1 Slavic speakers who declared no knowledge or Russian were not excluded from the analysis. However, to statistically control for potential differences in the results attributable to the participant’s language repertoire, native competence in Russian was added to the statistical model as a control predictor. Overall, only the single non-Slavic participant with no knowledge of Russian was excluded from the analysis.

## 5 Results and discussion

### 5.1 Qualitative overview

Most errors in the contextless condition consist in the participants’ failure to provide a response. In other cases, variously incorrect translations were proposed. In the following ex-

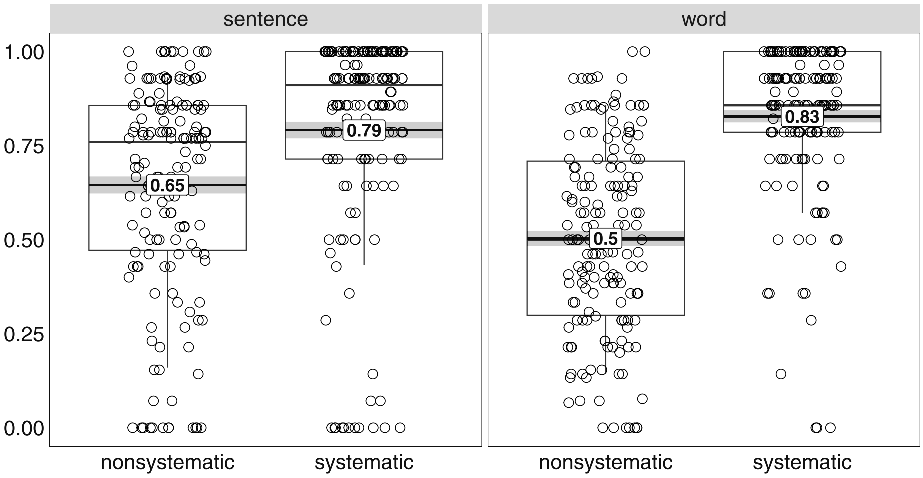


**Fig. 1** Recognition scores by presentation mode and systematicity of the sound correspondences

amples, the target non-word is provided in capital letters in a. along with its Russian model word, while learner responses are presented in b.

(2) a. *BOLNISZA* /bolˈnʲiʃa/, from Rus. *bol'nica* /bolʲˈnʲit͡sa/
b. *blondynka* /blonˈdɪnka/ 'blonde girl'.

Example (3) shows that participants are sometimes prepared to postulate more than one change if that allows for a viable translation.

(3) a. *RZEŚNICY* /ʒeɕˈnʲit͡sɪ/, from Rus. *resnicy* /rʲesˈnʲit͡sɨ/ 'eyelashes'
b. *walka* /ˈvalka/ 'fight', cf. Rus. *reznja* /rʲezˈnʲa/, Pol. *rzeź* /ʒɛʑ/ 'slaughter'

Examples like (4) can be interpreted in terms of the participants' varying competence in L2 Polish. Out of two Polish words comparable in terms of etymology and morphological structure, but quite different in meaning (*kierowca* 'driver' vs. *kierownik* 'director'), the learner selects the alternative that does not coincide with the Russian model word. One might speculate that the meaning of the non-word had probably been identified correctly, but was expressed through an inappropriate Polish word, most probably due to confusion between two arguably similar lexical items of the target language.

(4) a. *WODZICIEL* /voˈd͡ʑit͡ɕel/, from Rus. *voditel'* /voˈdʲitʲelʲ/
b. *kierownik* /kʲeˈrovnʲik/ 'manager', cf. Pol. *kierowca* /kʲeˈrovt͡sa/ 'driver', both from *kierować* /kʲeˈrovat͡ɕ/ 'direct, head'.

On the other hand, other responses reveal knowledge of highly specialised vocabulary (5).

(5) a. *BORNICA* /borˈnʲit͡sa/, from *bol'nica* /bolʲnʲˈit͡sa/
b. *bortnica* /bortˈnʲit͡sa/ 'toe board' (safety equipment used by roofers to prevent falls).

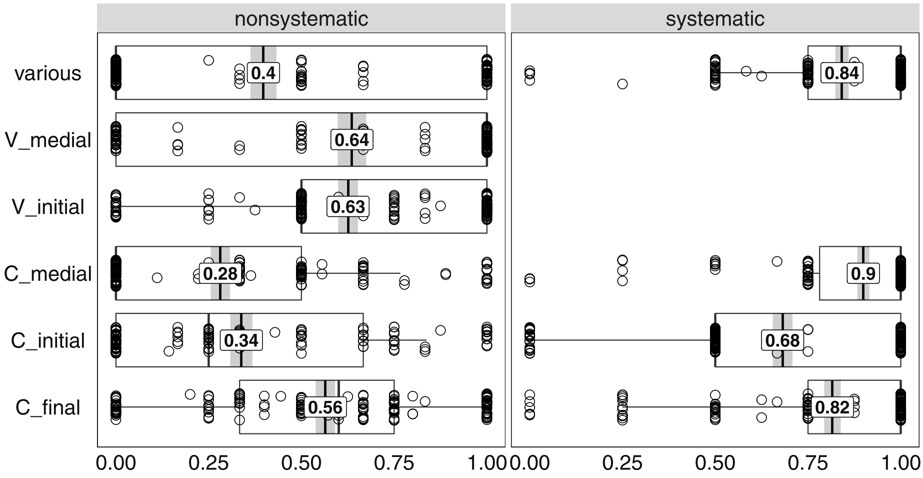


**Fig. 2** Recognition scores by systematicity of the sound correspondences and manipulated segment, contextless condition

## 5.2 Quantitative results

Cognate recognition seems to benefit from systematic sound correspondences between the non-word and its model, as opposed to arbitrary modifications (Fig. 1[1]). In addition, nonsystematic items seem to be more profoundly affected by the presence of a meaningful context compared to systematic items. One could explain this observation by speculating that systematic items may be quite recognisable *per se*, i.e. independently of the presence of a context. Somewhat counterintuitively, however, cognate recognition scores for systematic items proved slightly lower in the presence of a context than in its absence.

Regarding the locus of the manipulation introduced to the Russian model word, it appears that modifications affecting consonants have a more significant impact throughout (Fig. 2). To exemplify, Table 6 presents the mean scores obtained for set of non-words derived from Rus. *babočka* /ˈbabotʃka/ 'butterfly'.

Concerning the role of accentual schemes, no obvious pattern can be identified based on visual inspection alone (Fig. 3).

## 5.3 Statistical analysis

To statistically confirm the observations presented so far and verify the effect of the variables considered in the paper, a Bayesian generalised linear mixed model with binomial error structures was fitted to the data using R (R Core team, 2021) Stan (Stan Development Team, 2019) and its interface Rstan (Stan Development Team, 2020).

To answer the main research questions of the paper, the model included two three-way interactions between presentation mode (isolated words vs. carrier sentence), systematicity of the change pattern, and respectively stress pattern and segment manipulation pattern. The

[1] In addition to the standard elements of a boxplot, the following graphs indicate credibility intervals (shaded areas) and group mean score (bold segment and figures within white boxes).

**Table 6** intelligibility rate for non-words based on Rus. babočka /ˈbabotʃka/ ‘butterfly’, contextless condition

| operation -> | C_initial | C_medial | C_final | V_initial | V_medial |
|---|---|---|---|---|---|
| non-word -> | *kaboczka* | *batoczki* | *babonka* | *biboczka* | *babuczka* |
| intelligibility rate -> | 5% | 8% | 14% | 21% | 73% |

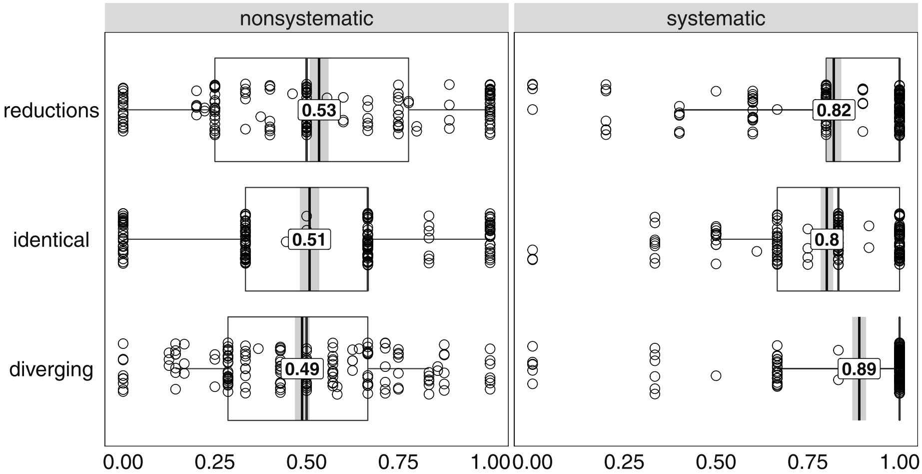


**Fig. 3** Recognition scores by accentual pattern and systematicity of the sound correspondences, contextless condition

rationale for this model structure is the following. First, the effect of the predictors under investigation may be less conspicuous in the presence of a meaningful context, since the carrier sentence could be sufficient to suggest the meaning of an otherwise opaque non-word. Second, the impact of manipulations may differ depending on whether or not they correspond to systematic interlingual correspondences, which are frequently found in existing words and may thus be more familiar to the participants.

As far as control predictors are concerned, the model included a two-way interaction between presentation mode and Levenshtein distance. A three-way interaction with systematicity was not deemed necessary in light of the fact that Levenshtein distance is a global measure of articulatory distance and as such cannot capture the systematicity (or lack thereof) of interlingual correspondences. A linear effect for native competence in Russian was also included in order to verify potential differences in performance between native speakers of Russian, on the one hand, and participants for whom this language represents a second or foreign language, on the other hand. Finally, random intercepts were fitted for participants and non-words to account for individual variability.

The coefficients estimated by the model represent the impact of the corresponding parameter on the grand mean of the contextless condition (mean = 0.83, 95% CI = 0.29-1.27). They are presented on the logit scale in Table 7, ordered by decreasing effect size. Shaded cells identify coefficients significant at the 95% threshold.

The main results of the statistical analysis may be summarized as follows. To start, changes affecting consonants in initial and medial position proved the most deleterious. In the latter case, in particular, the negative effect seems independent of the presence of a mean-

**Table 7** Summary of the statistical model

| parameter | mean | sd | 2.50% | 97.50% |
|---|---|---|---|---|
| word, nonsystematic, C_medial | −1.323 | 0.389 | −2.067 | −0.543 |
| word, systematic, C_medial | 1.041 | 0.567 | −0.108 | 2.168 |
| word, systematic, diverging stress | 1.004 | 0.578 | −0.169 | 2.108 |
| word, nonsystematic, C_initial | −0.996 | 0.397 | −1.757 | −0.191 |
| word, nonsystematic, diverging stress | −0.929 | 0.461 | −1.784 | −0.067 |
| word, nonsystematic, V_medial | 0.915 | 0.401 | 0.142 | 1.738 |
| word, nonsystematic, V_initial | 0.809 | 0.391 | 0.060 | 1.611 |
| sentence, nonsystematic, C_medial | −0.791 | 0.368 | −1.515 | −0.074 |
| sentence, nonsystematic, various | 0.664 | 0.424 | −0.188 | 1.549 |
| sentence, nonsystematic, V_medial | 0.663 | 0.386 | −0.076 | 1.434 |
| word, systematic, various | 0.607 | 0.553 | −0.469 | 1.707 |
| sentence, systematic, various | 0.597 | 0.575 | −0.570 | 1.692 |
| word, nonsystematic, vowel reductions | −0.552 | 0.511 | −1.563 | 0.429 |
| L1nonrus | 0.549 | 0.404 | −0.236 | 1.372 |
| word, nonsystematic, various | −0.545 | 0.425 | −1.340 | 0.319 |
| sentence, nonsystematic, C_initial | −0.532 | 0.368 | −1.253 | 0.213 |
| sentence, systematic, C_medial | 0.504 | 0.551 | −0.610 | 1.560 |
| sentence, systematic, diverging stress | 0.502 | 0.594 | −0.644 | 1.666 |
| sentence, nonsystematic, identical stress | 0.485 | 0.454 | −0.400 | 1.353 |
| sentence, lev | −0.480 | 0.244 | −0.967 | −0.018 |
| word, systematic, vowel reductions | 0.477 | 0.562 | −0.614 | 1.526 |
| word, lev | −0.400 | 0.229 | −0.838 | 0.029 |
| sentence, nonsystematic, V_initial | 0.399 | 0.376 | −0.320 | 1.154 |
| sentence, systematic, identical stress | 0.349 | 0.563 | −0.728 | 1.449 |
| sentence, systematic, vowel reductions | 0.340 | 0.560 | −0.750 | 1.426 |
| word, systematic, identical stress | 0.306 | 0.563 | −0.753 | 1.408 |
| word, nonsystematic, C_final | −0.285 | 0.389 | −1.032 | 0.501 |
| sentence, nonsystematic, diverging stress | −0.260 | 0.449 | −1.150 | 0.608 |
| L1rus | 0.239 | 0.384 | −0.493 | 0.959 |
| sentence, nonsystematic, vowel reductions | 0.217 | 0.518 | −0.773 | 1.238 |
| word, systematic, C_final | 0.204 | 0.568 | −0.878 | 1.320 |
| word, systematic, C_initial | −0.188 | 0.617 | −1.426 | 1.061 |
| sentence, nonsystematic, C_final | −0.102 | 0.373 | −0.872 | 0.648 |
| word, nonsystematic, identical stress | −0.038 | 0.466 | −0.918 | 0.916 |
| sentence, systematic, C_initial | 0.028 | 0.597 | −1.144 | 1.214 |
| sentence, systematic, C_final | −0.007 | 0.579 | −1.127 | 1.164 |

ingful context, whereas all other significant predictors except Levenshtein distance (see below) concern non-words presented in isolation. Compared to modifications of the consonant structures, changes affecting vowels resulted in higher-than-average scores.

As far as lexical stress is concerned, the only significant effect was estimated for diverging patterns in the contextless condition.

As expected, Levenshtein distance has a negative effect on intelligibility. Although the coefficient is only significant at the 95% threshold in the "sentence" condition, the credibility interval for the contextless condition is only marginally wider.

Native competence in Russian, finally, did not prove a significant predictor.

## 5.4 Discussion

Thanks to the results of the experiment, most of the research questions of the study receive a fairly clear answer.

To start, as could be expected, the same non-words presented in a meaningful context were recognised with far greater accuracy than when they were presented in isolation. Indeed, not only can a meaningful context suggest a cognate that the learner may not have thought of, but it can also improve the possibilities of disambiguation among alternative translations that may seem equally legitimate in isolation, e.g. *kierowca* 'driver' and *kierownik* 'manager', cf. example 4. The presence of a context also has an important impact on the choice and interpretation of the scoring criterion adopted in the study. On the one hand, the possibility exists that the greater intelligibility of target items within a sentence may be due not to the phonological characteristics of the item *per se*, but rather to the transparency of the carrier sentence. Indeed, most works devoted to the study of the linguistic predictors of intelligibility in intercomprehension typically rely on target items presented in isolation. Clearly, the assumption that the presence of a meaningful context should improve comprehension is based in turn on another assumption, namely that said context is comprehensible to the participant. Although both the existing bibliography and the coefficients estimated within the present study unambiguously point to a beneficial effect of this variable, the actual intelligibility of the carrier sentences employed in this paper is not known. In that respect, it is noteworthy that systematic items achieved slightly lower recognition scores in the presence of a context than in its absence. Based on the existing research on the role of context in IC, one could hypothesise that initially correct inferences concerning isolated words were modified once a context was introduced because they did not seem appropriate to it. The reduced recognition rate in the sentence condition may thus be due to a misinterpretation of the carrier sentence. Since the present data are insufficient to provide a univocal answer, this question remains open for further research.

From a methodological point of view, on the other hand, if no context is provided it may seem unsound to disqualify responses as "incorrect" just because they did not match the target word imagined by the researcher. This is especially true in the case of alternative translations that are as distant from the target non-word (in terms of overall Levenshtein distance and/or segmental correspondences) as the original L1 model word. In the contextless situation, moreover, one cannot exclude a role for chance: if $n$ equally legitimate alternative translations exist for a target non-word, then in theory the correct solution has a $1/n$ chance of being identified by chance. Despite these caveats, the present paper operationalised correct responses as those matching the original Russian word in light of two considerations. First, since most studies on this topic rely on a similar methodology, the adoption of the same scoring criterion enhances the comparability of the present research to existing insights. Second, this rationale seems ecologically valid in that one can imagine various realistic situations in which communicative success depends on the identification of a specific target word, such as the interpretation of short titles or items of a list.

Turning to the main research questions of the paper, it was found that the intelligibility of non-words was conspicuously affected by the systematicity of the modifications introduced, i.e. whether or not they corresponded to existing, near-exceptionless phonological correspondences between Polish and Russian. Among statistically significant predictors, all non-systematic modifications have a negative effect on intelligibility scores, while systematic correspondences usually result in higher-than-average scores. One can thus conclude that systematic correspondences present participants with less than a challenge compared to unpredictable modifications. Clearly, a prerequisite for systematic correspondences to exert a beneficial effect is that they must be recognised as such by the participants: in other words, L2 learners need sufficient exposure to the L2 input to realise (whether consciously or not: cf. Ellis' (2006) definition of L2 learners as "intuitive statisticians") that such patterns are indeed systematic and predictable. How much input constitutes a "sufficient" amount for that to happen is a further question for future research to pursue.

A statistically robust difference was found between modifications to the consonant structure of an L1 word, on the hand, and changes affecting vowels, on the other hand. In particular, the former – especially if the consonant is in word-medial position – have a deleterious effect on intelligibility, while the latter produce better-than-average results. Such a differential role of vowels and consonants has been reported by Berthele (2011, p. 215), who also noted that the finding is well known to dialectology, so much so that Schmeller's (1872) dictionary of Bavarian dialects "introduced a consonant skeleton organizing principle, since the synchronic vowel instability (caused by diachronic changes) makes an alphabetic order of a multi-dialect dictionary impossible".

It was also found that while non-words differing from the L1 model word in the initial and medial consonant produced similar scores, quite low in both cases, changes to the final consonant seem to exert a more limited effect (Table 6). A qualitative analysis of the data indicates that a change in the initial or – even more so – the medial consonant is likely to either make the underlying lexeme unrecognizable (as in */baˈtoʧki/ from /ˈbaboʧki/ 'butterflies') or indeed suggest a different lexeme (as in *kaboczka* /kaˈboʧka/ from Rus. *kabačok* /kabaˈʧok/ 'zucchini'). This finding too is consistent with previous research on word recognition, which generally suggests that the beginning of a word is an especially sensitive locus for its identification (Dijkstra, 2001, p. 1723, Möller & Zeevaert, 2010).

No discernible role for differences in the accentual pattern of the non-word compared to the L1 model could be identified through visual inspection of the data (Fig. 3). Nevertheless, the interactions included in the statistical model made it possible to estimate a statistically significant, negative coefficient for diverging stress patterns in non-systematic non-words presented in isolation. Stress certainly plays a complex role in Polish/Russian contact in light of the fact that while East Slavic has mobile stress (even within the paradigm of a give word), Polish has fixed stress on the penultimate syllable, with only few exceptions (e.g. learned words, verbal clitic affixes), which in any case are undergoing analogical normalisation in contemporary varieties. Moreover, stress is the trigger of the complex patterns of vowel reduction that characterise most East Slavic varieties, but not Polish, so that the same phoneme in a cognate pair may correspond to different sounds in the languages in question. It follows that the position of stress may interact with other variables, such as the modifications made to vowels: although the present paper relied on phonological representations to compute interlingual distance, it cannot be excluded that phonetics may have played a role, too. At the same time, the very fact that stress is not phonologically relevant in Polish may prompt L2 learners of this language not to rely on this parameter for the purposes of interlingual comparison.

In the present paper, Levenshtein distance was used primarily as a control predictor, i.e. to tease apart the effect of overall interlingual distance from that of the specific change patterns that were the primary object of the study. The coefficient identified by the statistical model goes in the expected direction (i.e. accuracy decreases as Levenshtein distance increases) and is statistically significant in the presence of a context, while it is very close to the 95% threshold in the contextless condition. It must be noted that in the present sample, non-systematic non-words were manipulated in such a way as to differ from their model in one segment only; systematic items typically differed in a very limited number of segments, too. It follows that Levenshtein distance was quite low in all cases. This is a consequence of the approach adopted here to compute this measure, aiming to evaluate not just the difference between two segments, but also the phonetic nature of such difference, described in terms of articulatory traits (this approach could be further refined along the lines of Heeringa (2004), who obtained good results using a set of weights based on acoustic analysis). Even in the present situation, however, most phonological contrasts produced phonetically similar segments in the two languages, especially in the case of systematic phonological correspondences. One may conclude that Russian-Polish cognates sound more similar than they may look, even when transliterated or transcribed.

One of the specificities of this study compared to most existing research is that its participants were L2 learners of the target language in a language teaching environment, whereas the tendency in IC research is to recruit participants with no exposure to the target language at all, or at most with causal exposure to it (Bahtina & ten Thije, 2012; Gooskens et al., 2018). Indeed, learning effects are often perceived as noise in research attempting to isolate the effect of possible linguistic determinants of intelligibility. Möller and Zeevart (2015, p. 323) for instance did not present more items concentrating on specific change patterns in order to avoid "an accumulation of cases with identical sound correspondences […], as this would lead to a learning effect". In the present case, this is not a problem in that the participants are, in effect, learners of Polish, and are exposed to a large amount of input both through classes and in their daily life. Indeed, some of the research questions of the paper (such as those regarding the systematicity of interlingual correspondences) precisely aim to verify the existence of such learning effects.

## 6 Conclusion

The present paper aimed to verify to what extent the recognition of cognates in a situation of Polish-Russian contact can be influenced by a set of phonological correspondences between the two languages, such as the position of lexical stress or the nature of a segment in a given position within the word. In addition to a prominent, but predictable effect of context, the results suggest a hampering role for modifications to consonants in word-initial and word-medial position, on the one hand, and diverging stress patterns, on the other hand.

The Russian-Polish combination considered in the paper is directly relevant to the solution of an important problem of applied linguistics, namely facilitating the linguistic (and therefore social) integration of the numerous East Slavic community residing in Poland, a task that has become particularly urgent following the 2022 invasion of Ukraine. Russian is indeed the native language of a significant proportion of the refugees; moreover, most of the considerations that were made on Russian also apply to the other East Slavic languages. Clearly, being based on a single highly structured task, the present study cannot aim to exhaustively model cognate recognition, while task effects have been shown to significantly impact on IC results (Doetjes, 2007). However, it is hoped that the insights produced by the present work will prove useful both to research on the linguistic determinants of intelligibility in IC more generally, on the one hand, and to the applied problems faced in the present historical conjuncture by research on L2 Polish learning and teaching, on the other hand.

## Appendix

**Table 8** Russian model words with Polish counterpart

| Russian | | Polish | | |
|---|---|---|---|---|
| *babočka* | /ˈbabotʃka/ | *motyl* | /ˈmotɨl/ | "butterfly" |
| *beseda* | /bʲeˈsʲeda/ | *rozmowa* | /rozˈmova/ | "conversation" |
| *bol'nica* | /bolʲˈnʲitsa/ | *szpital* | /ˈʃpʲital/ | "hospital" |
| *bumaga* | /buˈmaga/ | *papier* | /ˈpapʲer/ | "paper" |
| *bumažnik* | /buˈmaʒnʲik/ | *portfel* | /ˈportfel/ | "wallet" |
| *vetčina* | /vʲettʃʲiˈna/ | *szynka* | /ˈʃɨnka/ | "ham" |
| *voditel'* | /voˈdʲitʲelʲ/ | *kierowca* | /kʲeˈrovtsa/ | "driver" |
| *dvigatel'* | /ˈdvʲigatʲelʲ/ | *silnik* | /ˈɕilnʲik/ | "engine" |
| *zerkalo* | /ˈzʲerkalo/ | *lustro* | /ˈlustro/ | "mirror" |
| *karandaš* | /karanˈdaʃ/ | *ołówek* | /oˈwuvek/ | "pencil" |
| *kvartira* | /kvarˈtʲira/ | *mieszkanie* | /mʲeʃˈkanʲe/ | "flat" |
| *kirpič* | /kʲirˈpʲitʃ/ | *cegła* | /ˈtsegwa/ | "brick" |
| *klubnika* | /klubˈnʲika/ | *truskawka* | /trusˈkavka/ | "strawberry" |
| *kolgotki* | /kolˈgotkʲi/ | *rajstopy* | /rajˈstopɨ/ | "pantyhose" |
| *konfety* | /konˈfʲetɨ/ | *cukierki* | /tsuˈkʲerkʲi/ | "sweets" |
| *kopilka* | /koˈpʲilka/ | *skarbonka* | /skarˈbonka/ | "money box" |
| *korobka* | /koˈrobka/ | *pudełko* | /puˈdewko/ | "box" |
| *košelëk* | /koʃeˈlʲok/ | *portfel* | /ˈportfel/ | "wallet" |
| *lestnica* | /ˈlʲesnʲitsa/ | *schody* | /ˈsxodɨ/ | "stairs" |
| *perčatki* | /pʲerˈtʃʲatkʲi/ | *rękawice*[a] | /rẽkaˈvʲitse/ | "gloves" |
| *plotnik* | /ˈplotnʲik/ | *stolarz* | /ˈstolaʒ/ | "carpenter" |
| *povodok* | /povoˈdok/ | *smycz* | /smɨtʃ/ | "leash" |
| *potolok* | /potoˈlok/ | *sufit* | /ˈsufʲit/ | "ceiling" |
| *pričëska* | /prʲiˈtʃʲoska/ | *fryzura* | /frɨˈzura/ | "haircut" |
| *pylesos* | /pɨleˈsos/ | *odkurzacz* | /odˈkuʒatʃ/ | "vacuum cleaner" |
| *rastenie* | /rasˈtʲenʲie/ | *roślina* | /roˈɕlina/ | "bush" |
| *resnicy* | /rʲesˈnʲitsɨ/ | *rzęsy* | /ˈʒẽsɨ/ | "eyelashes" |
| *rubaška* | /ruˈbaʃka/ | *koszula* | /koˈʃula/ | "shirt" |
| *sobaka* | /soˈbaka/ | *pies* | /pʲes/ | "dog" |
| *teploxod* | /tʲeploˈxod/ | *statek* | /ˈstatek/ | "motorboat" |
| *fonarik* | /foˈnarʲik/ | *latarka* | /laˈtarka/ | "flashlight" |
| *čemodan* | /tʃʲemoˈdan/ | *walizka* | /vaˈlizka/ | "suitcase" |
| *černila* | /tʃʲerˈnʲila/ | *atrament* | /aˈtrament/ | "ink" |

[a]This representation of the nasal vowel as /ẽ/ is used to indicate not the actual realization of this phoneme in Polish, but rather the predictability of its allophones. The same considerations apply to *rzęsy* below. For a more detailed description, see Gussmann (2007: 2-3).

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## Declarations

**Competing Interests** The author states that there is no conflict of interest.



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