THE INFLUENCE OF ORTHOGRAPHY ON SPOKEN WORD RECOGNITION IN BANGLA

Moumita Mukherjee

Research Scholar, The English and Foreign Languages University, Hyderabad

ABSTRACT

The paper looks at the influence of orthography in phonological processing tasks and reports findings from a rhyme-monitoring task in Bangla. The lexical representation of words stores phonological, semantic, syntactic, and orthographic information in the lexicon. In recognizing words, listeners are required to match speech signals to the phonological representations (of these words) that are stored in the lexical memory (Peereman, Dufour, & Burt, 2007). Thus, it would appear that information accessed and retrieved directly pertain to the task at hand, i.e., those features which are needed for the task are accessed and other features that are not demanded by the task are ignored. If this were the case, in an auditory processing task, only phonological representations would be accessed, and orthographic information would neither be retrieved nor accessed directly or indirectly. However, several studies (Seidenberg & Tanenhaus, 1979; Dijkstra, Roelofs, & Fieuws, 1995; Castles, Holmes, Neath, & Kinoshita, 2003; Qu, Cui, and Damian, 2018; Slowiaczek et al, 2013) have shown that orthographic variables which were not demanded by the task actually impacted auditory word processing.

Building on the theoretical frameworks presented in these papers, the current study shall attempt to investigate whether automatic orthographic influence affects word recognition in Bangla which is an alpha-syllabary and has a mixed orthographic system.

Methodology: 40 (20=female and 20=male) native speakers of Bangla participated in the experiment. They were all above 18 years with a mean age of 23;0 (SD=2.85). Each participant had had formal education in Bangla and could read, write and speak the language with fluency. None of them had reported any sort of hearing problems or neurological disorders.

28 pairs of target word pairs were used for the rhyme detection task. The target words consisted of pairs of disyllabic (CV.CV or CVC.CV) Bangla words which were phonological rhymes. The target pairs were created in such a way that half of the sets were orthographically similar [e.g., নৃত্য (nritya) /nritto/ ‘dance’] and [ভৃত্য (bhritya) /bhritto/ ‘servant’], while the other half were dissimilar [e.g., নৃত্য (nritya) /nritto/ ‘dance’] and [বৃত্ত (britto) /britto/ ‘circle’]. Note that Bangla has a moderately opaque orthography, and similar-sounding words can be routinely spelt differently. The orthographically dissimilar target words were designed to account for these spelling inconsistencies. It included the inconsistencies resulting from the use of consonant allographs (e.g., স, শ, or ষ for /ʃ/), vowel allographs (e.g., ই (ি) and ঈ (ী) for /i/), use of full vs half *aksharas* (e.g., reph (র্) and র for /rɔ/), similarities in consonant clusters and geminating consonants (jo-phola (দ্য) and geminating consonants such as (দ্দ)), and so on. They have been presented in *Table 1*.

The task of the participants was to answer whether the given word pairs rhymed or not by pressing a YES/NO button. The experiment was conducted using PsychoPy and the time taken for rhyme judgement was measured for each word type. This acted as the dependent variable. As a control group, a set of non-native speakers of Bangla who were not familiar with the orthography were also tested on the same task.

Results: We discuss the results in terms of accuracy, the response time for the two conditions (orthographically similar and dissimilar), and also with respect to the different types of

phonology-orthography mapping inconsistencies in Bangla. The accuracy rate of rhyme detection was above 95% suggesting that the task which demanded detection of auditorily presented pairs was done accurately. The accuracy for orthographically similar pairs was 98.21% while that of the orthographically dissimilar pairs was 96.42%. Though the rhyme detection accuracy was lower for dissimilar pairs, the difference was not significant. This suggests that orthographic inconsistency in the pairs did not affect accuracy decisions.
Though the accuracy of rhyme detection does not show a difference between the dissimilar and similar pairs, we found a significant difference in response time, that is, time taken to decide whether the two words in the pair rhymed or not. The results indicate that participants took approximately 300–320 milliseconds longer to identify rhymes that were orthographically dissimilar (Mean=4314.16, SD=396.82) than those which were similar (Mean=3990.05, SD=288.561), and the difference was significant at $p < 0.05$. The orthographic effect played a major role in the word recognition task. The type of dissimilarity affected the response time as well. The comparison with non-native speakers showed that there was no significant difference between the two sets, further establishing the fact that the time difference can be accounted for by the knowledge of orthography that gets automatically accessed even in a phonological judgment task. The findings are used to investigate the well-known models of aural word recognition and judgment tasks.

Table 1: Orthographic inconsistencies used in the study.

TYPE	ITEMS	EXAMPLES
Consonant allographs	**জ /borgio jɔ/ and য /ɔntʰostʰo jɔ/ for /jɔ/** **ণ /moddʰanno nɔ/ and ন /dɔnto nɔ/ for /n/** **স /dɔnto ʃɔ/, শ /talobbo ʃɔ/, ষ /moddʰanno ʃɔ /, for /ʃ/**	জবাব (Jobab) /jobab/ 'answer' যমজ (JomoJ) /jomoj/ 'twins' পণ্য (poNNo) /pɔnno/ 'marketable' বন্য (boNNo) /bɔnno/ 'wild' ভাষা (bha**S**a) /bʰaʃa/ 'language' বাসা (ba**S**a) /baʃa/ 'house' আশা (a**S**a) /aʃa/ 'hope'
Vowel allographs	**অ and ও for /o/** **ই and ঈ for /i/** **উ and ঊ for /u/** **এ vs অ্যা for /æ/**	অতি (Oti) /oti/ 'very' ওজন (Ojon) /ojon/ 'weight' ইচ্ছে (Ichche) /iʧʧʰe/ 'wish' ঈগল (**I**gol) /igɔl/ 'eagle' উঠ (Uth) /utʰ/ 'camel' ঊরু (**U**ru) /uru/ 'thigh' এমন (Aemon) /æmon/ 'like' অ্যামেরিকা (AEmerika) /æmerika/ 'America'
C_1C_2 – CC	**jo-phala and geminating consonants**	গদ্য (godyo) /goddo/ 'prose' হদ্দ (hoddo) /hɔddo/ 'limit'
C_1C_2. – C_1C_3	**ma-phala and ja-phala**	গ্রীষ্ম (grisma) /griʃʃo/ 'summer' দাস্য (dashyo) /daʃʃo/ 'servitude'
Full – half akshara	**reph and র /rɔ/**	গর্ত (gorto) /gɔrto/ 'hole' করত (korto) /korto/ 'did'

References:

Castles, A., Holmes, V. M., Neath, J., & Kinoshita, S. (2003). How does orthographic knowledge influence performance on phonological awareness tasks? *The quarterly journal of experimental psychology*, 445-467.

Dijkstra, T., Roelofs, A., & Fieuws, S. (1995). Orthographic effects on phoneme monitoring. *Canadian Journal of Experimental Psychology/Revue canadienne de psychologie expérimentale*, 264-71.

Peereman, R., Dufour, S., & Burt, J. S. (2007). Orthographic consistency in spoken-word recognition. *48th Annual Meeting of the Psychonomic Society*.

Qu, Q., Cui, Z. , & Damian, M. F. (2018). Orthographic effects in second-language spoken-word recognition. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 44(8)*, 1325-1332.

Seidenberg, M. S., & Tanenhaus, M. K. (1979). Orthographic Effects on Rhyme Monitoring. *Journal of Experimental Psychology: Human Learning and Memory*, 546-553.

Slowiaczek, L. M., Soltano, E. G., Wieting, S. J., & Bishop, K. L. (2003). An investigation of phonology and orthography in spoken word recognition. *The Quarterly Journal of Experimental Psychology Section A: Human Experimental Psychology*, 233-262.