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Editorial: Formal approaches to multilingual phonology

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Editorial on the Research Topic

Formal approaches to multilingual phonology

Examining the nature of multilingual speech has been a vibrant practice in the field of language acquisition, represented by specialist journals, conferences, and prolific research programs around the world. While research on its phonetic and sociocultural properties is abundant, abstract representational issues pertaining to different sound systems coming into contact in the multilingual mind call for special research informed by theories of phonology, typology and learning. We contend that phonological models should be able to also map multilinguals' phonological knowledge and thus shed light on the dynamic nature of crosslinguistic influence across different phonological systems. We have thus defined this Research Topic as including *formal approaches* toward the description and explanation of *multilingual phonology*, which is a cover term we chose in order to include the fields of both L2 and L3 phonology, as well as contact phonology.

In this Research Topic, we have articles that adopt such theories as the contrastive hierarchy, feature geometry, underspecification, and different brands of constraint-based theories such as Stochastic Optimality Theory (StOT) and Harmonic Grammar (HG) with weighted constraints, and test the empirical and theoretical coverage of these at the intersection of language acquisition and crosslinguistic influence (CLI) in a variety of L1-Lx constellations.

Accordingly, our Research Topic addresses such different phonological concepts as features, segments, metrical feet, and post-lexical phonological processes as well as the interaction between segmental and suprasegmental phenomena. Some contributions examine the nature and dynamics of interlanguage phonological grammars by visiting assumptions surrounding the initial state of L2 learning, unlearning categorical processes, full copying of L1 grammar, redeployment of features, and the relationship between perception and production in L2 development, etc. Below, we draw out the implications of each contribution for our Research Topic in three groups: (i) representation and redeployment of features, (ii) post-lexical processes at/and the phonological interfaces, and (iii) methodological implications.

Representation and redeployment of features

Archibald, Flynn, and Nelson all demonstrate that abstract features organized in a dependency hierarchy explain sometimes surprising surface facts. Archibald tackles differential substitution to propose that feature ranking provides an explanation of why

in languages which possess both /t/ and /s/ phonemes some would choose /s/ and some /t/ as the “best” substitute for English /θ/. Flynn shows that the presence or absence of the feature [RTR] in a given language is a robust predictor of whether the language can adopt innovative emphatic consonants in language contact situations. Nelson demonstrates that in two languages (English and Spanish) which both lack uvular consonants we see differential performance in their ability to acquire uvular consonants in an additional language (Kaqchikel). The English speakers are able to redeploy their vocalic [RTR] feature to acquire the Kaqchikel uvular consonant which also is represented with an [RTR] feature.

In a similar vein, Yazawa et al. test the empirical and theoretical validity of using phonological features to model L2 perceptual behavior by providing a striking case from a L2 English vowel categorization experiment with L1 Japanese listeners. Employing simulations implemented on the premises of the StOT and the Gradual Learning Algorithm (GLA), they compare a segmental model that maps acoustic cues to segments, and a featural model that maps acoustic cues to features. The featural model correctly accounts for the L1 Japanese listeners’ perceptual behavior such that a new category can be formed for an L2 vowel that comprises a structurally ill-formed combination of relevant features in the L1 but not for those neighboring vowels that map to a well-formed L1 feature bundle. While the latter type of L2 vowels are prone to perceptual assimilation to the existing L1 vowel categories, the former vowel is perceived to be a deviant of a similar vowel in the L1 vowel space. The segmental model, however, is not only inadequate to capture this difference, but also performs unrealistically native-like, with the implication that the degree to which a distinct L2 segmental category can be formed depends on the listeners’ noticing of the perceptual distinctness of the familiar acoustic cues through copied L1 phonological features.

Finally, Barrientos investigates feature redeployment in L1 Spanish learners of German, focusing on the acquisition of front rounded vowels and tense/lax contrasts. Barrientos finds that learners perform better in discrimination tasks when acquiring a new feature ([+/-tense] than when redeploying an existing one ([+/-round]). However, identification tasks did not show a clear advantage for either contrast. The findings suggest that learners may rely more on salient acoustic cues than on abstract feature restructuring in L2 phonological development.

Post-lexical processes and phonological interfaces

Phonemic categories are subject to context-dependent distinct realizations, whereby contrasts may be neutralized in some languages while maintained in others in the same phonological context. Such conflicting demands on sound alternations may create a learning problem in different L1-Lx pairings. Bárkányi and Kiss approach this understudied aspect of phonological acquisition with a focus on regressive voicing assimilation (RVA), which is categorical in only adjacent obstruents in Hungarian (the L1 of participants), is present in Spanish (L2/L3), where it also extends to sonorant triggers (in the form of presonorant voicing, PSV),

and inoperant in English (L2/L3). Production results suggest that Hungarian L1 learners show a strong effect of RVA in both of the non-native languages but do not apply PSV in their Spanish (non-target-like) or English (target-like). Furthermore, the multilingual learners are unable to perceptually distinguish the non-target-like (i.e., the lack of) application of PSV from its target-like application in Spanish. While these results are possibly due to the interlingual classification of Hungarian and Spanish laryngeal systems as identical, the variable nature of PSV in Spanish (thus lack of sufficient and salient input for this process) as well as PSV’s typological rarity may be offered as potential explanations. The effect of RVA on both Spanish and English can be construed as an inability to block a dynamic and typologically common L1 post-lexical process as RVA in their L2/L3 productions, while perceptual results suggest that the same proficient multilingual learners are capable of detecting the non-target-like realizations of RVA in English. Altogether these point to a lack of direct correlation between multilingual perception and multilingual production as far as such dynamic phonological processes as RVA and PSV are concerned, intriguingly interacting with a multitude of such other factors as cognate and frequency effects.

Adding to the exploration of phonological interfaces, Schuhmann and Smith focus on the role of metrical feet in the acquisition of German plurals by L2 learners. Their study shows that L1 English learners gradually adopt the trochaic stress pattern typical of German plurals as their proficiency increases. This highlights how suprasegmental structures like stress patterns interact with morphological processes in L2 acquisition. As learners become more proficient, they internalize not only the morphophonological rules but also the prosodic patterns that define native-like production in German.

These studies illustrate the complexity of phonological learning with a focus on how phonological processes—particularly those that occur beyond the level of the segment—interact with other linguistic domains, such as morphology and suprasegmental features, in multilingual acquisition.

Variable surface realizations of sound sequences are also the focus of Zhang and Tessier, who investigate the anticipatory nasalization of low vowels preceding underlying nasal codas (loV-N), where N may be fully realized, lenited, or completely deleted on the surface in Beijing Mandarin. Despite the variable absence of coda Ns, the nasalized loVs carry the place of articulation feature of the following Ns such that they must agree for [+/-back] with following coronal or dorsal N codas while no labial N codas are allowed. None of these restrictions, however, holds for English. Similar to Yazawa et al. and Zhang and Tessier apply a computational simulation and use a GLA learner implemented in HG with weighted constraints, assuming that the “initial state of L2 grammar = the end state of the L1 grammar” in an attempt to explore how the fully copied L1 Mandarin grammar treats the range of loV-N sequences in L2 English. Evidence from L1 Mandarin speakers’ perception is used to postulate various assumptions about the initial state of the grammar, which deviate from previous treatments of loV-N sequences. This grammar is then implemented in L1 and L2 simulations (the acquisition of English loV-N sequences). Independent evidence from L2 English

production data and loanword phonology is then employed to test the validity of these simulations. These bring about an instructive methodology, where the cross-fertilization between theories of phonological grammars with inherent variability and learning simulations can inform L2 processes and be informed by them.

John and Rigoulot raise the question of how representational accounts can handle performance variation when looking at French speakers' acquisition of English /h/ focussing on the deletion of /h/ in production. They propose that the representations might be *fuzzy* or *murky*, and perhaps include diacritic markings which raises the question of whether the developmental grammars are constrained by UG.

Adding to the discussion of variability in surface realization, Cabrelli, Cruz, Escalante Martínez, Finestrat, and Luque examine the production of coda stops—phonotactically illicit in the L1 (Brazilian Portuguese) but permitted in the L2 (English)—by bilinguals immersed in an L2 environment. As with Bárkányi and Kiss, their data reveal that target-like perception does not guarantee target-like production; instead, production patterns often diverge through a variety of repair strategies. These asymmetries between modalities are formalized within the Bidirectional Phonetics and Phonology (BiPhon) framework (Boersma, 2011), which models perception and production within a single constraint-based grammar. As in their earlier work on perception with the same participant sample, the authors find that L2 production accuracy predicts L1 production patterns, suggesting L2 influence on L1 perception and production alike. While BiPhon captures the observed modality-specific asymmetries, the mechanisms that render L1 grammars permeable to influence from the L2 remain an open question for future research.

Methodological implications

Scott raises some methodological concerns in experimentation which may have led at times to contradictory behavioral results and proposes that experiments should control for orthographic and phonemic confounds. In particular, he reports on a phoneme detection task in which the object of the listener's attention is a sound adjacent to the phoneme of interest. Results of this task can be diagnostic of representational status.

References

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Yazawa et al. suggest that perceptual behavior, as far as crosslinguistic categorical assimilation is concerned, may vary depending on the experimental setup. Depending on the task, perceived goodness of a vowel category in one language as another one in another language may be "fair" despite the considerable acoustic distance between the two since perceived cues may be defined relatively within each language rather than between two languages. As such and also compatible with the full copying hypothesis, they propose language-specific feature identification rather than a direct comparison of raw acoustic values between the two languages.

We hope that the breadth of this Research Topic in terms of theoretical approaches, empirical issues, as well as questions raised and answered will be appealing to a wide readership. In our view, the papers in this Research Topic unequivocally demonstrate that formal approaches to language acquisition embrace the integration of representation, interlanguage processes, input factors, learner variation, and psycholinguistic methodology. A field as complex, diverse (and fascinating) as multilingual phonology demands nothing less.

Author contributions

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Conflict of interest

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