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Phonetic and phonological factors in L2: On the emergence of new features

There is debate in L2 phonology as to whether new phonological features can be acquired as opposed to leaners merely redeploying features of the L1. The Feature Model (FM) of Brown (1998, 2000), for example, argues that a new L2 phonological feature cannot be acquired in adulthood. In this case a new phonemic contrast can only be acquired if the relevant phonological feature, which differentiates the two sounds in the contrast, is already active in the L1 of learners. According to the FM, learning a new feature needs access to UG which terminates during adolescence. This paper evaluates these claims with respect to whether new laryngeal contrasts can be acquired and in particular, whether VOTs can be modified by L2 learners.

The subjects are drawn from five Indo-Aryan/Iranian Pakistani languages that have contrasting laryngeal specfications for plosives. Balochi (Elfenbein, 1997a) and Pashto (Elfenbein, 1997b) only have unaspirated plosives in their consonantal inventories, both voiced and voiceless. Punjabi has an aspiration contrast in voiceless but not in voiced plosives (Shackle, 2007), and Hindi (Shapiro, 2007) and Saraiki (Shackle, 1976) have four-way laryngeal contrasts in voiced and voiceless plosives. This is depicted in (1).

(1) Indo-Aryan/Iranian voicing contrasts

Balochi	p t k		b d g	
Pashto	p t k		b d g	
Punjabi	p t k	p^h t^h k^h	b d g	
Hindi	p t k	p^h t^h k^h	b d g	b^h d^h g^h
Saraiki	p t k	p^h t^h k^h	b d g	b^h d^h g^h
PHONOLOGICAL FEATURES	*UNDERSPECIFIED*	[SPREAD GLOTTIS]	[VOICE]	[VOICE] [SPREAD GLOTTIS]

A production experiment was conducted with the five groups of adult Pashto (N=12), Punjabi (N=8), Saraiki (N=30), Balochi (N=12) and Hindi (N=10) native speakers, who had been learning English in their home countries for at least 10 years. The subjects had also spent time in an English speaking country (UK) for 29.17, 35.13, 70.8, 79.08 and 8.8 months, respectively. The task was to produce English /p^h t^h k^h/ as target plosives in words in a carrier phrase. VOTs of word-initial stops were measured using Praat (Boersma & Weenink, 2012). 21 English native speakers were controls.

The acoustic analyses show that the Balochi and Pashto speakers significantly modified their VOT ranges ($p>.05$) to attain English aspirated plosives at all three places of articulation. Phonologically this implies that they had to acquire the [spread glottis] feature which is otherwise absent in their system. By contrast, the Punjabi and Saraiki speakers who have contrastive use of [spread glottis], only acquired the English aspiration contrast in dorsals. The Hindi speakers did not acquire the contrast at all.

These results contrast with the predictions of the FM where Balochi and Pashto speakers are predicted to be unable to acquire a contrast that relies on a feature that is absent in their L1, here [spread glottis]. In fact the opposite is predicted by the FM: Punjabi, Hindi and Saraiki speakers should easily acquire the contrast because [spread glottis] is active in their systems. Our results show that they do not. We take these results as arguing for emergent features and furthermore as reflecting that the absence of a specific feature in an L1 facilitates acquisition of that feature, rather than hinders it. Similarly, the presence of a feature in the L1 with a different function than the L2 (in English aspiration is allophonic) resists acquisition of

that feature in the L2. This is in line with the Perceptual Assimilation Model (Best et al. 2001) where similar sounds of the L1 and L2 perceptually block acquisition of the L2 target.

In order to test that the ease of acquisition for the Balochi and Pashto speakers was not correlated to the allophonic status of English aspirated stops a follow-up experiment was conducted. A group of Balochi (N=5) and Pashto (N=5) speakers acquiring Urdu, which has phonemic aspiration, were tested. The VOT values for Urdu stops produced by these learners show that they have acquired two significantly different (Z=2.701, p=.007) VOT ranges for aspirated and unaspirated dorsal plosives of Urdu. The earlier findings and presence of [spread glottis] are therefore supported at least for dorsals. Labials and coronals show no significant VOT difference between aspirated and unaspirated plosives although there is a tendency for the VOT values of aspirated plosives to be consistently greater than those of unaspirated plosives (see 2).

The paper thus challenges the FM which argues that a new phonological feature cannot be acquired by adult learners. The performance of the Balochi and Pashto participants is uniform in both allophonic and phonemic contexts, at least for dorsals, demonstrating that they must have activated a new feature based on input. Their performance may have been enhanced by time spent in the L2 context also showing that quality of input rather than just the presence or absence of a feature, plays a role in L2 phonological acquisition. **The main findings are:** (a) acquisition of new phonemes in adults is not dependent on accessibility to UG – features may be emergent, (b) there is a place preference in the acquisition of [spread glottis], (c) an L1 phonemic contrast is not easily reanalysed into an L2 allophonic split, and (d) there is a direct correlation between phonetic factors (VOT changes) and the acquisition of phonological categories.

(2) VOTs of Urdu plosives by Pashto and Balochi speakers

Sound	N	Minimum	Maximum	Mean	Std. Deviation
[p]	10	00.00	41.00	18.80	13.66
[p^{h}]	10	09.33	88.00	32.40	21.00
[t̪]	10	14.67	48.00	31.20	09.55
[t̪^{h}]	10	03.33	77.33	37.50	20.39
[ʈ]	10	22.33	72.67	40.77	14.06
[ʈ^{h}]	10	18.33	105.33	45.57	23.53
[k]	10	29.67	76.00	51.93	15.00
[k^{h}]	10	53.00	127.33	85.33	21.33

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