Articulatory Setting: An Overlooked Aspect of L2 Pronunciation?

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Abstract

The term articulatory setting, which is sometimes referred to as voice quality, or voice-setting features (Pennington and Richards, 1986), or basis of articulation (O'Connor, 1973), first coined by Beatrice Honikman (1964), refers to the specific habitual movement patterns and postures of the vocal tract and its articulators that contribute to the overall phonetic quality of a language. Proponents of this theory hold that without an understanding of how movement patterns differ cross-linguistically, second language (L2) learners will utilize the articulatory settings of their first language (L1) when speaking in their L2, thereby inhibiting them from acquiring accurate pronunciation. In line with this, there is a belief held by some researchers that teaching methods based on articulatory setting ought to be taught to learners, so they can be made aware of how to alter the movement patterns of their mouths for speaking in the target L2. This is to be done before learners are instructed in other aspects of pronunciation, such as the differences in phonemic inventories between the L1 and L2. As Thornbury (1993) puts it, the implications of this top-down approach are "that by teaching the 'whole', the bits might take care of themselves (p. 128)." In other words, if students are made aware of the holistic alterations that should be done to accurately pronounce the target language, specific difficulties might be remedied naturally. This shift in posture is conceptualized by Honikman (1964) as getting "into gear", which refers to the process of students consciously altering the positions of their articulators in preparation for speaking in the L2. This paper will elaborate on the subject of articulatory setting and its possible application to pronunciation pedagogy, summarize several studies in the field of articulatory and acoustic phonetics that support its validity as a teaching approach, and explore the application of the theory of articulatory setting to the instruction of learners in the Japanese EFL context.

Keywords: Articulatory Setting, Acoustic Phonetics, Articulatory Phonetics, L2 pronunciation, EFL pronunciation, intelligibility

Introduction

In the field of Applied Linguistics, it is agreed that what is perceived as foreign accent in the speech of an L2 speaker is greatly influenced by the phonology of the speaker's L1. These systematic differences in phonology that occur in the speech of L2 learners are known as language transfer (Zsiga, 2013, p. 459). Based on the principle of language transfer, any instructor with sufficient knowledge of the phonology of a speaker's native language can predict problematic areas of L2 pronunciation fairly easily and with relative accuracy. However, research regarding L2 pronunciation has found that accentedness is not always the primary factor in the comprehension of L2 speech. This may be counter to what is intuitively believed by many. For instance, research has indicated that an L2 speaker might be rated as having heavily accented speech yet still be highly intelligible to listeners (Munro, & Derwing, 1995). Therefore, in the last few decades, the goal of pronunciation instruction has been increased intelligibility, rather than accent reduction. This is especially important in EFL contexts, where L2 learners are more likely to communicate with other non-native speakers (NNS). For example, it has been found that native speakers are more sensitive to suprasegmental errors, while non-native speakers are more sensitive to segmental errors that result from L1 transfer (Jenkins, 2000). With this in mind, what teaching methods or exercises are the most effective at increasing the intelligibility of NNS? The next section will elaborate on the theory of articulatory setting and explain briefly how it bridges the gap between the psychological and physical dimensions of L2 phonology.

Articulatory Setting

The theoretical foundation that underlies the concept of articulatory setting is the idea that just as phonemic inventories differ across languages, so do the movement patterns and postures of the articulators. Honikman (1964) describes the concept by stating:

> By articulatory setting is meant the disposition of the parts of the speech mechanism and their composite action, i.e. the just placing of the individual parts, severally and jointly, for articulation according to the phonetic substance of the language concerned. To put this another way, it is the overall arrangement and manoeuvring of the speech organs necessary for the facile accomplishment of natural utterance. Broadly, it is the fundamental groundwork which pervades and, to an extent, determines the phonetic character and specific timbre of a language. It is immanent in all that the organs do. (p. 73)

Honikman distinguishes between settings for the internal articulators (such as the tongue, velum, and pharynx) and for the external articulators (lips and cheeks) and specifies that differences in the settings of each articulator form the basis of the overall sound of a language. For instance, unsurprisingly, tongue setting is regarded by Honikman as being the most important articulator in determining the resonance of the mouth (p. 76), and in describing the articulatory setting of the tongue for English, states that:

> Almost throughout English, the tongue is tethered laterally to the roof of the mouth by allowing the sides to rest along the inner surface of the upper lateral gums and teeth; the lateral rims of the tongue very seldom entirely leave this part of the roof of the mouth, whereas the tip constantly (or some other part of the dorsum occasionally) moves up and down, periodically touching the central part of the roof, but generally not for very long at a time, before it comes away. Thus, one might regard the tethered part – in this case, the lateral contact – as the anchorage, and the untethered part as the free or operative part of the tongue-setting. (p. 76)

Rather than assuming pronunciation errors to be a purely psychological phenomenon, i.e., learners have difficulty pronouncing sounds that are not present in their L1s because they

cannot perceive them, the theory of articulatory setting links perception to the actual physical movements of the mouth that condition the speech of L2 learners. According to this theory, it is the differences in the L1 settings and conditioned use of the articulators in speech that are transferred to the L2 in the speech of learners, thereby coloring the phonology of L2 speech.

The Validity of Articulatory Setting as an Approach L2 Pronunciation Pedagogy

In her book *English Phonology and Pronunciation Teaching*, Rogerson-Revell (2020) points out that articulatory setting is an area of pronunciation that has been largely overlooked in pronunciation teaching materials (p. 36). Since the concept of articulatory setting is not a recent development in the field of linguistics, one might question why it has not been applied to L2 pronunciation teaching methods. There are several reasons for this. First, the major criticism against the adoption of teaching methods based on articulatory setting is that the formulation of the theory had resulted largely from informal observations of the tendencies of speakers from different language backgrounds rather than from scientifically quantifiable methods (Wilson & Gick, 2014). Second, there is a historical reason for why articulatory setting was never earnestly adopted in the field of L2 pronunciation teaching. At the time when Honikman's article describing her theory of articulatory settings was written (1964), the prevailing view in the field of language teaching was a deemphasis on pronunciation. This was influenced by the Cognitive Approach to language teaching popular at the time, which held that all language phenomena were rule based in nature (Celce-Murcia et al., 2010, p. 5). In contrast to the 1960's deemphasis of the skill of pronunciation, pronunciation teaching in the following decade of the 1970s exhibited a heavy reliance on mimicry and repetition of speech (Celce-Murcia et al., 2010, p. 5). Since that time, the field has moved on to incorporate many findings from the various subfields of linguistics, and has emphasized different aspects of phonology, such as the importance of intelligibility and the stress-timing of English. However, given developments in

the field of phonetics there is increasing evidence for the validity of incorporating articulatory setting into the development of L2 pronunciation teaching methods.

Findings That Support Articulatory Setting from the Field of Phonetics

The existence of unique articulatory settings for different languages is supported by findings in the fields of acoustic and articulatory phonetics. One such finding in the field of acoustic phonetics that relates to the concept of articulatory settings is cross-linguistic variation in the formant frequencies of vowels. For example, the high front vowel, which is normally transcribed in the IPA as [i], differs acoustically in Spanish and English even though the sounds are both transcribed with the same symbol. In fact, all Spanish vowels /a, i, e, o, u/ differ systematically in the Spanish vowel space relative to their English equivalents (Bradlow, 1995). These acoustic differences noted by Bradlow are a result of differences in the shape of the mouth's resonant cavity resulting from the movements and postures of the articulators during speech. These systematic differences support the theory of articulatory setting as a valid framework in L2 pronunciation teaching, because if there were no differences, then an /i/ in Spanish and an /i/ in English should be exactly the same acoustically. Furthermore, if one were to compare two equivalent vowel segments in any two languages, it is likely that the formant frequencies would be different even though the sounds would be transcribed in the IPA with the same symbol. To put it simply, just because linguists transcribe vowels as the same symbols, or even may perceive them as the same sounds, does not alter the fact that there are quantifiable acoustic differences in articulation that occur cross-linguistically. These acoustic differences could be due to a number of postural differences such as cross-linguistic variation in the rigidness of the tongue i.e., the extent to which the muscles of the tongue are contracting during speech, the positioning of the tongue in the oral cavity prior to or during an utterance, the roundedness of the lips during an utterance, etc. However, one issue that measured

differences in the formant frequencies of vowels cannot account for is how much of the differences are a result of the articulatory settings that are necessary for the articulation of specific sounds or how the distribution of sounds affects these settings.

Recent studies in the field of articulatory phonetics have also attempted to quantify language specific articulatory settings. It has been noted that in order to clearly measure articulatory settings, it is necessary to differentiate settings that are unique to the given language from the ones that are necessary for the articulation of individual phonemes. In order to investigate this topic, Gick et al. (2004) studied what they define as inter-speech posture, which refers to the positions of the articulators between utterances. By measuring inter-speech posture, it is possible to separate the underlying articulatory settings from any settings that are required for the articulation of specific sounds. In their experiments they utilized x-ray imaging to measure the inter-speech postures of speakers of French and English. What they found was that when comparing measurements taken from French speakers with English speakers, there were observable differences in lip protrusion, pharynx width, tongue height, and its distance to the alveolar ridge during inter-speech periods (Gick et al., 2004, p. 226). These findings support the validity of underlying articulatory settings, and as Gick et al. claim, have "important implications for foreign-language teaching" (Gick et al., 2004, p, 231).

Applying Articulatory Settings to the Japanese EFL Context

Regarding the teaching of pronunciation to Japanese learners in an EFL context, there are several aspects of English phonology that present difficulty for Japanese learners. First, there is significant phonological distance between the phonemic inventories of Japanese and English. Standard Japanese uses approximately 21 phonemes (Okada, 1999, p.117), if vowel length contrasts are not considered, whereas Standard American English uses approximately 35 phonemes not including diphthongs (Ladefoged, 1999, p.p. 41-42).

Second, Japanese syllable structure is quite different from English syllable structure, with Japanese using CVV, CV, CCV, and rarely CVC syllable structures, which only end in /n/. In contrast with the syllable structure of Japanese, English uses a highly complex syllable structure, which can use any combination of consonants at the beginning or end of a syllable illustrated by the syllable structure (C)(C)(C)V(C)(C)(C)(C), with the word *strength* being an example of the most complex syllable type possible in English (Maddieson, 2013).

Finally, the metrical structure of Japanese is based on the unit of the mora rather than the stressed syllable of English. Considering these many differences, what area of pronunciation should be emphasized when instructing Japanese EFL students? One drawback of a focus on the segmental aspects of English phonology, such as vowels, is that it is extremely difficult if not impossible for adult learners to acquire non-native phonemes after a certain critical period (Nakashima, 2006). However, if teaching methods aimed at raising Japanese learners' awareness of the differences in articulatory settings between English and Japanese were used in the classroom, perhaps global improvements to these different issues in the L2 phonology of Japanese English learners could be facilitated.

One researcher that has advocated for the application of articulatory setting to pronunciation teaching in the Japanese EFL context is Junko Noguchi. In her 2014 paper, Noguchi builds a case for applying these concepts to the teaching of pronunciation to Japanese EFL students. Noguchi states that due to the differences in articulatory settings between English and Japanese, "Japanese learners may not be equipped with sufficient muscles of their articulatory organs in order to produce English sounds precisely and accurately" (Noguchi, 2014, p. 295). She believes that this could be one of the reasons why it often takes Japanese learners a long time to acquire English sounds since it takes time "to develop strength flexibility and control over the coordination of articulatory muscles, especially without any training

designed specifically for the purpose" (p. 295). Noguchi proceeds to explain how she believes English articulatory settings could be taught to Japanese EFL students, citing differences in vowel articulation, lip rounding, tongue position, and jaw movement as specific areas to be focused on. She also suggests the adoption of techniques adapted from drama in order to help warm-up and train the articulatory muscles for speech and the importance of diaphragmatic breathing to develop the muscles involved with stress pulses, which could facilitate the acquisition of English stress.

Wilson et al. (2020) investigated if the effects of jaw training could have a measurable effect on the formant frequencies of 20 Japanese English learners. The concept of jaw training was chosen because speakers tend to transfer their jaw displacement patterns, i.e., the degree to which speakers open their mouths during speech, from their L1s to their L2s. Jaw displacement has been shown to have an acoustic effect on formant frequencies of vowels, specifically the F1 formant (Wilson, et al., 2020). What Wilson et al. (2020) found was that after participants performed the training activities, they were able to alter their jaw displacement patterns as evidenced by a change in formant frequencies in before and after training recordings.

Limitations of the Approach

One major limitation of this approach to pronunciation teaching is that it heavily utilizes linguistic terminology in order to describe the ways in which articulatory settings differ cross-linguistically, and thus is by nature difficult to convey to learners. While some of the techniques prescribed by this approach may be easy for students to incorporate into their speech, such as consciously rounding the lips when pronouncing glides /j/ /w/ or the vowel /u/, how exactly does one teach students to tether their longue laterally to the roof of the mouth? Students are likely to be unfamiliar with the linguistic terminology and lack understanding of the anatomy of the vocal tract for instructions like these to be of any use to them, and thus, be

unable to apply these directions to their own speech. Therefore, in order for articulatory setting to have any practical application to the teaching of pronunciation for L2 learners, it would require further development and for it to be broken down into easily understandable steps or practices akin to a type of workout for the articulators. Thornbury (1993) points out that the application of articulatory settings to the teaching of pronunciation should be undertaken in a discovery-based approach, where instructors are not explicitly teaching specific alterations to learners, but learners are being led to understand the subtle differences in movement patterns that are required to accurately pronounce the target language.

Conclusion

Articulatory setting is by no means a new concept in the field of language teaching; however for various reasons, it has yet to be widely adopted by the field of pronunciation instruction. These reasons include historical trends in language teaching and an inability to quantify or measure the influence of articulatory settings on cross-linguistic differences in phonology. However, due to recent advancements in the field of articulatory phonetics made possible by modern imaging technology, and the ability of any researcher to perform high-level acoustic analysis with a personal computer, there are more studies being published that support the theoretical validity of articulatory setting. These findings suggest that articulatory setting be reevaluated as a viable approach for pronunciation instruction, especially at the lower levels of instruction. Regarding its relevance to the Japanese EFL context, as Noguchi (2014) points out, Japanese speakers' undeveloped musculature prevents them from accurately pronouncing many of the common sounds in English. Therefore, some exercises geared towards prompting learners to adapt their movements to a more English-like pattern could be merited in the beginning stages of pronunciation instruction aimed at Japanese learners of English.

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