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High Variability Phonetic Training and Self-assessment: A Reflection on Using Them Together to Support Phonetic Learning in the L2 Classroom

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Abstract

Previous research on second language (L2) error perception has suggested that a better ability to perceive others' and one's own L2 errors may lead to better production of L2 sounds. A follow-up study found that self-assessment (S-A), a type of formative assessment in which learners are trained to perceive their own (mis)pronunciation, has shown potential benefits in raising learner awareness of their progress in a classroom context. Another L2 perceptual training paradigm is High Variability Phonetic Training (HVPT). Studies on HVPT have revealed positive learning outcomes and its great potential for L2 pedagogy. For L2 pronunciation teachers, the results from these studies on L2 perception raise important questions regarding their incorporation into classroom instruction. How can teachers provide adequate perceptual training? How can language teachers use HVPT to enhance learner awareness more effectively? Can S-A be used to better inform HVPT-based instruction? In this practitioner's reflection paper, a review of HVPT and self-assessment literature will be presented through the lens of the Speech Learning Model. Recommendations for the use of these complementary tools will be then discussed in an attempt to bridge the gap further between HVPT research, action research and classroom L2 pronunciation teaching.

Keywords: *Self-assessment, high variability phonetic training (HVPT), L2 phonological development, Speech Learning Model, formative assessment*

1. Introduction

Some form of practice in perceiving the target sounds of a second language (L2) often accompanies or precedes production practice, as is evidenced in L2 pronunciation manuals at different levels [1, 2] and current pedagogical practice [3-8]. Indeed, those segments that are difficult to perceive are found to have more errors in production [9]. Wouters and John [10] have shown that the ability to detect L2 pronunciation errors correlates to better L2 production. These authors thus argued in favour of developing learner perception skills. It has been reported that learners may have difficulty identifying their own pronunciation weaknesses [11] and their own errors [12] and may overestimate their degree of accentedness [13]. For example, learners can detect that their production may not meet "standard" expectations, yet cannot identify as many errors [14] nor the same ones [11] as native speakers (NSs). Perhaps due to insufficient phonetic knowledge (e.g. at the beginning of a semester), learners may identify an issue as problematic when it is not for NSs [13]. Research has also shown that learners overestimate their own accent as more target-like than their peers [15]. It is thus important for pronunciation learners to develop accurate error detection skills, for example, through self-assessment (S-A). This form of formative assessment helps learners analyze their own production critically [11], particularly through improved awareness of their own pronunciation errors and increased confidence in their ability to self-monitor their L2 production [16, 17].

In addition, High Variability Phonetic Training (HVPT) [18] is an increasingly relevant L2 perception-based research paradigm « in which the auditory training stimuli include numerous samples, produced by multiple talkers, in varied phonetic contexts » [19, p. 209] in order to facilitate perceptual learning to new contexts and unfamiliar speakers.

This paper will provide reflections and recommendations for the combined use of HVPT and S-A in the L2 pronunciation classroom. We begin with an overview of the Speech Learning Model (SLM) [20], the theoretical foundation upon which issues discussed in this paper rest.

2. The Development of L2 Sound Categories

2.1. The Speech Language Model

Flege's Speech Learning Model (SLM) [20] posits that L1 and L2 learning are similar in that the distribution of phonetic input determines how phonetic categories are formed [21, p. 11]. The SLM has attempted to explain

the nature of accented L2 production in terms of how easy or difficult it is to perceptually map out non-native (NN) sounds to native (N) phonetic categories in a "common phonetic space" [p. 19]. Difficulties in mastering NN sounds are attributed to problems in forming new phonetic categories due to a process called "interlingual identification" [pp. 8, 13] (originally "equivalence classification" [22]). The SLM further hypothesizes that the establishment of new phonetic categories is determined by "statistical input distributions". This includes allophonic variation, position-dependent coarticulation, and multiple acoustic cues that may differ from one language to another [21, pp. 13-19].

Initially, L2 learners will map an L2 sound to the phonetically closest L1 sound. In other words, if the phonetic features of the L2 sound are sufficiently similar to an L1 category, that L2 sound will be relatively difficult to master because it will be associated with an L1 phoneme. Those L2 sounds that share few equivalent phonetic features are expected to be more easily mastered since they cannot be associated with an L1 phoneme, therefore a "new" L2 category must be formed [20]. However, even in cases where there has been equivalence classification, as learners are exposed to more and varied input, they may begin to discern phonetic differences between the L2 sound and the L1 sound to which it is identified. Once learners become aware of such differences, they can proceed to establish a new and separate category for the L2 sound (21, p. 31).

2.2. Varied Input in Perceptual Training

For the language teacher, the SLM suggests that learners must be exposed to phonetically rich and varied L2 input, as was evidenced by the seminal work done in the 1990's (see [23] for an overview). HVPT may include discrimination and identification tasks encompassing target exposure to various speakers (familiar or unfamiliar human voices, human vs. synthetic voices, single or multiple talkers) in different phonetic contexts (initial, medial or final position of a word; isolated words or words in a sentence; real L2 or nonsense words) [19, 23, 24]. Metanalyses of research using HVPT have revealed significant improvement among adults in L2 perception and production of the targeted sounds [19] with moderate-to-large correlations between perception and production gains [24].

Despite many research questions that have yet to be answered, HVPT seems to be the best candidate for L2 perceptual training, particularly for individual [25] and complementary practice to classroom instruction [26]. Reported advantages are its important focus on form rather than meaning, interactivity and immediate feedback [23]. Furthermore, HVPT is recommended over other tools, such as Praat [27] or automatic speech recognition (ASR) as these may require extensive acoustic manipulation, technical expertise and time that some teachers and learners may not have [19, 28]. One HVPT study, conducted in 2022 [29], has also used a mobile gaming app to enhance learner engagement though motivating, fast-paced, perceptual decision-making. Their study revealed that generalization of learned targets took place not only for new voices but also from perception tasks to production tasks.

2.3. Recommendations for HVPT Design and Implementation

HVPT still remains largely underexploited among classroom researchers and teachers [19, 23]. For those teachers who wish to develop their own HVPT materials and help bridge the gap between pure research, action research and course instruction, here are some considerations.

When selecting audio files or recording audio for exercises, it is recommended to validate the target accuracy of the input with NSs or highly proficient speakers. This can be done through transcription or word-matching tasks to exclude those that may lead to confusion, depending on the learners' level of proficiency.

For action research and independent learning practice, forced choice target identification tasks (FCID), rather than AXB discrimination tasks (judging whether two sounds are the same or different), are recommended as they have revealed better outcomes for both consonant and vowel learning [19, p. 224]. An online learning management system (LMS), such as Moodle, can be helpful in delivering large amounts of randomized listening stimuli in test form with customizable feedback to direct attention to relevant features and acoustic cues that are helpful in phoneme identification, such as listening for a burst of air where aspiration may occur [5]. Moodle [30] also has certainty-based marking (CBM), allowing participants and learners to identify the degree of certainty of each answer on a 3-point scale leading to "bonus" points when correct. Confidence ratings may provide objective indicators to action researchers, teachers and to the learners themselves as to how well they are mastering the target sounds, especially after multiple attempts. These insights into an individual's developing metacognitive and self-monitoring perceptual skills have been shown to correlate with production [31]. If it is not possible to implement this form of automatic confidence rating, research participants may be encouraged to reflect on the degree of certainty of their judgments through interviews and questionnaires, and students may be asked to reflect on their judgments in their S-As.

The use of HVPT should also account for individual differences rather than a "one-size-fits-all" approach [23, p. 189] that is adaptive to learner ability and proficiency. For example, the target sounds should be represented simply, such as with keywords, phonetic symbols or colors that do not add processing difficulties for weaker subjects and learners [32].

Interactive HVPT learning should favour multimodal processing instead of only auditory processing. In its HVPT speed-matching mobile application, Saito's team [29] adjusted the multimodal support depending on the level of difficulty: colors for the visual mode, spatial orientation for different placement of the targets and visuomotor interaction by touching the screen for right, left or up directions. As the level of difficulty progressed, the multimodal supports disappeared and the perceptual challenges became more randomized. For low-tech learning environments, an in-class variant of this activity can be used as a quick and engaging awareness-raising activity; the teacher plays the sound and learners, playing individually or in teams, raise corresponding color-coded phoneme cards or move to different places around the classroom where target categories are represented. For students who enjoy competition, points can be attributed for correct identification then bonus points for how quickly an individual student or team identifies the target category or how sure they are of their individual or collective decisions.

2.4. Existing HVPT Resources

The following resources can provide varied input that is suitable for action research projects and instruction. *English Accent Coach* (EAC) [32], developed by Ron Thomson, provides free, unlimited HVPT perception-based vowel and consonant identification practice. Users may personalize their online experience by defining the target sound(s) to practice in a practice session as well as the level of difficulty. Automatically generated result reports pinpoint problematic L2 sounds that can be addressed in subsequent practice attempts. Other customizable features include the following: the length of each practice test (20, 100 or 200 items); the number of retries (1-3 times) after a wrong answer; the use of color coding, phonetic symbols, or different key words representing the target sounds offer visual support**.** Also, with "record" and "playback" buttons, learners can use EAC for production practice.

Forvo.com [33] is known as one of the world's largest multilingual online pronunciation resources with more than 430 languages represented. This resource provides extensive opportunities to access phrases and individual words recorded by multiple NSs and compare phonetic variability in the speech samples. YouGlish.com [34] is a multiliingual search engine that can find authentic YouTube videoclips in which the desired word or phrase is pronounced. Search criteria can be set to locate speech samples in different regional accents, parts of speech (nouns vs. verbs), or by the gender of the speaker. For pure and action research, additional recommendations of existing, extensive cloud-based databases can be found in [28]. Each of these tools may facilitate HVPT action research in alleviating the task of creating one's own experimental stimuli since varied speech is readily available. For pronunciation teachers, these resources are just a starting point for learner exploration, reflection in S-As, and collaborative class activities and projects, such as encouraging learners to create a shared bank of reliable pronunciation web resources.

With these points in mind, how can teachers use HVPT and S-A together effectively to support L2 pronunciation outcomes?

3. Self-Assessment in the (L2) Classroom

Defined as "a descriptive and evaluative act carried out by the student concerning his or her work and academic abilities" [36, p. 368], self-assessment (S-A) is increasingly used in formative assessment as teachers see its value in engaging students in reflective analysis [36]. Teachers can improve classroom time management and their workload with S-A, especially for large classes, and more accurately track their students' progress [41]. However, some teachers may not view opportunities for S-A as important to their teaching [37], which may impede its adoption.

Learners become more active and informed participants in their own L2 learning [37] and experience less anxiety when being evaluated [41]. Indeed, S-A allows students to monitor their performance in a safe space where errors are accepted and free from the judgment of others, thus allowing them to be more engaged with the course material and better equipped at undertaking more challenging learning tasks thus sharpening their reflective and critical thinking skills [41], especially when a focus on language form is needed [37, p. 6]. On the other hand, students may face challenges engaging in unfamiliar S-A tasks, in that expected criteria of performance and standards to attain may be difficult for students to understand without performance models nor clear benchmarks. Students may also receive teacher feedback that is perceived as overly critical, unrelated

to performance goals, or not concrete enough to provide actionable guidance [38]. For S-A to be effective, Harris and Brown [39] propose frequent, well-structured assessments that provide clear guidance and feedback from the teacher, which, in turn, foster a nuanced understanding of what to identify and improve upon. These authors finally suggest that the resulting development of better adaptive learning strategies, learner empowerment and essential self-regulatory skills [40] foster learner autonomy and bring about improved learning outcomes.

With these considerations in mind, what recommendations can be made for the use of HVPT training and S-A to optimize form-focused L2 pronunciation instruction?

3.1. Recommendations for Self-Assessment

S-A is at the heart MacGregor and Reed's pronunciation instructional framework [4]. It is understood that pronunciation S-A is a skill that needs to be taught explicitly designed and scaffolded: the learning value of S-A as well as teacher expectations of the task (assessment criteria) should be clarified and practiced through benchmarking activities and open discussions [13]. Assessing learner needs is important to guide teachers towards the type of information and feedback they give students [4], so a language background questionnaire [3, 5] or "first day of class" discussions about their previous language experience may provide food for thought to students and insights to teachers as to training priorities for individual learner profiles in the class. Students should thus be encouraged to reflect on what their long-term and short-term pronunciation goals are in early S-As and how those relate to the instructional goals as well as their own identity as a language learner [42].

Self-assessments of production should be based on a phonetically rich diagnostic text. (See [1, 2, 3] for sample paragraphs). The baseline recording of a read-aloud text and an open-ended speech sample [43] are best taken as early in the course as possible before form-focused instruction takes place. Both teacher and learner should give the initial recording a score, for example, on a scale of 1 to 10 [11] against which later S-As are judged.

Also, model analysis questions and rubrics of S-A and instruction may be provided as students put their S-A skills into practice through multiple opportunities to review and improve themselves. The design of L2 self-assessment grids (or rubrics that can be used with LMSs) should scaffold the increasing complexity and difficulty of the phonetic skills to be developed from one S-A to the next [11, 13]. S-As should take place at periodic intervals, such as around weeks 3, 6 and 12 as seen for oral presentations [13] or more frequently (weekly as in [16, 17]) in preparation for summative evaluations.

Furthermore, Kiely [37] views teacher feedback as another form of scaffolding and draws attention to its importance in fostering learners' confidence in their S-A abilities as well as their desire to learn. In early student attempts to self-assess, new phoneme features to monitor and assess—especially less salient acoustic cues—could come with clear criteria to check off in a checklist to scaffold learner error detection. As the course progresses, assessment of older phonetic topics/features can be removed from checklists and replaced with open-ended, written and/or spoken development questions as learners appreciate "Why?" questions that encourage reflection [37]. A minimum required word count for written analyses or a minimal recording time that does not count silence nor redundancy [author's instructions to students] may encourage students to engage in deeper analyses of their performance. However, the effectiveness of these practitioner recommendations has yet to be explored in more empirical action research.

Each step of the communicative framework outlined by Celce-Murcia and her colleagues [8, p. 45]—description and analysis, listening discrimination and controlled practice, guided practice and communicative practice—can include an element of S-A. L2 pronunciation learners report that S-A tasks can be difficult at first but they (the learners) are able to develop their S-A skills over time [17]. Teachers should direct learner attention to learning priorities. This may include the ability to make predictions about L2 production, for example, anticipating sound-spelling correspondence [44] in phoneme identification tasks or knowing which acoustic or articulatory cues to attend to, such listening for a puff of air after a stressed /t/ or putting the tip of the tongue between the front teeth for interdental fricatives [3, 5]. Learners then reflect on their perceived degree of understanding of new and previous theoretical knowledge and track their progress from one S-A to the next [3]. Next, targeted, teacher-driven or technology-assisted perception activities offer immediate feedback to raise learner awareness of strengths and weaknesses. HVPT practice observations can be included in S-As as to where the most common errors occurred, how similar or different the sounds seem to those in their L1 or how many repetitions were needed to pass a perception task. Learners may also reflect on what acoustic cues they were anticipating or attending to and what perceptual or articulatory adjustments need to be made in follow-up tasks. These forms of S-A can be helpful in encouraging students to engage in their own error detection—and receive important teacher feedback for any "blind spots"—as they continue to stages 3 to 5 of the framework, which further challenge student awareness of L2 sound production. Learners should be encouraged to not only actively seek out meaningful L2 human interactions in a variety of contexts outside the classroom, where

exposure to unfamiliar voices which vary by L1, age, gender, and socioeconomic class may provide rich phonetic input but also to reflect on these experiences In their S-As and to report the features and idiosyncracies they observe.

Students may get impatient or discouraged if they detect little or no pronunciation improvement. Informing students that perception skills normally develop before production skills [43] and that changes to pronunciation may be small in comparison to gains in perception [45] could motivate students to persevere in their efforts to learn.

4. Conclusion

This practitioner reflection paper was intended to guide L2 pronunciation teachers into areas of potential action research and improved classroom intervention with HVPT and S-A. As explored above, HVPT may provide objective, measurable, adaptive, technology-based opportunities for supplemental practice, and its feedback may help inform S-As by bringing to light perceived strengths and weaknesses in L2 perception and error detection. It is thus the author's hope that the effective co-implementation of these pedagogical tools in future action research and classroom practice may direct both learners and teachers to new areas of focus, leading to the development of better self-regulation and learner autonomy skills [40] and closer alignment to NS perception and production [13].

However, care should be taken by instructors to evaluate the amount of time and effort necessary to implement S-A and HVPT individually or in complementarity to current practice. By carefully assessing learner needs [4], teachers should then be able to identify those areas where HVPT and S-A are most important and offer repeated opportunities for assessment and feedback [13].

Researchers and practitioners still have much to explore and replicate in the fields of phonetic category development, HVPT and S-A: for example, how long or involved should self-assessment or HVPT modules be to have minimal effectiveness among adult learners at differing levels of proficiency in a 15-week university course? How many voices per target are minimally necessary in HVPT training modules to provide the much-needed varied input? How can HVPT training be adapted for different L1 profiles according to perceptual ease or difficulty of certain target sounds? Should S-A and HVPT training be addressed differently based on the L2 of instruction? Also, L2 research suggests that using more than one form of assessment may not only reduce the teacher workload but also further encourage learner autonomy [37, 42]; this raises the question of whether other pedagogical tools, such as benchmarking used with peer assessment [13] and communities of practice [46], influence S-A skills and perception or production performance? Furthermore, while the SLM explains the learning of target sounds, it does not take prosodic elements into account [42], and L2 pronunciation instruction could benefit from more action research, as evidenced by the positive effects of S-A on learner awareness to prosody [16, 17]. Foote and Trofimovich [42] call for more L2 pronunciation research across different theoretical perspectives, and those important unknowns which still linger in the literature may partially explain the often deplored "gaps" in L2 pronunciation research when compared to other areas of L2 research and classroom application. Also, institutional factors may influence the pace at which pronunciation instruction is valued and prioritized in L2 curricula and in the allocation of resources for long-term, sustainable implementation [4]. Thus, the author of this paper advises teachers not to feel pressured into making sweeping modifications to their current practice, but rather small, incremental changes. She also shares the optimistic view of others [19, 23, 42] that the current understanding of the many variables that influence L2 phonetic development should continue to evolve through theoretical and action research to pave the way for both efficient and effective L2 phonetic instructional practices.

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