

WS2-3 ワークショップ(2)

Haptic Techniques for Teaching English Prosody

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1. Introduction

In this paper, we will focus on three prosodic variables of English: Intonation, stress and syllables. English and Japanese differ in many interesting ways, and do not allow for a one to one comparison of variables. For example, pitch in English is mostly a property of the intonational phrase whereas in Japanese, it is a property of words as well as the intonational phrase. The intonational phrase in English is linked to the sentence through the word that is in focus. Generally, though not always, this focal stress tends to be on the final content word in a sentence. In English there is word stress and sentence stress whereas in Japanese it is pitch accent (Beckman, 1986). In English accent there are three variables (pitch, duration and loudness) whereas Japanese has one chief variable--pitch. In English, duration is the primary marker of stress. Stressed syllables have a longer duration, which gives English its characteristic rhythm (see Adam & Munro, 1978 and Tajima et al., 1997). This variable, perhaps more than any other one variable contributes greatly to intelligibility (Munro & Derwing, 1995 and Anderson-Hsieh et al., 1992). Finally, Japanese syllables are mainly open as in V and CV, whereas English also has closed syllables CVC as well as consonant clusters consisting of 2 to 4 consonants. Transferring Japanese syllable structure to English greatly hinders intelligibility so getting syllables right or closer to English norms gives a boost to intelligibility.

Because of these substantial differences between Japanese and English, we suggest a haptic approach, which means using body movement and touch, as a promising way to teach and learn these prosodic aspects of English. After a brief look at some anecdotal evidence and previous studies, we will give a brief introduction to haptic techniques and then show the results of a pilot study.

2. Anecdotal evidence: One teacher's experience

As a teacher of Japanese students for more than 20 years, I have observed that there is a barrier between studying English as a primarily internal, silent and cognitive activity to one which engages the entire body. Speaking is a physical act and involves the control of parts of the body much like a sport or dance. One can study about how to play tennis, but not achieve any proficiency without actually doing it and automatizing the many processes involved in playing a successful tennis match. The first days of university classes show that most students are very uncomfortable with starting to speak. It shows that they are getting very little practice with the physical part of English. In workshops for high school students, it is hard to get students to go beyond just sitting and listening to the teacher. Haptic practice serves as a way to break out of the invisible shell that surrounds them and begin moving and speaking. Anyone can tell by the way that students look around nervously when you ask them to stand up, move their hands and arms, or even speak, that they are not used to crossing this line in the classroom. However, once they stand up they will then be more willing to

speak or perform haptic activities. This can be the first step to engaging the body and becoming a successful English speaker.

3. Previous Studies: Haptic Stimuli

Body motion coordinated with the focus words and stressed syllables will help learners enhance their acoustic prominence, and make their L2 English more intelligible. Students can start by imitating simple beat gestures. McCafferty (2006) found that beat gestures such as a sharp up-and-down movement of the hand improves L2 learners' syllable parsing. It is argued this metaphoric gesture helps L2 learners to gain control over syllable parsing, and the physicalized sense of prosodic features of the L2 improves automaticity and fluency. Krahmer and Swerts (2007) tested how acoustic prominence is perceived by observers when they *see* a speaker perform a manual beat gesture on a word, and found that they are perceived as more prominent than when they do not see the beat gesture. They also tested whether producing a manual beat gesture, a head nod and a rapid eyebrow movement lead to changes in acoustic prominence in speech, and found a significant effect with regard to duration (longer), energy (more intense) and peak *F0* (higher).

Parrell, Goldstein and Byrd (2014) argue that the implementation of prosody is not domain-specific but relies on general aspects of the motor system. In their study, participants were instructed to tap their fingers and produce repetitive monosyllabic words simultaneously, and enhance one of them while keeping the other action unchanged. In spite of the instruction, when the finger tapping is enhanced, the oral articulator is enhanced, and vice versa. The results suggest speech and manual motor systems tend to coordinate with each other spontaneously.

4. Implementation of Haptic Techniques - Pilot

In this presentation, haptic techniques (Acton, 2016) will be introduced that have been shown to be helpful in the learning of these important prosodic features based on experience with learners from many contexts around world and including high school and first year college students in Japan. Haptic phonetics is a kinesthetic learning of sounds with the use of body movement and touch. Haptic learning helps make prosodic features salient and learnable (Acton et al., 2013, Teaman & Acton, 2013). Haptic movements perform two functions. One as a symbolic representation of an important sound feature and the other is a way to connect the body and performance of language to that symbolic representation. The following describes three haptic techniques used for intonation, rhythm, and syllables.

The Haptic Intonational Touchinami: The Haptic Intonational Touchinami is a blend of the words "touch" and the Japanese word for wave. It symbolically represents the shape of the melody, like a wave, and the intonational focus of the sentence. The intonational contour is represented by the basic shape of the contour of one hand moving across the visual field in a way that roughly matches the pitch pattern of the sentence. On the center of the intonational phrase, the wave hand strikes the other hand to symbolize the IP nucleus. (The application of this technique to intonation in a narrative is discussed in Yamane & Teaman (2017)).

The Haptic Rhythm Fight Club: In the haptic rhythm fight club, has the learner with arms raised in something like a boxing stance, with fists clenched. As the learner speaks, one hand thrusts forward on stressed syllables with either a long stroke forwards for main stresses or a short stroke forward for secondarily stressed syllables. This activity helps learners to feel the rhythm of English. It is especially effective in learning to engage the diaphragm and other core muscles used to expel breath with force on stressed syllables. (The application of this technique to focus words is discussed in Yamane & Teaman in prep, see Burri et al. 2016 for vocabulary learning.)

The Haptic Syllable Butterfly: The syllable butterfly helps students practice syllable structures and stress. With one hand cupping the opposite elbow and the other hand placed on the opposite shoulder, they tap harder on the shoulder (**TAP**) for the main stressed syllable and softer on the elbow (**tap**) for non-main stressed syllables. So the word “economy” is said with a **tap TAP tap tap** accompanying the 4 syllables of this word. This is an excellent teaching tool, so that when a student makes a stress error, the teacher can tap out the rhythm in front of the student and they can learn to correct the error themselves by applying the tapping pattern to their pronunciation. (The application of this technique to English rhythm is discussed in Burri & Baker 2016.)

5. Acoustic Analysis and Auditory Judgements

This section shows our approach to assessment, with preliminary results from a pilot haptic study that we conducted with university students (Yamane, Teaman & Acton, 2017). The average English proficiency level was ‘pre-intermediate level’ to ‘intermediate level’ (embassyenglish.com). A comparison group (n=10) received shadowing, while the experimental group (n=10) received haptic treatment (Intonational Touchnami). Both treatments were less than 15 minutes. Their task was to read an English passage in English textbook used in middle school (Kairyudo 2014). The target was “Everyone in her class loved the colorful flowers” located in the last sentence of a short narrative passage. The duration ratio of the stressed vowel “l[o]ved” in relation to “th[e]” (Ratio 1) and the duration ratio of the stressed vowel “cl[a]ss” in relation to “th[e]” (Ratio 2) were measured.

Results of the dependent (paired) sample t-tests indicated that there were significant differences in these ratios between pretest and posttest: [1] Audio group: (i) Ratio 1 between pretest (M=1.73, SD=0.92) and posttest (M=3.67, SD=2.73) conditions; $t(18)=2.13$, $p<.05$., and in (ii) Ratio 2 between pretest (M=2.31, SD=1.46) and posttest (M=4.21, SD=2.71) conditions; $t(18)=1.95$, $p<.05$. [2] Haptic group: (i) Ratio 1 between pretest (M=2.54, SD=1.59) and posttest (M=4.92, SD=2.01) conditions; $t(18)=2.93$, $p<.01$, and in (ii) Ratio 2 between pretest (M=2.51, SD=1.33) and posttest (M=4.91, SD=1.83) conditions; $t(18)=3.37$, $p<.01$. These results suggest that both kinds of practice have a positive effect on students’ performance of making the contrast between stressed and unstressed syllables. Thus, their M values in the posttest approached those of native speakers’ (n=10) (M=5.79, SD=3.48 for Ratio 1, M=4.99, SD=1.83 for Ratio2). However, there was no significant difference in the effects between the two groups: (i) Ratio 1; $t(18)=0.39$, $p=0.35$ (ii) Ratio 2; $t(18)=0.67$, $p=0.26$. Furthermore, one native speaker’s blind auditory judgement (5 level likert-scale)

revealed that both groups show some improvement, but the pretest vs. posttest differences were not significant for the audio group ($p=0.21$) or the haptic group ($p=0.14$).

6. Conclusion and Further Direction

It can be seen that even though Japanese university students seem to readily learn to recognize and predict focus (Yoshimura et al. 2015), their spoken control of prosodic variables in English needs to be improved including stress, rhythm and syllable structure. Haptic methods seem to offer a powerful tool for raising awareness as well as improving performance of these variables.

Since pedagogical research for prosody is quite new, issues to tackle are many. The results are promising but lead us consider that we need a more systematic and automated assessment, more carefully-developed tokens, longer training, and more raters. Oral readings for pre and post tests are commonly used, but the next question is whether the learners are able to apply this to other novel sentences, especially in spontaneous speech.

Teacher education should also be enhanced. The amount of training teachers have received in pronunciation pedagogy strongly affects their knowledge and their confidence in that area (Baker 2014). Baker also shows that one's own experience of L2 learning influences their belief as well. Thus in phonetics classes in Japanese universities, it is important for prospective teachers to learn to self-monitor, self-analyze and self-evaluate their L2 speech performance, to experience different teaching methods that they can readily adopt, and to grow their metalinguistic and metacognitive ability, which helps them to further create their own methods and/or materials.

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