L2 PROFICIENCY PREDICTS L1 ACCENTEDNESS AND COMPREHENSIBILITY

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ABSTRACT

Learning a second language (L2) can change the pronunciation of one's first language (L1), but its implications for communicative dimensions such as accentedness and comprehensibility remain unclear. In this study, L1 recordings of 183 Japanese learners of English living in Japan were rated for accentedness and comprehensibility by a cohort of Japanese listeners. The resulting scores were compared with those of a previous similar assessment, in which the L2 recordings of the same speakers were rated for nativelikeness by English listeners. Statistical analyses revealed that those who were judged to be more nativelike in the L2 tended to be perceived as more foreign-accented in the L1, but surprisingly, their L1 speech was also perceived as more comprehensible. Theoretical implications and future directions are discussed.

Keywords: foreign accent, comprehensibility, proficiency, phonetic drift, nativelikeness

1. INTRODUCTION

The acquisition of a second language (L2) and its deployment in actual communicative scenarios have a deep and meaningful impact on the way phonological processing is shaped in the mind of the speaker. Traditional studies have shown a clear shift in a 'forward' way, that is, a transfer of traits from the first language (L1) to the spoken realization of the L2 [1, 2]. This imposition of one's own native language on the target language gives rise to what is known as a foreign accent [3].

There is, however, a possibility that the opposite also occurs: as the particularities of the L2 are instilled in the mind of the speaker, the pronunciation of the L1 may change as these new traits transfer 'backward' [4]. This phenomenon, often referred to as L1 phonetic drift, has been examined by an increasing number of studies lately (see [5] for a review). According to these studies, L2 learners can show evidence of phonetic drift in the form of L1 sound categories either assimilating to [6, 7] or dissimilating from [8, 9] the L2 ones, both of which are predicted by the Speech Learning Model (SLM) [10, 11]. The likelihood and magnitude of phonetic drift appear to be influenced by how proficient the learner is in the L2 and/or how dominantly the learner uses it, but since these two factors often go along in real-world learning scenarios, their own effects remain to be elucidated.

In this study, we will tackle the implications of the above phenomenon for communication. While studies on L1 phonetic drift abound, the majority of them have examined the acoustic-phonetic aspects of it, including the VOT of stops, spectral characteristics of vowels, approximants, and fricatives, f_o level, and f_o alignment [12]. Very few studies have focused on the consequence of the observed drift, namely how the drifted speech is perceived by listeners. One such study [13] examined L1 German speakers who had lived in Canada or the Netherlands for an average of 37 years, finding that their native German speech had a foreign accent perceptible to monolingual German listeners, with some speakers even being perceived as non-native speakers of German. A similar and perhaps more iconic case is that of Arnold Schwarzenegger, who was born in Austria in 1947, moved to the US in 1968 and has lived there since then. According to a longitudinal study of his speech [14], his recent L1 German (2010 - 2017) has a perceptible foreign accent that was absent in the early stage of his career (1977 - 1989).

The main research question we will address in this study is how L2 proficiency (defined as the ability to speak in a native-like fashion) relates to L1 accentedness. Specifically, we will examine a population of Japanese learners of English who are based in Japan and use Japanese as the primary means of communication but show diverse levels of L2 nativelikeness. This would help us disentangle the effects of L2 proficiency and L2 use, in contrast to the two previous studies mentioned above [13, 14] which examined a migrant population who were not only proficient but also dominant in the L2. We will also examine L1 comprehensibility, which, to the best of our knowledge, is a novel attempt in the field.

2. METHODS

2.1. Speakers

The speakers to be assessed are 183 L1 Japanese learners of L2 English (115 female, 68 male) from the J-AESOP corpus [15, 16, 17]. All of them were undergraduate or graduate students at universities in Tokyo and surrounding areas (mean age = 20.3). Most of the students started learning English at the age of 13 as part of their compulsory education in Japanese schools, while others were first exposed to English at an earlier age in Japan or overseas. Approximately one-third of the speakers ($n = 63$) had an experience of living in an English-speaking country (Australia, Canada, New Zealand, the US, and the UK) for various periods of time: 13 speakers for 1 to 6 months, 25 for 9 to 18 months, 15 for 2 to 5 years, and 10 for 6 to 11 years.

The corpus also includes 20 L1 English learners of L2 Japanese (15 female and 5 male) who were visiting, exchange, or degree-seeking students at one of the universities mentioned above (mean age = 20.7). Their speech will also be assessed as a distractor and reference.

2.2. Materials

There are eight types of recording tasks in J-AESOP (see [15] for details). This study uses the data from Task 6, in which the speakers read aloud the Japanese and English versions of "The North Wind and the Sun" [18].

2.3. Assessment of English speech

As part of the development of the corpus, all speakers' perceived nativelikeness in English had previously been assessed by four phonetically trained judges whose L1 is American English (see [19] for detailed procedures). The judges listened to each speaker's recorded sample of the English version of "The North Wind and the Sun" and evaluated its nativelikeness on a scale of 1 ("strongly foreign-accented") to 10 ("free of foreign accent"). Inter-judge consistency was very high, with a Cronbach's alpha of 0.98. The resultant scores of L1 Japanese speakers, when averaged across judges, ranged from 1.33 to 10.00 (mean = 5.44, median = 5.00, standard deviation = 1.98), suggesting that the speakers' impression ranged from heavily Japanese-accented to practically native English-like. The average scores of L1 English speakers ranged from 8.92 to 10.00 (mean = 9.83, median = 10.00, standard deviation = 0.29).

2.4. Assessment of Japanese speech

2.4.1. Listeners

Ten female L1 Japanese listeners, all of whom were undergraduate or graduate students at the University of Tsukuba (mean age = 20.8), participated in the assessment of the Japanese speech for this study. Most of them started learning English at the age of 13, while a few started earlier. Six had not lived outside of Japan for more than one month, while four had studied overseas for less than a year: one in the UK for 2 months, one in Australia for 2 months, one in the US for 7 months, and one in Germany for 10 months. All reported normal hearing.

2.4.2. Stimuli

The stimuli were the recorded samples of the Japanese version of "The North Wind and the Sun" as read by the 183 Japanese and 20 English speakers. Each audio sample's intensity was scaled to have a peak of 60 dB and noise-reduced on Praat [20].

2.4.3. Procedure

Gorilla Experiment Builder [21] was used to create an online experimental platform that the listeners could access from their own devices. They were encouraged to wear earphones or headphones throughout the experiment. After a brief tutorial, they engaged in a series of trials for assessment.

In each trial, the listeners were first presented with one of the 203 stimuli in random order. They then assessed the accentedness and comprehensibility of the speech, using one response slider per criterion.[1] The slider for accentedness had a "strong foreign accent" label on one end and a "no foreign accent" label on the other, while the slider for comprehensibility had "difficult to understand" on one end and "easy to understand" on the other. The internal value of each slider ranged from 0 to 100, where a larger value would indicate a higher level of perceived accentedness or comprehensibility, respectively.

A pause screen was displayed between trials so that the listeners could take a short break at any time during the experiment. This was because the experiment was estimated to take three to five hours to complete. The listeners were also instructed to take a long break after no more than one hour of assessment. All listeners completed their tasks within one week. They received monetary compensation for their time and effort.

3. RESULTS

3.1. Accentedness

Figure 1 shows the overall relationship between the Japanese accentedness score and the English nativelikeness score across all speakers. The accentedness scores were highly consistent across listeners, with a Cronbach's alpha of 0.94.
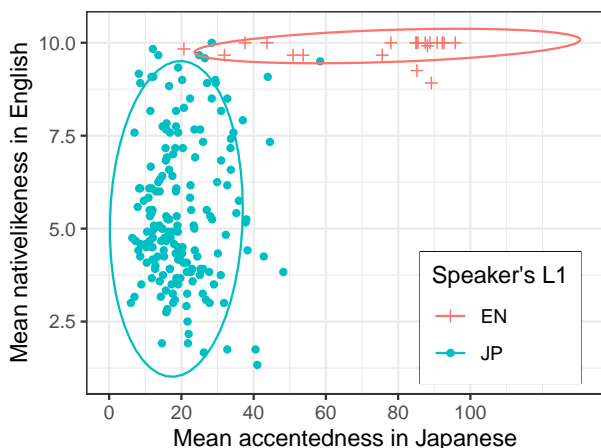

Figure 1: Mean accentedness in Japanese and nativelikeness in English per speaker.

The main question here is whether L1 Japanese speakers who are more nativelike (i.e., proficient) in L2 English tend to be perceived as more foreign-accented in the L1. Even though such a tendency is not evident in the figure, a linear mixed effects (LME) model with the following structure would reveal the effect of L2 proficiency:

$lmer(Acc \sim Ntv + (1 \mid judge) + (1 \mid listener), data = L1.Japanese.speakers)$

where *Acc* is the accentedness score in Japanese and *Ntv* is the nativelikeness score in English. Random intercepts were fitted for *judge* (of nativelikeness scores) and *listener* (of accentedness scores). The result of the model according to the *lmerTest* function [22] of R [23] is shown in Table 1.

	Estimate	*s.e.*	*t*	*p*
Intercept	18.505	6.493	2.850	.019
Ntv	0.273	0.083	3.306	< .001

Table 1: Results of the LME model on accentedness.

Ntv is a statistically significant predictor of *Acc*, and its positive estimated coefficient suggests that those who are more proficient in the L2 tend to be perceived as more foreign-accented in their L1.

3.2. Comprehensibility

Figure 2 shows the overall relationship between the Japanese comprehensibility score and the English nativelikeness score across all speakers. The listeners' assessment was again highly consistent, with a Cronbach's alpha of 0.92.
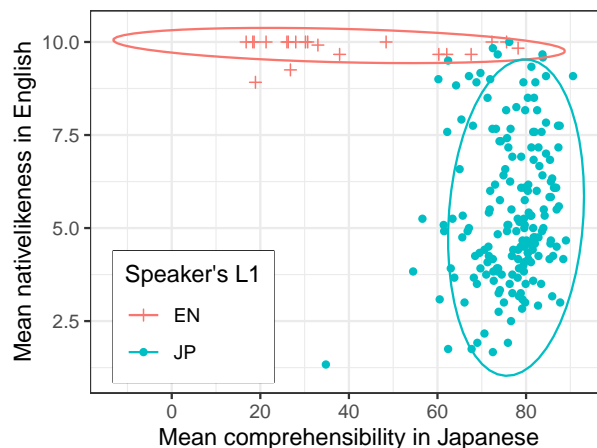

Figure 2: Mean comprehensibility in Japanese and nativelikeness in English per speaker.

The question here is whether L1 Japanese speakers who are more nativelike (i.e., proficient) in L2 English tend to be perceived as less comprehensible in the L1, which would be a plausible hypothesis given the result in Section 3.1. In order to test this, another LME model was fitted with the following structure:

$lmer(Cmp \sim Ntv + (1 \mid judge) + (1 \mid listener), data = L1.Japanese.speakers)$

where *Cmp* is the comprehensibility score in Japanese. The result of the model is shown in Table 2.

	Estimate	*s.e.*	*t*	*p*
Intercept	74.142	5.334	13.898	< .001
Ntv	0.477	0.074	6.413	< .001

Table 2: Results of the LME model on comprehensibility.

Ntv is again a statistically significant predictor of *Cmp*, but its estimated coefficient is unexpectedly positive. This indicates that those who are more proficient in the L2 are *easier* to understand in their L1. This would align with the ellipse for Japanese speakers in Figure 2 that is slightly tilted rightwards.

4. DISCUSSION

This study explored the potential effects of L2 proficiency on perceived L1 accentedness and comprehensibility using a corpus of Japanese learners of English. While previous studies have found perceptible foreign accents in the L1 speech of highly proficient L2 learners [13, 14], it was unclear whether the accent was due to their high proficiency per se or to their dominant use of the L2. It is possible that these migrant learners had experienced a significant reduction in L1 use and a consequent decline in linguistic abilities in the L1, commonly referred to as L1 attrition [24]. The current study, therefore, eliminated the possibility of L1 attrition caused by insufficient L1 use by focusing on a population who live where the L1 is spoken and use the L1 as their primary language but differ in L2 proficiency levels. The analysis revealed that those who were judged to be more nativelike or proficient in L2 English tended to be perceived as more foreign-accented in L1 Japanese, confirming a sole effect of L2 proficiency on L1 accentedness, perhaps for the first time.

Another novel finding of this study was the relationship between L2 proficiency and L1 comprehensibility. If L2 proficiency leads to L1 accentedness, one might expect that it would also lead to less comprehensibility of the L1 speech, given the close connection between accentedness and comprehensibility [25]. The result was in fact the opposite, as higher L2 proficiency predicted higher L1 comprehensibility. This surprising result may be explained by the "category precision" hypothesis of the revised SLM [11]. According to this hypothesis, individuals having relatively precise L1 phonetic categories will be better able to discern phonetic differences between an L2 sound and the closest L1 sound. This will increase their likelihood of forming new phonetic categories for L2 sounds and thus becoming nativelike in the L2. In other words, individuals whose L1 speech is clear and precise (i.e., comprehensible) are likely to attain a high level of L2 proficiency [26]. There is, in theory, another possibility that higher L2 proficiency makes L1 speech more comprehensible, but no current models of L2 speech acquisition provide a plausible explanation for why this would be the case.

One caveat with the obtained results, however, is that the overall magnitude of the effects of L2 proficiency on nativelikeness or comprehensibility was not that large. Specifically, the estimate of the effect of *Ntv* (which itself ranged from 1 to 10) on *Acc* was 0.273, meaning that the predicted difference between the least and most accented speakers is less than 3 on a scale of 0 to 100. Likewise, the estimated effect of *Ntv* on *Cmp* was 0.477, meaning that the predicted difference between the least and most accented speakers is less than 5. Thus, while both effects were statistically significant, it must be kept in mind that the differences were only subtle.

The results of the current study are admittedly preliminary, and more can be done to extend the findings. For example, since the L1 Japanese speakers show some degree of variation in their age of learning (AOL) and length of residence (LOR) in an English-speaking country, these factors can be additionally examined. Of particular importance is AOL, as early, late, and very late bilinguals may show different patterns of L1 phonetic drift [5]. Testing more L1 Japanese listeners would help to consolidate the obtained results, while at the same time, a stricter control of the listeners' language learning background would be desirable because it can affect the evaluation of L1 accented speech [27].

Another important avenue for future research is to identify what kind of segmental characteristics contribute to the overall perceived accentedness and comprehensibility of the L1 Japanese speech. As mentioned earlier, previous studies on L1 phonetic drift have tended to focus on the acoustic-phonetic aspect of it, and its relevance to communicative dimensions is still unclear. Previous studies on segmentally manipulated L2 speech have also found non-uniform effects of different vowels and consonants on perceived accentedness and intelligibility [28, 29], which would most likely apply to L1 accentedness and comprehensibility as well. Further investigation of the corpus data in relation to the obtained accentedness and comprehensibility scores may help shed further light on this matter.

5. ACKNOWLEDGMENTS

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