The influence of intelligibility, comprehensibility and degree of foreign accent in evaluating and categorizing non-native pronunciation errors

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Keywords: non-native accent, pronunciation errors, speech perception, error assessment.

1. OBJECTIVE

Characterizing a foreign realization as mispronounced depends on several factors, such as the degree to which the realization deviates from a standard pronunciation model, the phonological implications of the mispronounced sound(s) and finally, the individual tolerance level of non-nativeness by the interlocutor [1]. On the other hand, recent methodological approaches to pronunciation training do not aim at complete native-like proficiency, but focus instead on increasing the intelligibility and comprehensibility of learners [2]. The objective of our experiment was to test the severity of frequent pronunciation errors by Japanese learners of Spanish as a foreign language. A sample of 50 utterances that contained both words with frequent mispronunciations and words correctly pronounced was drawn from a spoken corpus of Japanese-accented Spanish L2 [3].

2. METHOD

Following the studies of [4], we asked 12 participants, native speakers of Castilian Spanish, to judge the intelligibility, comprehensibility and the degree of foreign accent of each utterance. The participants were not experts –phoneticians or language teachers– and reported no knowledge of Japanese. Stimuli were presented to listeners in two conditions: first, the words were presented in isolation and afterwards the same words were presented within the original utterances. Listeners were asked to rate on the three dimensions after each stimulus was heard.

Five types of pronunciation errors were selected according to their frequency of appearance in the corpus and to their different phonological status. Following the distinction proposed in [5], phonemic, phonetic and phonotactic errors were considered. Each group was formed by 5 instances of the mispronunciation uttered by different speakers in different words. In each group, 5 instances of the same words but correctly pronounced, or words which presented the same target sound or sequence of sounds, were included as control items. All the stimuli were extracted from the sentences in which they were uttered and grouped into two categories: isolated words and words in context. In total, 100 stimuli were created. The experiment was build into a web page and conducted on-line using the tool described in [6]. Participants were asked to do the test with headphones, in a quiet environment and without taking any pause between the stimuli. A training phase with 6 stimuli was also included.

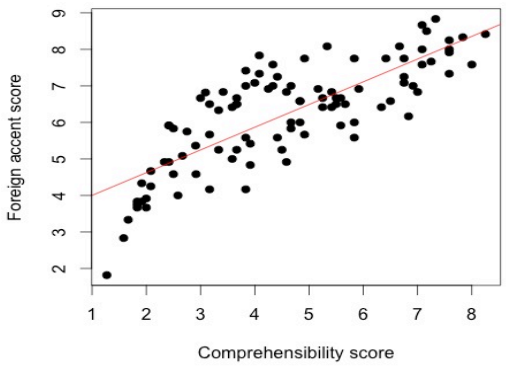
Intelligibility was assessed by asking the participants to write down into a textbox exactly what they perceived; comprehensibility and degree of foreign accent were evaluated using two Likert scales with 9 points (“1” being no accented and clear, and “9” highly accented and difficult to understand). After the first 50 stimuli (isolated words), it followed a pause of 2 minutes and then the second part (words in context) started; the procedure was exactly the same as in part one. Stimuli were randomly ordered and each stimulus could be heard up to three times. Before finishing the experiment, the participants had to fill in a questionnaire regarding the conditions of the experiment. Comprehensibility and foreign accent scores were directly obtained in the experiment. Intelligibility score was calculated afterwards by comparing each target word as transcribed by the participants with the word intended by the foreign speaker. If the target phone matched in both transcriptions, intelligibility was considered “true”; else, it was labelled as “false”, then the ratio of correctly identified words (true) was calculated.

3. RESULTS AND CONCLUSIONS

Comprehensibility and foreign accent scores yield a correlation of 0.65 ($t = 29.63$ $df = 1195$ $p < 0{,}001$), although comprehensibility ($\overline{X} = 6.16$ SD = 2.31) is globally evaluated as more problematic than foreign accent ($\overline{X} = 4.51$ SD = 2.83). These data can be

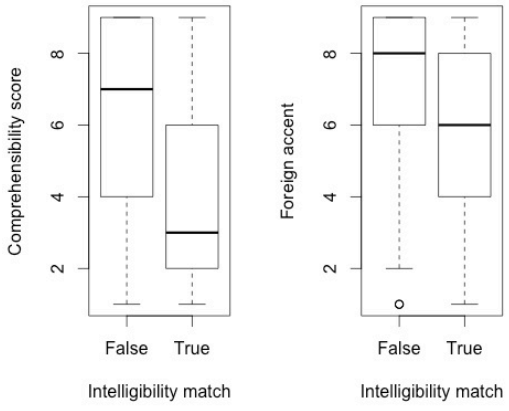
interpreted as follows: stimuli were evaluated with a significantly better score for foreign accent than for comprehensibility; in addition, as the degree of foreign accent increases, the comprehensibility decreases, as expected (Figure 1).

Figure 1: Correlation between foreign accent and comprehensibility



Intelligibility shows a significant relationship with comprehensibility (F = 277 df = 1 p < 0.001) and with foreign accent scores (F = 88.4 df = 1 p < 0.001), correctly identified words were globally evaluated as being less accented and more understandable (Figure 2), intelligibility ratio is higher for the control items (.84) than for the mispronounced items (.59); which suggests that the utterances tagged as mispronounced in the non-native speech corpus from which the stimuli for this experiment were obtained are more difficult to identify than the ones tagged as correctly pronounced.

Figure 2: Comprehensibility and foreign accent score according to intelligibility



As we expected, the presence of the context affected positively the comprehensibility score (F = 65.08 df = 1 p < 0.001) and the intelligibility ratio (χ^2 = 103.66 df = 1 p < 0.001) but not the foreign accent score (F = 0.41 df = 1 p > 0.05), which implies that for the same stimuli, the evaluation was consistent between isolated and in context conditions (Figure 3).

Figure 3: Comprehensibility and foreign accent score means according to the type of item

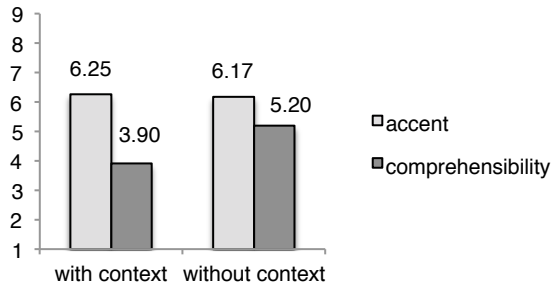


Table 1: Means for mispronounced stimuli (isolated and in-context) sorted by error type

Error type	Foreign accent	Comprehen sibility	Intelligibility ratio
c. (syllabic)	7.66	5.81	.50
a. (phonemic)	6.88	5.66	.38
e. (phonetic)	6.44	4.78	.66
b. (phonemic)	6.30	4.50	.76
d. (phonetic)	6.00	4.14	.66
TOTAL	**6.66**	**4.98**	**.59**

We found a significant difference for the comprehensibility (F = 8.726 df = 4 p < 0.001), the foreign accent degree (F = 12.83 df = 4 p < 0.001) and the intelligibility (χ^2 = 32.72 df = 4 p < 0.001) according to the type of error. Particularly, error type "c" (vowel epenthesis) produced the worst rates for comprehensibility and foreign accent, followed by the confusion in the contrast between [ɾ] and [l] (type "a", phonemic error). Phonetic errors seem to be the less problematic for native participants, since type "e" (substitution of [x]) and type "d" (substitution of [r]) errors obtained the better rates (Table 1). Vowel epenthesis originates when the learner must produce a combination of sounds that is not allowed by the phonotactic rules of the L1; therefore, the added vocalic element alters the word's syllabic structure and, consequently, its phonological representation, reducing drastically the cues for identifying the target word. Classical contrastive analyses have not usually considered phonotactic rules, but have focused instead on establishing a mapping between L1 and L2 phonemic categories. In light of the results, we stress the need for reconsidering pronunciation error analysis, taking into account not only phonemic contrasts but also phonetic ones and, especially, dissimilarities at the phonotactic level between the target and the source languages.

4. REFERENCES

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