REVISITING INTELLIGIBILITY: THE ROLE OF LISTENERS' L1 AND PROFICIENCY IN PERCEIVING CHINESE EFL LEARNERS' SPEECH

Yating Cao[1,2] Hua Chen[1]

[1]Nanjing University [2]University of Warwick
yatingcao@smail.nju.edu.cn; chenhua@nju.edu.cn

ABSTRACT

This study examines how listeners' first language and English proficiency level affect the intelligibility of Chinese EFL learners' oral production. Native English speakers, intermediate-level Chinese EFL learners, and high-level Chinese EFL learners dictated 18 sentences, which were analyzed through both form- and meaning-based understanding and interview. Results showed that the accuracy of both form- and meaning-based comprehension by the intermediate-level Chinese EFL listeners was significantly lower than that of high-level Chinese EFL listeners and native English speakers, but there was no significant difference between the latter two groups. Further, the type and position of segmental features and stressed information were crucial for all the three groups; speech rate had a complex relationship with intelligibility and significantly affected intermediate-level Chinese EFL learners; However, native English listeners were more sensitive to tone. The findings will offer insights into teaching English pronunciation and improving the communicative ability of L2 learners.

Keywords: intelligibility, L1 background, English proficiency level

1. INTRODUCTION

As English has been used as a Lingua Franca, communication between non-native speakers has become more frequent [1] and non-native speakers could reach mutual intelligibility even with a perceptible foreign accent [2]. Therefore, the traditionally-advocated nativeness principle has been shifted to the intelligibility principle, which sets more realistic teaching and learning goals and prioritizes mutual intelligibility [3].

[4] conceptualized intelligibility as *accentedness*, *comprehensibility,* and *intelligibility*, referring to the degree of deviation from specific phonetic standards, the perceived degree of difficulty of understanding speech, and the actual understanding of utterances, respectively. Studies have established that accented speech does not necessarily lower intelligibility, but there is still dispute over which characteristics and how they affect intelligibility [5-6]. [2] proposed the Lingua Franca Core model, which listed some segmental features as the priority to maintain mutual

intelligibility. Other research found that prosody, such as stress [7-8], tone choices [9], and speech rate [10], is also essential to intelligibility. Furthermore, recent studies have begun to examine the contribution of various linguistic features to intelligibility using similar methods [e.g., 5-6, 11]. Speakers were asked to deliver an impromptu speech describing an eight-frame image, and then their speeches were evaluated by listeners to further investigate which linguistic characteristics were associated with accentedness and comprehensibility, respectively.

The listener factor is also critical to intelligibility [12]. Interlanguage Speech Intelligibility Benefit Hypothesis (ISIB) developed by [13] believed that L2 listeners have an advantage in understanding speech by speakers sharing the same language background, which has gained empirical support from quantitative [14] and qualitative analyses [6, 11].

However, there are still some gaps to fill. First, more studies on the role of the listener factor are called. On the one hand, previous research has primarily depended on the perceptions of native English speakers, which is inconsistent with the fact that non-natives constitute the bulk of international communication. On the other hand, results regarding the ISIB hypothesis that whether listeners and speakers sharing the same L1 have advantages in understanding are conflicting [15]. It is assumed that the function of proficiency level accounts for this inconsistency [16]. [17] reported that only the low-proficient listeners recognized low-proficient accented speech better than native English speakers did when speakers and listeners shared the same first language. However, this aspect has not received due attention [18].

Second, research should reconsider the methods concerning measuring intelligibility. The research conducted by the Trofimovich team [5-6, 11] equated *comprehensibility* and *intelligibility* by using the self-reported difficulty of comprehending L2 speech, disregarding whether listeners understood the speech or not. Further, previous studies have frequently adopted the traditional word-by-word transcription to calculate the accuracy [e.g., 19, 20]. In fact, this method is more likely to emphasize listeners' form-based comprehension, and more importantly, the large proportion of function words included in the analysis plays a limited role in meaning construction [21]. In contrast, fewer studies have used idea-unit as

a standard to examine meaning-based comprehension. Such method could evaluate listeners' understanding of the key information of utterances to better examine intelligibility-related features [22]. Therefore, it is necessary to combine both form-based and meaning-based comprehension to better reflect the concept of intelligibility. Besides, this line of research usually adopts the quantitative analysis, while the qualitative evidence of how listeners perceive L2 speech and their feelings is limited, which is called for more studies [6, 11].

Therefore, this study attempts to investigate the role of both listeners' L1 and English proficiency level in the intelligibility of Chinese EFL learners' accented speech to further testify the ISIB hypothesis. Also, combining both quantitative data from form- and meaning-based comprehension and qualitative interview data will advance the understanding of speech intelligibility.

2. METHODS

2.1. Data source

60 online audio clips of English public speech given by Chinese college students were selected as the candidate data source. All of these speeches were persuasive speech [23], and topics including culture, sports, and education and others related to college life. Three experts in L2 phonetic acquisition and spoken English teaching were invited to rate the accentedness and comprehensibility via a 100-point scale (1=very accented/very difficult to understand, 100 = no accent/very easy to understand). And the inter-rater reliability indicated that expert raters achieved a high degree of agreement (*Accentedness*: Cronbach's α = .821, *Comprehensibility*: Cronbach's α = .834). Then, clips were ranked based on their mean ratings of accentedness and comprehensibility, respectively, with the first 20 marked as less accented/more comprehensible and the last 20 being more accented/ less comprehensible. Taking the two rankings, syntactic structures, prosodic features, and gender balance of each audio clip into account, the current study chose 18 clips as the final data source (7.85s/sentence; 17.87 words/sentence), among which 15 clips matched in terms of their accentedness and comprehensibility ranks, and three clips did not match.

2.2. Listeners

This study included 29 Chinese college students and 10 native English speakers (NS). In particular, Chinese college students were from the same university and comprised 17 high-level English learners (HL) and 12 intermediate-level English learners (IL). The HL group was either senior English majors or had excelled in English speech contests at the national level. Also, they received high scores on standardized English tests (TOEFL: $M = 114.4$, $SD = 1.41$; IELTS: $M =7.7$, $SD = 0.27$). By contrast, the IL group were freshman non-English majors. They were classified as intermediate level in the university displacement test, and had no prior experience with public speech contests nor taking any standardized English tests before. For the NS group, they were all international exchange students (from UK) of the same university. They lived in China for only one month when the experiment was carried out. No hearing or any other health issues were reported.

2.3. Procedure

All the participants were instructed to listen to the 18 audio clips in a random order and write down what they heard with a 30-second break every five clips. Every clip was played four times with a 10-second interval. Before the experiment, participants were shown three identical audio clips that were not included in the analysis to familiarise them with the procedures. This task lasted for 30 minutes.

After the sentence dictation task, 22 listeners were randomly selected to the semi-structured interview (9 HL, 7 IL, 6 NS). The questions included but were not limited to the following:

(1) What's the meaning of this sentence?
(2) What's your biggest difficulty during this task?
(3) Why did you fail to write down this part?

2.4. Analysis

The quantitative analysis includes the accuracy of both form- and meaning-based comprehension. For form-based comprehension, it is the percentage of words correctly transcribed as traditional method did [19, 20]. And meaning-based comprehension refers to the percentage of idea-units correctly written down. [24] believed that idea-unit is related to intonation unit and pause of the speech. Considering the possibility of improper use of pause and/or intonation unit by Chinese EFL learners, the present study also considered the syntactic structure as proposed by [25] when identifying idea-units. In total, 89 idea-units were identified. For instance:

(1) For most ordinary people // the lives of the famous stars // are very mysterious

The above sentence contains 13 words and can be divided into three idea-units. This part of analysis was conducted by the first author and then a Ph.D. student in linguistics analyzed 30% of randomly-selected data. And the Cohen's Kappa value (k=0.85) indicated the high inter-annotator reliability. Then, the between-group comparison was conducted.

For the qualitative analysis, all the interview data were transcribed and then classified according to different linguistic features and reasons mentioned by participants. Then, we analyzed the impact of certain phonetic features on intelligibility and the effects of listener factors.

3. RESULTS AND DISCUSSION

3.1. The effect of listener factors on the form and-meaning-based comprehension

It can be seen in Table 1 that the form-based comprehension accuracy of the three groups exceeded 70%, among which the HL and NS groups reached 93%, and the meaning-based comprehension accuracy exceeded 70%. It suggested that the overall intelligibility of Chinese EFL learners' speech is acceptable, corroborating [20]'s findings. Moreover, the one-way ANOVA test found that the group had a significant main effect ($F_{form}(2, 701) = 38.88$, $p<.001$; $F_{meaning}(2, 701) = 27.46$, $p<.001$). A further Tukey HSD post-hoc test revealed that the accuracy of two indices of the IL group was significantly lower than that of the HL and NS group ($p<.0001$), but that there was no significant difference between the latter two groups ($p=.963$).

Table 1: The accuracy of form- and meaning-based comprehension.

	HL	IL	NS
Form-based comprehension	93.6 (10.98)	84.02 (17.58)	93.73 (10.95)
Meaning-based comprehension	87.1 (20.25)	74.45 (24.72)	87.62 (17.92)

First, the results revealed that the listeners' first language background did affect the intelligibility of Chinese EFL learners' speech. Regardless of form- or meaning-based comprehension, the accuracy of NS group was higher than the other two Chinese listener groups, which appears to contradict the shared-L1 advantage observed in earlier research [e.g., 6, 11, 13]. The discrepancies in research designs may account for these contradictory outcomes. Specifically, [13] used the phoneme identification task to test intelligibility, and [6, 11] used the subject ratings to explore accentedness and comprehensibility, without tapping into the third aspect of intelligibility (i.e., the actual understanding of utterances). However, the present study focused on listeners' real understanding, which was involved with phoneme identification, spoken word recognition, contextual information, etc. This task placed a greater demand on listeners' linguistic ability. Thus, the interlanguage speech intelligibility benefit might be weakened.

The present study also provided additional evidence for extending the ISIB hypothesis [13] that

listeners' proficiency level was an important factor. Studies like [26] have shown that the more exposure to particular sounds, the higher listeners' sensitivity and general perceptual adaptability would become. In this study, the high-level group had greater exposure to and higher familiarity with English compared with the intermediate-level group, and their language skills were more comprehensive [21]; therefore, they were more likely to perceive the deviated sounds of the examined speech. This might effectively reduce cognitive load and processing difficulty, which results in better comprehension than the IL group.

Besides, the accuracy of form- and meaning-based comprehension was also compared. Results revealed that all the listener groups achieved significantly lower accuracy in meaning-based comprehension, indicating that listeners did not fully understand the core information of the speech even if they could write down the individual words. The findings may be pertinent to the analysis method. Since form-based comprehension analysis took every individual word into account, some function words, which did not convey actual discourse meaning, were also included. Consequently, its proportion was inflated and did not reflect the real comprehension [27]. Another possibility is related to the listening strategy. [19] found that listeners preferred to employ the bottom-up strategy (i.e., from isolated words to discourse meaning) when perceiving accented speech rather than the top-down approach (i.e., from key information and whole discourse meaning to individual words). And this is particularly the case for non-native English speakers [2]. This evidence also shows the advantages and necessity of adopting idea-unit to measure meaning-based comprehension in this line of research.

3.2. The effect of listener factors on the features safeguarding intelligibility

To further find out which and how phonetic features affected different listener groups, the present study combined both quantitative and interview data.

3.2.1. Segmental features

There were only 19 segmental deviations found throughout 18 sentences, taking up 3.6% of all the phonemes. Further analysis showed that listeners had increased difficulty in deviations of vowels contrasts /æ/-/ɑː/, /aɪ/-/ʌ/, /æ/-/e/, /ei/-/æ/, /ʌ/-/ɜː/ and consonant contrasts /θ/-/z/, /k/-/g/, and /l/-/r/, corroborating the findings of prior study on the intelligibility of Chinese EFL learners' speech [19, 20]. Moreover, results also found that listeners relied on the initial syllables to recognize words. That is, listeners might lose the key anchor to search for the mental lexicon when the

phonetic deviation occurs at the initial syllable [28], as listener 23 (IL) said "Sometimes if I can only clearly hear the initial part, I can still guess the meaning, but not vice versa. For example, I heard *pros* first, then I can quickly think of *prosperity*. But for the word *valuable*, the vowel of the initial syllable was very unclear, so I could not search for the word."

The interview data also revealed that more proficient learners might had higher adaptability of the deviated segmental features, which could reduce the processing difficulty and thus improve the intelligibility, as described by listener 6 (HL) that "Even though the speaker did not pronounce *awareness* correctly, I could still understand because the speaker possesses the typical Chinese accent."

3.2.2. Sentence stress

It was found that the stimuli exhibited a typical syllable-timed rhythmic pattern of Chinese EFL learners' speech [19]. Specifically, the speaker in sentence 9 stressed every single word and frequently had a long pause between each word without clear communicative intention. All the listeners considered this sentence as the most difficult one for them to understand. Moreover, listeners reported that they "would rely on the stressed information to predict or organize the discourse; therefore, it is hard to distinguish the major and minor information when speakers emphasized every word" (listener 20, IL).

In fact, the existing literature has shown that sentence stress is vital for speech comprehension, particularly for native English speakers [29]. The present study offers empirical support for the findings from Chinese EFL learners as listeners.

3.2.3. Speech rate

The average speech rate of the current study was 2.17 syllables/s. However, [10] found that the optimal speech rate for accentedness rating was 4.76 syllable/s, and that for comprehensibility rating was 4.23 syllables/s, which was faster than that of current study. Combined with the interview data, it was shown that the IL group was strongly impacted by the fast speech rate, as 15.7% mentioned factors leading to misunderstandings were attributed to speech rate. For instance, listener 25 (IL) said that "I cannot grasp this sentence and it became more difficult to write it down as the speaker spoke faster. So I could only write down what I have heard." Again, the qualitative data triangulated with the quantitative findings that IL group tended to use the bottom-up strategy [2, 19]. Under such situation, the faster speech rate taxed more processing difficulty for them to catch the key information.

Interestingly, the speech rate of sentence 10 was 4.8 syllables/s, which was faster than the average speech rate and the optimal rate found by [10], but the accuracy achieved the ceiling effect. The interview elucidated the reasons, such as "fast yet clear pronunciation" (listener 29, IL), "like a native speaker and I can adapt to that rate quickly" (listener 13, HL), and "maybe a little fast but the pronunciation and stress were perfect to the point" (listener 30, NS). The verbal reports showed the intricate interplay between speech rate and other phonetic features – clear pronunciation and stress served as the basis, and speech rate worked as the further safeguard for intelligibility.

3.2.4. Tone

Despite the fact that 13 out of 18 speakers in the present study overused the falling tone which made the speech monotonous, the quantitative data indicated that such a tone choice did not impair intelligibility. However, results showed that sentence 15 negatively affected native English speakers' understanding, which was also the only sentence where they underperformed than the other two groups. As stated by listener 34 (NS), the tone was "unnatural and abruptly changing", which led to the failure of understanding sentence and speaker's intention.

Such group difference might result from the different sensitivity to tone information. Chinese EFL learners are found to be less sensitive to the intonational changes as influenced by their L1–a tonal language. Moreover, Chinese EFL students are taught intonation through rote memorization, which might influence their production and perception of intonation [30]. Thus, the abrupt changes in tone choices had less negative impact on HL and IL groups.

4. CONCLUSION

This present study extends the ISIB hypothesis by providing empirical evidence of the importance of listeners' proficiency level and offered qualitative data on how certain phonetic features influence listeners' comprehension. Also, the methods of measuring of intelligibility through both form- and meaning-based comprehension merits further research to get a deeper and more valid understanding of intelligibility. Future studies can explore the effects of more linguistic features on intelligibility and include more listeners' and speakers' language backgrounds to advance this line of research.

5. ACKOWNLEDGEMENTS

6. REFERENCES

[1] Crystal, D. 2003. *English as a Global Language (2nd ed)*. Cambridge: Cambridge University Press.

[2] Jenkins, J. 2002. A sociolinguistically based empirically researched pronunciation syllabus for English as an international language. *Applied Linguistics* 23, 83–103.

[3] Levis, J. 2005. Changing contexts and shifting paradigms in pronunciation teaching. *TESOL Quarterly* 39, 369–377.

[4] Munro, M. J., Derwing, T. M. 1995. Foreign accent, comprehensibility, and intelligibility in the speech of second language learners, *Language Learning* 45, 73-97.

[5] Trofimovich, P., Isaacs, T. 2012. Disentangling accent from comprehensibility. *Bilingualism: Language and Cognition* 15, 905-916.

[6] Foote, J.A., Trofimovich, P. 2018. Is it because of my language background? A study of language background influence on comprehensibility judgments. *Canadian Modern Language Review* 74, 253-278.

[7] Hahn, L. 2004. Primary stress and intelligibility: Research to motivate the teaching of supra-segmentals. *TESOL Quarterly* 38, 201–223.

[8] Field, J. 2005. Intelligibility and the listener: The role of lexical stress. *TESOL Quarterly* 39, 399–423.

[9] Pickering, L. 2001. The role of tone choice in improving ITA communication in the classroom. *TESOL Quarterly* 35, 233-255.

[10] Munro, M. J., Derwing, T. M. 2001. Modeling perceptions of the accentedness and comprehensibility of L2 speech the role of speaking rate. *Studies in Second Language Acquisition* 23, 451-468.

[11] Crowther, D., Trofimovich, P., Saito, K., Isaacs, T., 2015. Second language comprehensibility revisited: Investigating the effects of learner background. *TESOL Quarterly* 49, 814-837.

[12] Munro, M J. 2008. Foreign accent and speech intelligibility. In: Hansen, J. G., Zampini, M.L. (eds.). *Phonology and Second Language Acquisition*. Amsterdam: John Benjamins.

[13] Bent, T., Bradlow, A. R. 2003. The interlanguage speech intelligibility benefit. *The Journal of the Acoustical Society of America* 114, 1600-1610.

[14] Kennedy, S., Trofimovich, P., 2008. Intelligibility, comprehensibility, and accentedness of L2 speech: The role of listener experience and semantic context. *Canadian Modern Language Review* 64, 459-489.

[15] Munro, M. J., Derwing, T. M., Morton, S. L. 2006. The mutual intelligibility of L2 speech. *Studies in Second Language Acquisition* 28, 111-131.

[16] Xie, X., Fowler, C. A. 2013. Listening with a foreign-accent: The interlanguage speech intelligibility benefit in Mandarin speakers of English. *Journal of Phonetics* 41, 369-378.

[17] Hayes-Harb, R., Smith, B. L., Bent, T., Bradlow, A. R. 2008. The interlanguage speech intelligibility benefit for native speakers of Mandarin: Production and perception of English word-final voicing contrasts. *Journal of Phonetic* 36, 664-679.

[18] Kang, O., Rubin, D., Kermad, A. The effect of training and rater differences on oral proficiency assessment. *Language Testing* 36, 481-504.

[19] Deterding, D. 2010. ELF-based Pronunciation Teaching in China. *Chinese Journal of Applied Linguistics* 33, 3-15.

[20] Zhang, L. L. 2015. An empirical study on the intelligibility of English spoken by Chinese university students. *Chinese Journal of Applied Linguistics* 38, 36-53.

[21] Field, J. 2008. Bricks or mortar: Which parts of the input does a second language listener rely on? *TESOL Quarterly* 42, 411-432.

[22] Winke, P., Gass, S. 2016. Using free recall and idea units for evaluating second language comprehension: Methodological choices and issues.http://newsmanager.commpartners.com/tesolalis/issues/2016-11-04/5.html.

[23] Lucas, S. E. 2020. *The Art of Public Speaking (13th ed)*. Boston: Mc. Graw Hill.

[24] Chafe, W. L. 1998. The deployment of consciousness in the production of narrative. In: Chafe, W.L. (ed.). *The Pear Stories: Cognitive, Cultural and Linguistic Aspects of Narrative Production*. Norwood. NJ: Ablex.

[25] Kroll, B. 1997. Combining ideas in written and spoken English: A look at subordination and coordination. In: Ochs, E., Bennett, T. (eds.). *Discourse across Time and Space*. Los Angeles: Southern California Occasional Papers in Linguistics, 69-108.

[26] Best, C. 1995. A direct realist view of cross-language speech perception. In: Strange, W. (ed.). *Speech Perception and Linguistic Experience: Issues in Cross-language Research*. Timonium: York Press.

[27] Isaacs, T. 2008. Towards defining a valid assessment criterion of pronunciation proficiency in non-native English-speaking graduate students. *Canadian Modern Language Review* 64, 555-580.

[28] Weber, A., Scharenborg, O. 2012. Models of spoken-word recognition. *Wiley Interdisciplinary Reviews: Cognitive Science* 3, 387-401.

[29] Cutler, A. 2012. *Native Listening: Language Experience and the Recognition of Spoken Words*. Cambridge: MIT Press.

[30] Chen, H., Li, J. 2017. Reflections on the current situation of phonological assessment: A survey among raters of standardized oral tests in China. *Foreign Languages and Their Teaching 5*, 81-87.