

# The Mutual Intelligibility in Phonological and Lexical Aspects Between Shanghainese and Cantonese

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## ABSTRACT

We determined the mutual intelligibility between Shanghainese and Cantonese by isolated word tests (Subjective measure) with the recording of two native speakers in the age range of 31-50. In addition, we assessed the linguistic background of the listeners with questionnaires who are also the test takers. We then examine the dialect words in the recording with objective measures (lexical similarity, phonological correspondence) to understand our conclusion drawn from our results as the mutual intelligibility is low and the intelligibility is asymmetrical.

**Keywords:** *Mutual intelligibility, Shanghainese, Cantonese, Subjective measures, Objective measures*

## 1. INTRODUCTION

### 1.1 Language distance

There are always debates on the question of whether Chinese (including all dialects of Chinese) is a language. If not, how much do two dialects differ? When two language varieties differ only to a slight extent, linguists are inclined to consider them dialects of one language; if the differences are relatively large, the varieties will be classified as manifestations of different languages. "When two dialects varieties differ only by a small amount, the linguistic distance between them is small; linguistic distance increases as dialects differ more radically. On a higher level, the same criterion of linguistic distance can be used to set up family trees (cladistic trees) for groups of (related) languages." [1] Purpose of our research is to test the difference between Cantonese and Shanghainese.

"In spite of its apparent success and conceptual simplicity, the notion of linguistic distance, i.e., the inverse of similarity shared between languages, has persistently eluded quantification. The problem is that languages do not differ along just one dimension. Languages may differ formally in their lexicon, phonetics and phonology, morphology, and in their syntax. And again, at each of these linguistic levels, the ways in which languages may vary are further subdivided along many

different parameters. Linguists have argued about family relationships among languages, and thereby implicitly about linguistic distance, largely on an intuitive basis." [1] Thus, in our research, we test the mutual intelligibility between Shanghainese and Cantonese through many lights such as lexicon and intuition.

In addition, it is not easy to distinguish 'dialect' from 'language'. The concepts of dialect and language involve non-linguistic as well as linguistic factors. Some speech varieties are very similar to each other, but they are defined as different languages (e.g., German versus Dutch), while some speech varieties are quite different but are defined as dialects of the same language (e.g., Mandarin versus Cantonese). [2]

### 1.2 The mutual intelligibility between Shanghainese and Cantonese

"The linguistic wealth of China is a rich diversity of language varieties spoken today. Research on these language varieties has produced significant results that have greatly expanded our knowledge of the origin, the evolution, and the diversity of Chinese languages and their dialects." [2]. "Cantonese has 6 tones, which is different from most Chinese dialects. Shanghainese is rich in vowels and in consonants. Like other Taihu Wu dialects, Shanghainese has voiced initial stop, neither Cantonese or Mandarin has voiced initial stop or affricates. Therefore, the purpose of our research, to a

large extent, is to research the level of mutual intelligibility between Shanghainese and Cantonese.

### ***1.3 Current Status of Shanghainese and Cantonese***

Shanghainese is a northern dialect of the Chinese Wu that is spoken in Shanghai and surrounding areas. It is traditionally believed that, except for other varieties of the Wu Chinese, its intelligibility with other Chinese varieties is low. Its spoken language currently has 14 million speakers, making it the largest single coherent form of Wu Chinese. The phonology of Shanghainese is obviously different from other Chinese varieties, such as, Cantonese or Mandarin which are pronounced without the voiced stops or fricatives in Shanghainese. Some people believe that Shanghainese has only two live tones, while Cantonese and Mandarin are contour tonal languages.

Standard Cantonese is originated from the city of Guangzhou, itself most representative dialect of Yue Chinese (in Cantonese the word for Yue Chinese is usually Cantonese), spoken by more than 80 million people mainly in the Canton provinces, Hongkong and Macau in China with speakers in Chinese communities around the world. It is widely acknowledged that the standard pronunciation is that of Guangzhou. It has a well preserved complex tonal system with 6 distinctive tones and three additional checked tones.

### ***1.4 Government policy on the promotion of Mandarin***

In the past few decades, the government announced several policies to promote the use of Mandarin. Approved by The State Council, the third week of September every year since 1998 is the National Promotion of Putonghua Publicity Week. On January 1<sup>st</sup>, 2001, the Chinese government published the Law of the People's Republic of China on the Standard Spoken and Written Chinese Language. This law announced that the common spoken and written language of the State is Putonghua (Mandarin) and standard Chinese characters.[3] Since then, more people have started to speak Mandarin in their daily life instead of dialects. This could have an influence on the mutual intelligibility between Cantonese speakers and Shanghainese speakers.

## **2. PREPARATION**

### ***2.1 Selection of our participants***

Chinese is the most widely used in China, one billion people speak Mandarin, the most prominent member of the Sino-Tibetan language family and the official language of media, government, and education in the

People's Republic of China and Taiwan. Some 70% of the 1.1 billion citizens of the People's Republic are native speakers, as are some 10% of Taiwan's 20 million citizens, those descended from the mainlanders who retreated to the island with Chiang Kai-shek after the 1949 Communist victory. [4] Thus, to ensure precision of the research design (to predict whether the participants' language usage is influenced by other variations of Chinese), the participants appropriate for our tests are those who have been speaking standard Cantonese or Shanghainese since they were born, that is, Shanghainese and Cantonese are their native tones. In this way, our participants are mostly from Shanghai, Guangdong, Hongkong, or Macao where people usually speak Shanghainese and Cantonese however, possibly with influence of Mandarin and English. Thus, eventually, we found 25 Cantonese and 33 Shanghainese. That way, using data collected from native speakers could, to a large extent, eliminate the effect from Mandarin.

### ***2.2 The choice of the word***

We refer to the method used by Tang and Heuven. We prepared 40 words in both Shanghainese and Cantonese versions. As Tang and Heuven did, the isolated words are high in frequency for daily usages which are organized into 8 categories. The words all indicate basic concepts commonly used and thus their counterparts are presumed to be used in each of our 2 target Chinese varieties. We rejected words with the same morphemes in Mandarin Chinese, to eliminate the priming effect. [1]

### ***2.3 Sound recording***

Two speakers were recorded, both of them are male. One's native tone is Shanghainese and the other's native tone is Cantonese. We asked them to articulate 40 words in their dialects. The intelligibility tests fundamentally practice the word recognition ability of the participants. In word recognition tests participants should not be exposed to the same word (or morpheme) twice. A word that is heard more than once within a day is easier to be recognized than those heard once only (e.g., Morton, 1969 [5]). In order to prevent such priming effects, the stimulus words have to be blocked over listeners, such that each listener hears each word only once, regardless of the diversity between the speakers. [1]

### ***2.4 Answer sheets and introduction***

For each recording, we have a corresponding answer sheet prepared for our participants. They were required to categorize the 40 words into 10 semantic categories. The ten categories will be listed for the participants to select under each of 40 questions. There are 40 multiple choice questions for each word. Each choice stands for one category. The Participant is asked to choose the right category right after they listens to the sound of the word.

[1] We prepared an introduction for the test to every participant. The introduction, briefly speaking, is that recording of each word is going to play once, and there will be 3 seconds for our participants to answer the question, besides, there will be another 2 seconds before each question. As Tang and Heuven says in their paper [1], an inevitable problem arises in the context of functional intelligibility tests is that the same listener cannot recognize the same word twice, even if the target word is translated into other related languages the second time.

## 2.5 Scoring system

If our participant chooses one question correctly, he will get one point for each word. And the total mark for the test is 40 points. Then, we researchers will turn their marks into their correct ratio.

## 3. METHODOLOGY

The experiment is split into two parts: the linguistics background investigation of the participants and a test on their ability to understand Shanghainese or Cantonese. The results collected from both the questionnaire and the test are first analyzed independently and then together.

### 3.1 Questionnaire

Before the test, all participants were required to do a questionnaire asking their linguistics background information. The questionnaire contains 15 questions, asking the participants' self-evaluation. There are two versions of the test, one is for native Shanghainese speakers and the other is for native Cantonese speakers.

According to Tang and Heuven's research paper in 2007 [6], opinion testing "has been advanced as a short-cut" when compared to functional testing. The results gained from the questionnaire is the participants' self-appraisal on their ability to understand Shanghainese, Cantonese, and mandarin. The indices derived from the survey can then be used to predict the performance of the participants in the comprehension test and compared to the results of it. Overall, this is an economical test that gains valuable information in a short period of time.

The questions in the questionnaire can be categorized into four categories: the personal details of participants (name, age), their ability of understanding their first dialect, their ability of understanding Mandarin and their preference over dialects and Mandarin, and their ability of understanding the other dialect in the experiment.

- **Personal details questions:**

The first three questions are all about the personal details of the participants. In question 2, participants are asked to choose a choice of age range that their age belongs in. In question 3, the participants

1. What's your name?
2. What's your gender?
3. What's your age?

- **Ability of understanding Shanghainese/ Cantonese.**

1. When did you start speaking Shanghainese/ Cantonese?
2. How much do you score on your ability of speaking Shanghainese/ Cantonese from 1-10?
3. How much do you score on your ability to listen to Shanghainese/ Cantonese from 1-10?
4. How many family members of yours speak Shanghainese/ Cantonese?
5. How often do you communicate with your family members in Shanghainese/ Cantonese? Rate from 1-10.
6. How often do you use Shanghainese/ Cantonese when you work? Rate from 1-10.

- **Ability of understanding Mandarin and preference**

1. Which one do you prefer, Mandarin or Shanghainese/ Cantonese?
2. How much do you score on your ability of speaking Mandarin from 1-10?
3. How much do you score on your ability to listen to Mandarin from 1-10?

- **Preference over Mandarin and Shanghainese/Cantonese**

1. How many family members of yours speak Cantonese/ Shanghainese?
2. How much do you rate on your ability of Cantonese/ Shanghainese from 1-10?
3. How much do you rate on your ability to listen to Cantonese/ Shanghainese from 1-10?

### 3.2 Isolated Word Test

After doing the questionnaire, the participants were required to listen to a recording and answer the questions in the test simultaneously. The native Shanghainese speakers were assigned with a Cantonese recording, and the native Cantonese speakers were assigned with a Shanghainese recording. After participants hear a word, they can pause the audio, and choose which category the word belongs to.

### 3.2.1 Recording

The two speakers of the recordings were male native speakers who aged between 31-50. Each recording includes 40 different words from 8 different categories.

### 3.2.2 Choices

The choices for each question include the eight categories listed above and “don’t know”.

## 4. RESULTS

In total, we received 26 responses for the isolated word tests and 59 responses for the surveys of subjects’ linguistic background. The dependent variable in the isolated word test is the level of intelligibility between Cantonese and Shanghaiese, and the independent variable is the mutual intelligibility of lexical and phonological aspects between Shanghaiese and Cantonese. We sent the subjects tapes of either Shanghaiese or Cantonese recordings according to listeners’ native tones, and each tape consists of 50 randomly chosen words of different categories from Tang and Heuven’s list of words in their research paper in 2009. We calculated a mean percentage of correct answers for every subject, which yielded 26 results.

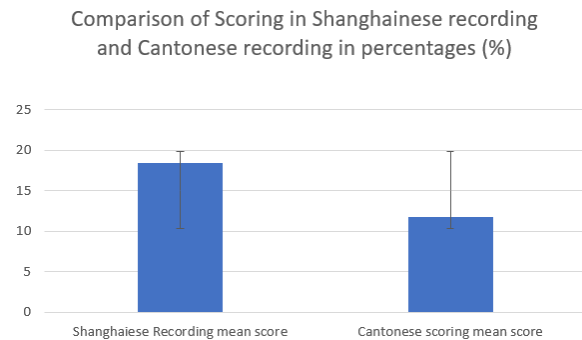
For the opinion tests (surveys), we sent subjects online surveys according to their native tones, and the questions were rather straightforward, mostly asking their ability to speak and listen to another variety. We have asked subjects to self-evaluate their abilities to speak another variety on a scale from 1-10 to see if they are familiar with the test language, and we also checked their linguistic background to make sure they are sufficient readers and listeners of their own native tones.

We will first present an analysis of isolated word test results (Section 3.1) and then introduce the results of the opinion tests.

### 4.1. Isolated-word-intelligibility test

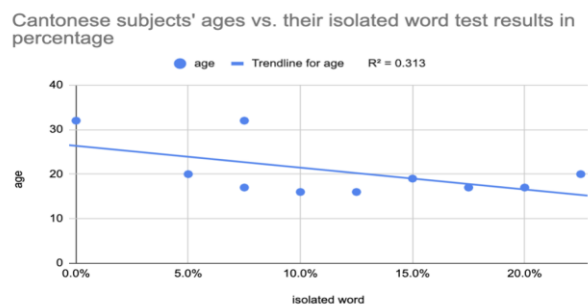
Table 1 showcases the percentage of correctly classified words for each participant who listened to Shanghaiese and Table 2 showcases the scores for who listened to Cantonese in percentage. We expect to observe an asymmetry between the intelligibility of Shanghaiese and Cantonese, and their mutual intelligibility is predicted to be low according to the objective measures, such as the phonological correspondence indices and the lexical similarity indices[7]. Also, we have assumed that older subjects tend to score higher than younger ones, because they were exposed to more occasions and people. We do observe an asymmetry happening between the intelligibility between Cantonese and Shanghaiese, and Shanghaiese score higher when listening to Cantonese

tape than vice versa. However, we failed to discover any correlations between age and scores. The mean percentage of Shanghaiese scores when listening to Cantonese tape is 18.4%, which is significantly higher than that of Cantonese—11.8%. The max value obtained by Shanghaiese (40%) is also substantially higher than that of Cantonese (22.5%), while their minimum values are the same—0%. The reason why Shanghaiese can comprehend Cantonese a lot is assumed to be the prosperous Hong Kong entertainment industries since the end of the last century. Many Asians, even foreigners, were exposed to Cantonese cultures and varieties when watching the films and listening to the music. We generated two linear regression graphs for the correlation between subjects’ ages and their test results, and the closer  $R^2$  value is to 1, the more correlated two data sets are to each other. The Cantonese group’s  $R^2$  value is 0.313, and that of the Shanghaiese group is 0.082, both of which are far from 1. Thus, there is no correlation between age and intelligibility.

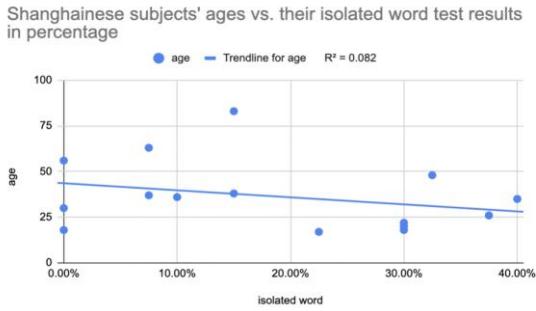


**Figure.1** Mean Scoring for Shanghaiese Recording (Cantonese Listeners) in Percentages with Standard Deviation

We had 16 participants Cantonese listeners to listen to Shanghaiese Recording and 10 Shanghaiese Listeners for Cantonese Recording. Mann-Whitney U test was conducted, and the results are proven to be significant to accept the alternative hypothesis: There is a differences in scorings for results from ‘Shanghaiese recording’ and results from ‘Cantonese recording’.



**Figure.2** Cantonese Subjects’ Ages Against Their Isolated Word Test Results in Percentage

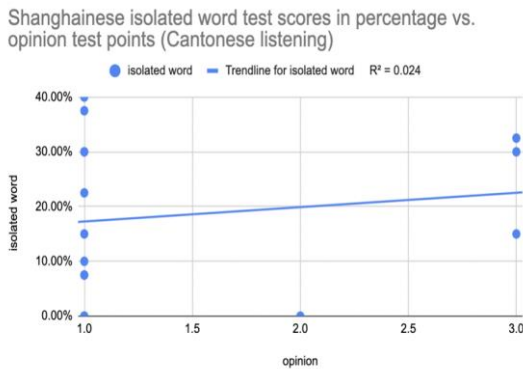


**Figure.3** Shanghai Subject’s Ages Against Their Isolated Word Test Results in Percentage

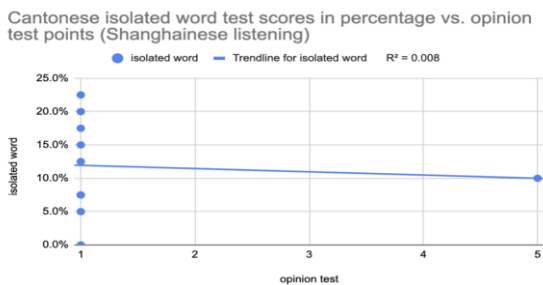
**4.2 Opinion test**

Figure 1 and Figure 2 shows that there is barely any correlation between opinion test results and functional test results. The two graphs below are two linear regression graphs, and the closer R<sup>2</sup> is to 1, the more correlated the two kinds of test results are to each other. Unfortunately, in our research, the R<sup>2</sup> value of the Cantonese group is 0.002, and that of Shanghai is 0.024, both of which are far from 1. Tang and Heuven’s research[2] showed that the opinion test is an efficient shortcut to discover the mutual intelligibility between Chinese dialects, whereas it is not so in our research.

**Figure 3** Shanghai Isolated Word Test Scores in Percentage Against Opinion Test Points (Cantonese Recording)



**Figure.4** Cantonese participants’ Isolated Word Test Scores in Percentage Against Opinion Test Points (Shanghai Recording)



**Figure.5** Shanghai participant’s Isolated Word Test Scores in Percentage Against Opinion Test Points (Cantonese Recording)

**5. DISCUSSION**

**5.1 The relation between subjective measures and objective measures**

To understand the low intelligibility and the asymmetrical intelligibility results further, we analyzed both lexical and phonological features of the isolated words in Shanghai, Cantonese, and Mandarin, compared to the scores we collected.

In terms of lexicons of the words, the speakers’ choice consisted of three levels of differences:

- (1) They used words with the same Chinese writings (the majority of words).
- (2) At least one character in the words was in the same character.
- (3) No character was the same.

A general trend is observed: The bigger the lexical differences, the lower the intelligibility scoring with the words for “lightning” and “grape” (Both first level words) as two exceptions. On a more generic level, the overall lexical differences are low, still, the overall intelligibility is low.

We reviewed the recording to adjust the standard pronunciation as a source for our phonology measures. Three perspectives were taken into consideration. The tone/pitch variations, the consonants, and the vowels which we represented with IPA. (Only the words with the same Chinese Characters were compared at the phonological level.).

In terms of the tonal variations, we utilized not only the five-tone letters but also the traditional tonal system of Chinese which in total includes 8 major tones. There are no corresponding tones with the same character words between Shanghai and Cantonese where Shanghai has more tonal variations in individual characters and is generally higher in pitch.

Significantly, the place of articulation of the same-character words are similar where Shanghai words have voiced consonants (/d/ and /g/) to correspond with the unvoiced consonants /t/ and /k/ respectively. Shanghai words also have more closed vowels than Cantonese. Finally, the words we used in the final experiment are all high in frequency and with no repetitive morphemes. However, they are limited in number.

**5.2 Influence of varieties of Chinese**

Most of our participants are not monolingual. The asymmetry scoring can be explained by the closer phonological relationship between Cantonese and Mandarin than Shanghai and the wide-spreading Hongkong culture. Cantonese words have corresponding

tonal variations with Mandarin Chinese words in terms of the rising and falling of pitch. Whenever Mandarin readings have a rising tone, the Cantonese readings are rising. The flat tones are also reoccurring in both varieties. The only exception is that when the Mandarin is a falling tone the words in Cantonese are flat. This symmetrical tonal variation could be predicted by the Shanghainese listeners as they gradually gain exposure to Cantonese.

### ***5.3 Difference in literary and colloquial readings of Chinese characters***

Nevertheless, the low scoring reveals the fact that there is little lexical influence from Mandarin Chinese in our test with most words having the same characters in Mandarin, Cantonese, and Shanghainese. The difference in literary and colloquial readings of Chinese characters is a phenomenon in Chinese varieties, the former historically is used to read formal scripts in Mandarin the latter in quotidian conversations. As the script for the speakers to read was shown in Mandarin Chinese, we maximize the possibility of speakers using colloquial readings of the isolated words, by identifying the literary reading after their first recording and kindly ask them to change to colloquial expressions.

### ***5.4 Assessing the reliability and validity of isolated word test***

#### ***5.4.1 Influence of Part of speech***

One thing to notice is that the percentage of correctness on words categorized as Orientation in Time and Space is mutually the lowest as they are not the primary parts of speech in Chinese sentences. One other explanation could be that they are mostly monosyllabic words which leaves a shorter reaction time for the participants, however, the scoring percentage on one-character, two-character, and three-character words are similar.

#### ***5.4.2 Replication of the previous test***

Comparing the results in Tang and Heuven's Isolated word classification intelligibility test, we replicated their outcomes to a certain extent. They did not have Shanghainese listeners, however, two other cities (Wenzhou and Suzhou) where the Wu dialect of Chinese is spoken. We replicated the Wu listeners listening to Cantonese (Our participants were Standard Cantonese speakers from different cities of Guangdong and Shanghainese speakers from Shanghai.) for which they have Wenzhou listeners to Guangzhou speakers with the correctness of 18%. In addition, for both varieties mutually, their and our scoring are both very low. However, we have a more significant asymmetry of Shanghainese listeners scoring higher. Admittedly, to

have more representative results, a greater number of words and a greater number of participants are required.

## **6. CONCLUSION**

### ***6.1 Limitation analysis on the results***

There are two possible factors: the first one is the limited sample size, potentially yielding inaccurate results, and the other is our way of conducting the opinion test survey. Tang and Heuven might have taken a more accurate and advanced kind of opinion test than we did, yielding reliable results. Thus, the opinion test in our research is not correlated with the functional test, so it could not be a sufficient shortcut for the results.

### ***6.2 Conclusions***

A few conclusions can be drawn from the results of both the questionnaire and the categorizing test. Firstly, the mutual intelligibility of Shanghainese and Cantonese is low. Secondly, there is an asymmetry of their intelligibility: Shanghainese scored higher averages when listening to Cantonese than vice versa. Thirdly, the Isolated word categorizing tests are reliable and valid to study the mutual intelligibility between Wu and Yue dialects of Chinese. Comparing the information from the questionnaire and results of the experiment parallelly we identified no significant issues affecting results on this test design. Fourthly, there are no apparent correlations so far between genders and scores or age groups and scores.

### ***6.3 Suggestions for further study***

Firstly, more participants can be sampled, especially the more elderly participants who have less exposure to Mandarin Chinese or other varieties of Chinese. Secondly, the tonal variations of Chinese varieties are speculated to play an important role in intelligibility which awaits to be examined using objective measures in further studies.

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