

# CAN DEGREE OF BILINGUALISM HELP SUSTAIN A DIFFICULT SOUND? —USING TAIWAN MANDARIN /z/ AS AN EXAMPLE

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## ABSTRACT

This study examined how degree of bilingualism modulates /z/ realization among Mandarin-Min bilinguals in Taiwan. Mandarin has a voiced fricative /z/ while Min has a voiced fricative /z/. Twenty speakers performed a word reading and a question-and-answer task. Results showed that four major variants were found for /z/ realization, the canonical [z], and the variants [ɹ], [z], and [l]. Degree of bilingualism measured by self-rated Min proficiency and frequency of use showed a gender-dependent effect on the realization of [z]. Female speakers demonstrated a negative effect of Min proficiency, but a positive effect of Min frequency of use, while male speakers only showed a negative yet non-significant trend for both indicators. The result is partially in line with the Structural Similarity Theory and implies that degree of bilingualism may help sustain a difficult sound among females with mid-level proficiency for the other language, but use it on a regular basis.

**Keywords:** voiced fricative, degree of bilingualism, language proficiency, frequency of use, Mandarin-Min bilinguals

## 1. INTRODUCTION

Bilinguals are people who have two linguistic systems coexistent in their mind. How these two systems interact is a central issue in human cognition that has mesmerized researchers for decades. Previous studies have shown that the two phonological systems in early bilinguals are kept distinct to a large extent. For instance, Canadian English-French bilinguals are capable of maintaining separate realizations for coronals and high vowels in their two languages [13, 15]. Similarly, Spanish-Catalan bilinguals were found to maintain the Catalan /e/-/ɛ/ distinction nonexistent in Spanish [3]. However, this does not imply that the two languages never interact. Oftentimes the distinctions

maintained by bilinguals are not as separate as their monolingual counterparts [13, 15], and the first-acquired language still show some advantage even among early bilinguals [3]. Based on these studies, one could conclude that the two phonological systems of early bilinguals are both autonomous and interdependent.

Maintaining two phonological systems in one mind renders the speaker with some metalinguistic advantages. According to the Structural Sensitivity Theory [10], bilingual children are more sensitive to structural similarities and differences in their two languages than their monolingual counterparts, and are thus more capable of forming representations at an abstract level. This study thus intends to examine whether adult early bilinguals could also make use of this metalinguistic advantage when maintaining their two phonological systems by looking at Mandarin-Min bilinguals in Taiwan. Taiwan is a country of multi-languages. Mandarin is its official language, while Min is its major substrate, with about 70% of the population having at least some knowledge of Min [8]. Both languages incorporate a voiced fricative in their phonological inventory, with Mandarin having a retroflex /z/ and Min having a dental /z/. As voiced fricatives are articulatorily challenging [14], it is not surprising to find that both languages show much variation for this sound category. There are at least three to five major variants observed for Mandarin /z/, i.e., [z], [ɹ], [l], [z], and [n] [4, 7, 9], and four to five variants for Min /z/, i.e., [z], [g], [l], [d], and [ɹ] [1, 5, 6]. This study only focused on realizations for the former. For Mandarin /z/, although [z] is considered canonical, [ɹ], [l], and [z] are often found to be common, if not more common, variants. Of the three, [l] and [z] are traditionally attributed to Min influence, as Min does not have any retroflex in its inventory, and suffer negative connotation [4, 9]. Style and lexical specificity also play a role in the realization of /z/ [4, 7]. [z] occurs more often in spontaneous speech while [n] has a high occurrence rate for certain words.

## 2. SPECIFIC AIM

The specific aim in this study is to examine whether degree of bilingualism would help sustain an articulatorily challenging sound like Mandarin /z/. Previous studies have shown that bilingual children have better phonological awareness than their monolingual counterparts [11]. This implies that even though voiced fricatives are in general difficult to sustain [14], being a Mandarin-Min bilingual might have an advantage to counteract this articulatory difficulty, as s/he receives double exposure from both languages. However, it is also not uncommon in the Mandarin literature to find researchers attributing deretroflexion of /z/ to (negative) influence from Min, e.g. [4, 9]. Although most of the observations could probably be explained away by influences from late L2 learners instead of genuine early bilingualism, it is still worth investigating whether Mandarin-Min bilinguals represent a special case of early bilinguals who merge the two phonological systems (cf. [3, 13, 15]).

## 3. METHOD

### 3.1. Participants

Twenty Mandarin-Min early bilinguals (10 males and 10 females), aged from 18 to 25, were recruited. All spoke Mandarin and Min fluently. Their Min proficiency was assessed by both a short tailor-made verbal test and self-ratings on 7-point Likert scales on Min proficiency and frequency of use. The verbal test and the Min proficiency ratings correlated well.

### 3.2. Stimuli and procedure

Five Mandarin /z/-initial bisyllabic words were selected as stimuli. There were two elicitation conditions: wordlist reading (henceforth WR) and question-and-answer (henceforth QA). All stimuli appeared in both contexts. In the WR condition, participants were asked to read the words off a computer screen in a natural manner. In the QA condition, the experimenter asked the participants prompt questions to elicit the response of the target words. For example, the stimulus *ranfa* /ʐan.fa/ ‘to dye hair’ was elicited by prompt questions such as “what do you call the action of changing the color of your hair?”.

### 3.3. Data analyses

Each Mandarin /z/ token was independently transcribed by both authors, who were phonetically-trained Mandarin-Min early bilinguals, and were later corroborated with acoustic measurements of center of gravity [12].

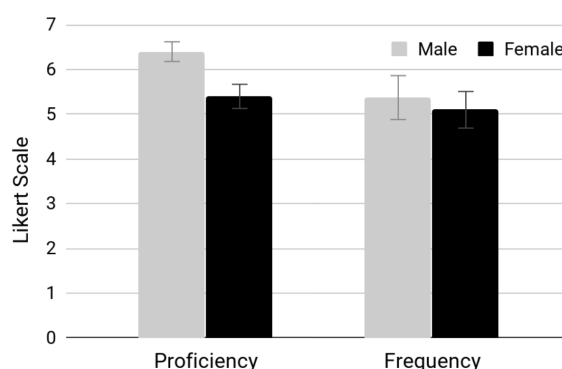
Degree of bilingualism for each speaker was determined by Min self-ratings. Since Mandarin is the official language in Taiwan, all speakers use Mandarin fluently on a daily basis. On the other hand, Min is mostly limited to family or informal settings. As a result, speakers’ degree of bilingualism is dependent on their Min familiarity, which is in turn dependent on their social circles. Those who have frequent contact with their family of origin would tend to be more familiar with Min than those who do not.

## 4. RESULTS

### 4.1. Min familiarity

Figure 1 shows the mean ratings for Min proficiency and frequency of use. Males were in general more proficient than females [ $t(18) = 2.89, p < .01$ ], but the two genders did not differ significantly in their frequency of use [ $t(18) = .43, ns.$ ]. Despite rating differences, all speakers rated themselves as 4 or above on Min proficiency, which is considered as above average among young Mandarin-Min bilinguals in Taiwan.

**Figure 1:** Min proficiency and frequency of use. Error bars are standard errors.



### 4.2. Realization of /z/

There were in total 29 different variants observed for /z/ realization, which could be broadly categorized along two dimensions, [ $\pm$ retroflexion] and [ $\pm$ frication]. As shown in Table 1, [ $+$ retroflexion]

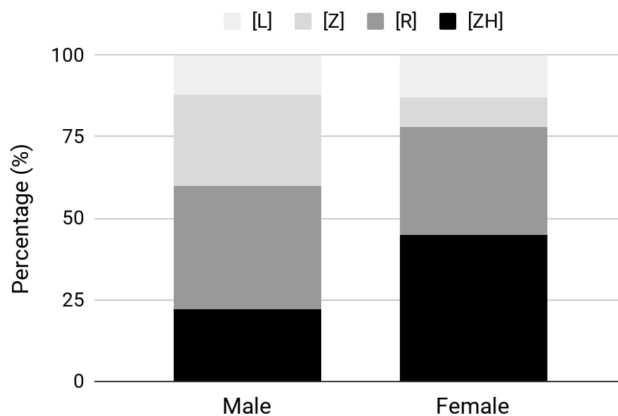
seems to be a more important feature than [+frication] [ $\chi^2(3) = 30.48, p < .0001$ ]. [ɹ] and [z] are the two most frequent variants, accounting for 31.5% and 22%, respectively.

**Table 1:** Frequency distribution of /z/. Two most frequent variants are shown for each category. The dominant ones are in bold.

	[+retroflexion]	[-retroflexion]
[+frication]	67: [ <b>ʒ</b> , <b>ʒ̥</b> ]	37: [ <b>z</b> $\delta$ ]
[-frication]	71: [ <b>ɹ</b> <sup>n</sup> , <b>ɹ̥</b> ]	25: [ <b>l</b> <b>n</b> ]

There is a gender-dependent preference in realization choices, as shown in Figure 2 [ $\chi^2(3) = 18.04, p < .001$ ]. Males were more likely to use sounds that have only one defining feature of /z/, either nonfricative retroflexes like [ɹ] (henceforth [R]) or fricative nonretroflexes like [z] (henceforth [Z]). The canonical form of retroflex fricatives (henceforth [ZH]) were not as preferred. On the other hand, females were advocates of retroflex variants, [ZH] and [R]. [Z] was not their preferred choice. Both genders did not use nonretroflex nonfricative sounds (henceforth [L]) as much. Post hoc analyses using Beasley and Schumacker’s method [2] showed that gender differences mainly lie in the use of [ZH] and [Z]. Males were more likely to adopt [Z], while females were more likely to adopt [ZH] ( $p < .001$ ).

**Figure 2:** Differential gender preferences for /z/. [ZH]: [z]-like sounds; [R]: [ɹ]-like sounds; [Z]: [z]-like sounds; [L]: [l]-like sounds. Same below.



#### 4.3. Degree of bilingualism on /z/

In order to examine the effect of degree of bilingualism on /z/ realization, speakers were conveniently divided into approximately two equal groups based on their self-ratings using gender

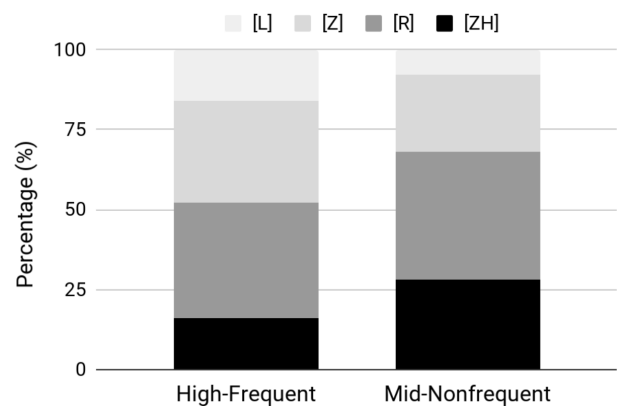
group medians. As ratings of Min proficiency and frequency of use did not always coincide, subgroupings were performed separately on the two rating scales. For males, speakers who self-rated themselves as 7 on the proficiency scale were categorized as high-level, while those who rated themselves as 6 or below were categorized as mid-level. Similarly, males who rated themselves as 6 or above on the frequency scale were categorized as frequent users, while those who rated themselves as 5 or below were categorized as nonfrequent users. For females, the divide was 6 or above for the high-level group, and 5 or above for the frequent group. Table 2 shows the subgrouping distribution. Males in general showed perfect alignment for the two measures. High-level users were also frequent users. On the other hand, females showed some disjoint combinations. Although there were high-level frequent speakers and mid-level nonfrequent speakers, there were also some mid-level frequent speakers. However, high-level nonfrequent speakers were rare.

**Table 2:** Number of speakers for the subgroupings of the two measures of bilingualism. Numbers on the left are males and those on the right are females.

	Frequent	Nonfrequent
High	5/3	0/1
Mid	0/3	5/3

As shown in Figure 3, there seemed to be a slight trend for mid-level males to use more retroflex variants of [ZH] and [R] than their high-level counterparts. However, the chi-square test showed only a marginal effect [ $\chi^2(1) = 2.67, p = .10$ ].

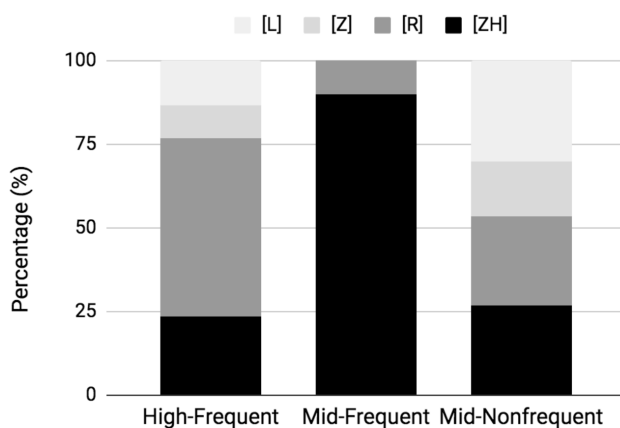
**Figure 3:** Male preferences for /z/ with regards to Min proficiency level and frequency of use.



For females, the alignment of the two indicators were not as straightforward. Therefore, two sets of

comparisons were made. The first is to examine the effect of Min proficiency on /z/ realization by looking at only frequent speakers. As shown in Figure 4, mid-level speakers were overwhelmingly in favor of the canonical realization [ZH] compared to their high-level speakers. The chi-square test showed that the trend was significant [ $\chi^2(1) = 27.15, p < .0001$ ]. The second set is to examine the effect of Min frequency of use by looking at only mid-level speakers. As shown in Figure 4, frequent speakers were more likely to use the canonical [ZH] than nonfrequent speakers. The chi-square test showed that the difference was significant [ $\chi^2(1) = 24.75, p < .0001$ ]. If only high-level, frequent speakers and mid-level, nonfrequent speakers were compared (as was the case for males), the chi-square test showed that the latter group had near-significantly more nonretroflex realizations of [Z] and [L] [ $\chi^2(1) = 3.59, p = .06$ ].

**Figure 4:** Female preferences for /z/ with regards to Min proficiency level and frequency of use.



## 5. DISCUSSION

The results in this study have two implications. First, the realization of Mandarin /z/ is much more variable than what was suggested in previous research (cf. [4, 7, 9]). However, it could still be largely subcategorized into four types, [ZH], [R], [Z], and [L]. Male speakers were more inclined to use [R] and [Z], while female speakers were more inclined to use [ZH] and [R]. This implies that [R] is probably the most accepted form across the two genders while the canonical [ZH] was regularly used only among females. This also implies that the two defining characteristics of /z/ are of different weighting for the two genders. Females likely regard [+retroflexion] as a more important feature to be preserved for /z/, while males probably consider

both [+retroflexion] and [+frication] to be equally important.

Secondly, the degree of bilingualism modulated /z/ realization in a gender-dependent fashion. For males, Min proficiency level and frequency of use seemed to work in the same direction, and there was a slight tendency for them to correlate negatively with the use of [+retroflexion] variants of [ZH] and [R]. In other words, high-level, frequent male users were somewhat less likely to use retroflex realizations of /z/. This is in line with what was often argued in previous studies that Min familiarity might be ‘detrimental’ to the canonical realization of Mandarin /z/ [4, 9]. However, such a pattern was not observed among females. Although females still showed a negative correlation between Min proficiency and the use of canonical [ZH], there was in fact a positive correlation for Min frequency of use instead. In other words, high-level females were less likely to use [ZH], but frequent female users were more likely to do so. Even if only high-level frequent females and mid-level nonfrequent females were compared, as was done for the male speakers, the former group still used fewer nonretroflex realizations of [Z] and [L] than the latter. This implies that at least for females, there was an advantage for being a frequent bilingual user, as would have been predicted by the Structural Sensitivity Theory [10]. By having more experiences in both languages, females were more likely to develop articulatory skills in maintaining a difficult sound like Mandarin /z/.

In Taiwan, Min-accented Mandarin was often frowned upon and ridiculed in the mass media, and deviants from the canonical realization in Mandarin are often attributed to negative Min influence, thereby largely discouraging the use of Min in both public and private domains. However, this study showed that although there might be some inter-language interactions for Mandarin-Min bilinguals, negative impacts on canonical realizations of Mandarin /z/ from being an early bilingual were in fact minimal. Min frequency of use even showed a positive effect on the realization of [ZH] among female speakers. This implies that when the two languages of a bilingual have sounds of similar articulatory mechanism, mastering one could help master the other, even at an abstract level.

This study consisted of only a relatively small sample. Therefore, further studies will be needed in order to see whether such an effect still holds when a larger sample is used.

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