Chapter 5 Frequency of Rhotacization Tokens

5.1 Introduction

Rhotacization is one of the most characteristic features of the Beijing Mandarin, and Beijing native speakers use rhotacization extensively in their speech (Duanmu, 1990; B. Huang & Liao, 2017; Y.-H. Lin, 2007b), as described in Chapter 2. Furthermore, rhotacization is mostly identified as an oral, informal, and changeable speech phenomenon (Cao, 2004; Qian, 1995; L. Wang, 2005), rather than a written and formal linguistic object, especially in Beijing Mandarin. Even those who don't speak Mandarin will recognize this salient element in certain syllables. Migrants, coming from all over China to Beijing, come into social and language contact with native Beijingers and with newcomers like themselves. They are on a daily basis made aware of their own language use and of the communicative habits of the people they interact with. Part of this experience is the frequent presence of the rather prominent rhotacization in Beijing Mandarin. Some newcomers to the city will be more likely and even more capable of producing rhotacization because rhotacization is part of their own native Chinese dialect. For speakers of Non-rhotic dialects, rhotacization is a relatively alien concept that they need to learn. Some other migrants simply need to produce more rhotacized rimes than they are used to.

As pointed out in Section 1.2.1, previous sociolinguistic studies on rhotacization in Beijing Mandarin were mostly conducted by linguists in mainland China, where paradigms of Chinese traditional dialectology and phonology play a part in modern sociolinguistic studies on Chinese languages (M. Zhou, 2009). However, from the perspective of Western variationist sociolinguistics, some issues were not adequately addressed. First, the pronunciation norms for rhotacization were mostly examined among Beijing native speakers (T. Lin, 1982; T. Lin & Shen, 1995; D. Sun, 1991), while speakers from other dialect backgrounds in the Beijing community were excluded. Second, speech data were obtained variously from recordings in which speakers read aloud rhotacized words presented to them (Jing, 2005; Wang 2010), from the rhotacization used by anchors in Beijing local TV programs (Peng, 2003), or from a Beijing speech database established in the 1980s (C. Zhou, 2005, 2006). However, speakers of different dialect backgrounds are all members of the Beijing speech community, and their language use affects the use of and change in rhotacization of the other members in that community. Moreover, due to the oral and informal characteristics of rhotacization in Beijing Mandarin, it is unlikely that studying the change in rhotacization when speakers read aloud words with their full attention, and with the effects of social variables, could lead to convincing results.

Therefore, to investigate whether there is a change in the amount of rhotacization used, in the present study, we will examine the rhotacization frequencies in the naturalistic and spontaneous speech of both Beijing native speakers and speakers of the various Rhotic and Non-rhotic dialects who have joined the Beijing speech community. Two research questions will be addressed. First, how is rhotacization overall distributed across different speaker groups, and what are the rhotacization frequencies of speakers in those groups in the

Beijing speech community? Second, what effects do the social variables of age, gender, and dialect background have on the number of rhotacizations found?

This chapter is structured as follows. In Section 5.2, the specific methods of this study are presented, supplementing the general description in Chapter 3. Section 5.3 shows the results of the general rhotacization frequencies and of the statistical tests on the frequency differences between speakers in different social groups. The last section presents the conclusion and discussion of this chapter.

5.2 Method

Data source

This study is based on the frequency counts of the number of rhotacized words per 1,000 words per person per social group. The outcome is termed “rhotacization frequency." The total number of words observed is 76,000 (76 participants times 1,000 words per participant). These count data were obtained from the recordings of the pair talking sessions in Beijing, described in Chapter 3. The detailed methods and explanation of data collection and data processing can be found in Section 3.2.

Statistical treatment

In order to compare the rhotacization frequency differences across different social groups statistically, both parametric and nonparametric statistical tests were used. The normality tests were done with the combination of visual inspection and significance test in R (R Core Team, 2020). We used the ggpbur package (Kassambara, 2020) in R to perform a visual inspection and Shapiro-Wilk’s test to do the significance tests. The data sets of Beijing native speakers were normally distributed, according to the Shapiro-Wilk’s test in R. Differences among Beijing native speaker groups were thus mainly tested using parametric statistical tests—*t*-tests and one-way ANOVA. The total participant data set was tested but not normally distributed, and therefore nonparametric statistics were also used. The Kruskal-Wallis test and Wilcoxon test were applied to deal with the nonparametric data set in this study.[17]

[17] In nonparametric statistics, data are not required to fit a normal distribution. The nonparametric methods usually apply to data sets in which the number and nature of the parameters are flexible and not fixed in advance. The Kruskal-Wallis test by rank is a non-parametric alternative to a one-way ANOVA, which extends the unpaired two-sample Wilcoxon test (also known as the Mann-Whitney *U* test) in the situation where there are more than two groups. It is used when the assumptions of a one-way ANOVA test are not met.

In addition, distributions were considered relevant, in addition to the average tendencies. For this reason, boxplots are used to present the distribution of the number of rhotacized words across the social variables, which could show the effects of the various social variables on rhotacization. The boxplots were made using the ggplot2 package (Wickham, 2016) in R and alpha value was shown on the boxplots as well.

5.3 Results

Overall rhotacization distribution

Among the total number of 76,000 words observed, 3,402 rhotacized words were encountered, accounting for 4.5% of the total. Table 5.1 shows the number of participants and the sum of rhotacizations per social group, as well as the average rhotacization frequency per participant per social group.

Table 5.1 Number of rhotacization tokens (*N*=3,402) per 1,000 words for various speaker groups (*N*=76).

Gender	*Age*	*Beijing*			*Rhotic*			*Rhotic*		
		p n	*r n*	*avg.*	*p n*	*r n*	*avg.*	*p n*	*r n*	*avg.*
Male	Young	8	466	58	4	139	35	4	13	3
	Middle	4	282	71	4	137	34	4	62	16
	Old	4	435	109	4	108	27	2	2	1
Female	Young	7	450	64	4	173	43	5	51	10
	Middle	4	376	94	4	134	34	3	57	19
	Old	4	394	99	2	74	37	5	49	10
	Total	31	2403	78	22	765	35	23	234	10

Note: p n refers to the number of participants per social group; *r n* refers to the total number of rhotacized words per 1,000 words by participants in each social group; *ave* is the number of rhotacized words per 1,000 words per participant per social group. *Beijing, Rhotic,* and *Non-rhotic* refer to the three dialect backgrounds of participants.

Figure 5.1 shows the boxplots of the overall distribution of rhotacization across the social variables. The x-axis indicates speakers by the social variable, and the y-axis indicates the number of rhotacized words produced by each speaker group. The top and bottom ends of the box are the upper and lower quartiles, which means that the boxes as a whole span the interquartile range. The median is marked by the dark horizontal line inside the box. The "whiskers" extend to the highest and lowest observations. Outliers are represented by single dots. These outliers are not part of the statistical calculations.

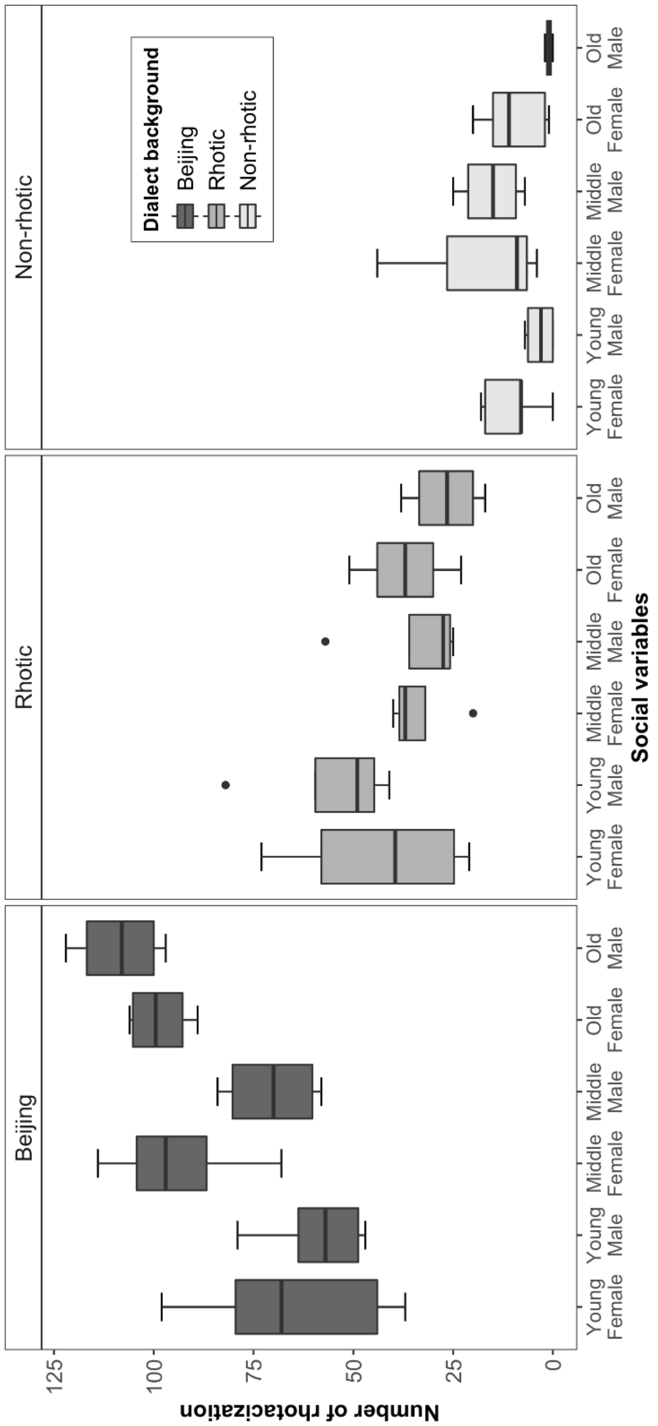

Figure 5.1 Distribution of rhotacization (N=3,402) across the speaker groups (N=76).

Table 5.1 and Figure 5.1 show that the average rhotacization frequencies and the overall distribution of rhotacization vary substantially among speakers in different social groups. Combined and independently, the three social variables affect the tendency of speakers towards rhotacization. The specific effects of these social variables are considered next, and the subsequent figures show the statistical results.

Gender

It should be noted that only the gender differences among the Beijing native speakers were examined and the gender differences among speakers with Rhotic and Non-rhotic dialect backgrounds were excluded in this study. This is because speakers with Rhotic and Non-rhotic dialect backgrounds usually come from a variety of towns and cities in various provinces in China. Their original accents and dialects, as well as their rhotacization use could be very different from each other. So, given that there is no comparability across those speakers, the results of comparison would not have provided insight into the gender differences, due to the heterogeneous nature of the group of non-native speakers.

An independent two-sample *t*-test was conducted to examine if the variable Gender is a factor among the Beijing native speakers. Figure 5.2 presents the boxplot of the number of rhotacizations of two gender groups and the alpha value. The big horizontal brackets above the boxplots indicate that the difference of the two groups is being tested and asterisks are used to show the *p*-value and significance level.[18]

[18] 'ns' means that the comparisons are not significant. One asterisk means that $.01<p<.05$ and the significant level is .05. Two asterisks mean that $.001<p<.01$ and the significant level is .01. If the *p* value is smaller than .001, then three asterisks will be shown and its significant level is .001. Same below.

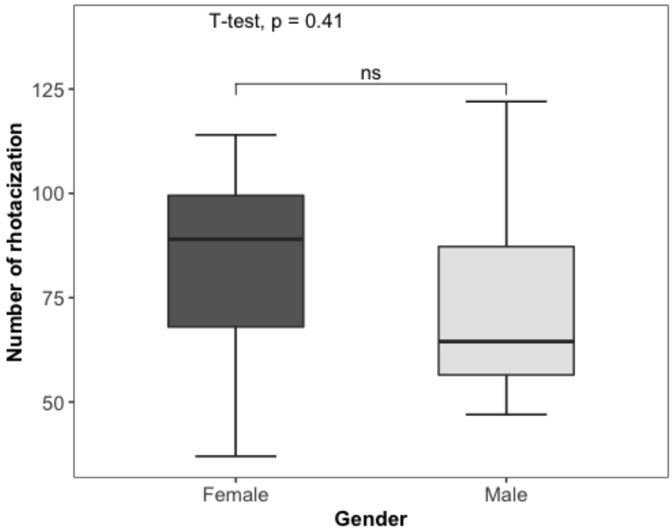

Figure 5.2 Number of rhotacization tokens (*N*=2,403) of each gender (*female, n*=15*; male, n*=16).

The statistical result shows that there was no significant difference in the number of rhotacizations for Female (M = 81.3, SD = 24.7) and Male native speakers (M = 73.9, SD = 24); $t(29) = 0.84$, $p = .41$. This suggests that the social variable Gender has no effect on the rhotacization frequency of Beijing native speakers. The detailed *t*-test results are summarized in Table 5.2.

Table 5.2 Summary of the independent *t*-test on rhotacization frequency of female and male Beijing native speakers.

Gender	*N*	*Mean*	*SD*	*Se*
Female	15	81.3	24.7	6.38
Male	16	73.9	24.0	6.01

When comparing the gender differences between Beijing speakers of the same Age group, we find no significant differences. The number of rhotacizations produced by both Female and Male Beijing speakers of the same Age group is not significantly different from each other (*Young*, p = .53; *Middle*, p = .09; *Old*, p= .204).

Age

As was the case for Gender, no statistical tests were conducted to examine the effects of Age among the group of Rhotic speakers and Non-rhotic speakers, due to the heterogeneous nature of the group of non-native speakers.

A one-way ANOVA test was conducted to examine if the variable Age is an effective factor. Figure 5.3 presents the boxplot of the number of rhotacizations produced by three age groups and the alpha value.

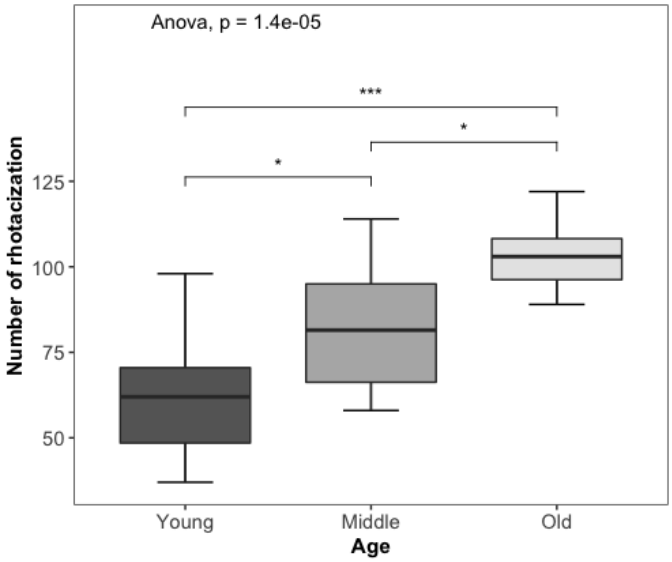

Figure 5.3 Number of rhotacization tokens (*N*=2,403) of each age group of Beijing Speakers (*Young=15, Middle=8, Old =8*).

The results of the one-way ANOVA test show that Age had a significant effect on the number of rhotacizations at the $p < .01$ level for the three conditions [F (2, 28) = 17.07, p = .000]. Post hoc comparisons using the Tukey HSD test indicate that the Young Beijing native speakers (*M* = 61.1, *SD* = *17.7*) produced significantly fewer rhotacizations than the Middle (*M* = 82.2, *SD* = 19.8) and *Old* (*M* = 104, *SD* = 10.9) speakers. Middle Beijing native speakers (*M* = 82.2, *SD* = 19.8) also produced significantly fewer rhotacizations than Old Beijing native speakers (*M* = 104, *SD* = 10.9). Table 5.3 lists the summary of the results.

Table 5.3 Summary of the independent *t*-test on the number of rhotacizations produced by Young, Middle, and Old Beijing native speakers (*N*=31).

Age	*N*	*Mean*	*SD*	*Se*
Young	15	61.1	17.7	4.57
Middle	8	82.2	19.8	6.98
Old	8	104	10.9	3.85

As Age turned out to be an effective variable, an independent *t*-test was conducted to test the generational difference among Female and Male Beijing native speakers among the three age groups. The results are shown in Table 5.4 (females) and Table 5.5 (males).

Table 5.4 *p*-values of pairwise comparisons of three age groups of female Beijing native speakers (N=15).

	Young Beijing Female speakers	Middle Beijing Female speakers	Old Beijing Female speakers
Young Beijing Female speakers		.063	.023
		Middle Beijing Female speakers	.685
			Old Beijing Female speakers

Table 5.5 *p*-values of pairwise comparisons of three age groups of male Beijing native speakers (N=16).

	Young Beijing Male speakers	Middle Beijing Male speakers	Old Beijing Male speakers
Young Beijing Male speakers		.12	.000
		Middle Beijing Male speakers	.004
			Old Beijing Male speakers

Young Beijing Female native speakers and the Old Beijing Female speakers had significantly different rhotacization productions: $t(9)$ = 2.74, p = .023. The difference between the Young and Middle Beijing Female speakers is not significant, $t(9)$ = 2.12, p = .063, nor was the difference between Middle and Old Beijing Female $t(6)$ = –0.43, p = .685. The number of rhotacizations of Young and Middle Male Beijing native speakers respectively were significantly different from that of Old Beijing Male speakers, $t(10)$=1.7, p = .000; $t(6)$= -4.38, p = .004, while there was no significant difference between Young and Middle Beijing Male speakers; $t(10)$=1.7, p = .12.

Dialect background

Next, the nonparametric Kruskal-Wallis test and Wilcoxon test were conducted due to the non-normal distribution of the total data set. The results are shown in Figure 5.4.

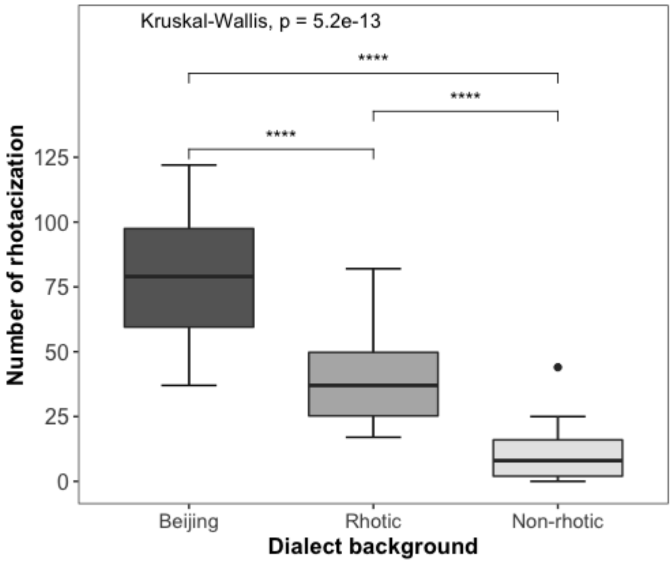

Figure 5.4 Number of rhotacization tokens (*N*=2,403) of each dialect background group (*N*=76).

The results reveal a significant difference on at least one non-paired comparison (Kruskal-Wallis chi-squared = 56.554, df = 2, *p* = .000). This shows Dialect Background is a crucial social variable. Wilcoxon tests were conducted to test which pairs were significantly different. The figure (the horizontal lines with asterisks) shows that all pairs of groups are significantly different. The number of rhotacizations is greater for Beijing native speakers (n=31) than for Rhotic dialect speakers (*n*=22), *U* = 199, *p* = .01, and Non-rhotic Dialect speakers (*n*=7), *U* = 771, p = .000. Rhotic dialect speakers (*n*=22) also produce significantly more rhotacization than Non-rhotic Dialect speakers (*n*=23), *U* = 25, *p* = .000. Thus, speakers with a Beijing dialect background produced the greatest number of rhotacized words in their natural speech, while the Non-rhotic speakers produced the fewest.

Wilcoxon tests were conducted to test the rhotacization difference between Beijing native speakers and speakers from Rhotic areas of the same generation. The difference of the number of rhotacized words produced by the Young, Middle, and Old speakers in these two dialect groups were tested and the *p*-values are shown in Table 5.6.

Table 5.6 *p*-values of pairwise comparisons of Beijing native speakers (*N*=31) and Rhotic speakers (*N*=22) of three generations.

Young Rhotic speakers	Middle Rhotic speakers	Old Rhotic speakers
.258	.000	.000
Young Beijing speakers	Middle Beijing speakers	Old Beijing speakers

There exists a significant difference in the number of rhotacized words between Middle Beijing native speakers (n=8) and Middle Rhotic speakers (n=8), U= 64, p = .000, and between Old Beijing native speakers (n=8) and Old Rhotic speakers (n=6), U= 48, p = .000. The number of rhotacized words produced by Young Beijing native speakers (n=15) was not significantly different from that of Young Rhotic speakers (n=8), U=78, p =.258.

5.4 Discussion and conclusion

Methodological discussion

This investigation is reminiscent of Labov's famous New York City department store study, which also focused on the frequency of postvocalic r produced by various groups of speakers (Labov, 2006), in which his rapid and anonymous survey gave the answer to this question. In Beijing, this approach was never likely to lead to any such clear-cut answers. One reason is that an anonymous survey would fail to provide information on speaker-specific social factors. Estimates as to speakers' gender and age could be made, but because so many Beijingers are migrants, the most important determinant of accent—dialect background—would remain unknown. The situation in New York City was such that predictions as to the speakers' geographical background were predictable, but this is quite the opposite in Beijing nowadays (and difficult in New York City nowadays too, for that matter). Class distinctions in Beijing are also less predictable than they were in 1960s New York and even less relevant. An alternative to Labov's approach is the frequency counts as presented in this chapter, which provide more reliable information in several ways.

Another difference that warrants a different approach is the likely frequency of postvocalic r. Not only would a predictable answer to a fixed question (Labov's approach) probably not yield a natural postvocalic r that was directly reflective of the dialect background of the speaker, the natural number of rhotacized words in Beijing Mandarin is also naturally lower. This determines the degree of markedness of the feature. In the speech of all Rhotic speakers in this experiment, including Beijing native speakers and speakers from other Rhotic areas, it turned out that the rhotacized words constituted less than 4.5% of the words. We did a quick calculation of the number of rhotacizations in an online discourse by two native English (rhotic) speakers, and it showed that more than 15% of their words were rhotacized. This means that the salience of this feature is different in the two places, at least from a frequency point of view.

Results and discussion

In the present study, there are three main findings. First, among the three variables, Gender has no effect on the number of rhotacizations among Beijing native speakers. In Zhang (2008) rhotacization is called the Beijing Smooth Operator which is a “gendered character type consisting of a set of male urban Beijing social personae.” However, with respect to rhotacization frequency, no statistical difference is found between male and female speakers in our study. Even in the same age group, the rhotacization frequency is not significantly different between the two genders.

Second, there was a significant difference across Beijing native age groups: the Young native speakers produced significantly fewer rhotacized words than their Middle counterparts, while the Middle generation also produced significantly fewer rhotacized words than the Old speakers did. Briefly, the younger the speakers are, the fewer rhotacized words they tend to produce. The result shows that a generation change occurs on the number of rhotacizations among Beijing native speakers.

Third, a striking factor regarding Dialect Background was that three dialect groups were significantly different from each other in rhotacization frequency. This result can be interpreted in three ways: (1) Beijing native speakers produce more rhotacized words in their spontaneous speech than speakers with other dialect backgrounds. This result provides statistical evidence that the extensive occurrence of rhotacized words is characteristic of Beijing Mandarin. (2) Speakers from a Non-rhotic dialect background produce the lowest number of rhotacized words in their natural speech, but they do appear to adopt this feature that is not natural to them. (3) In addition, though Beijing and Rhotic speakers are significantly different from each other in general, there is no statistical difference among the Young Beijing speakers and the Young Rhotic speakers. Combined with the result of Age differences, this result suggests that a sound change in the natural speech of the Young generation of Beijing native speakers may be taking place. That is, a process of de-rhotacization. The promotion of Standard Chinese, the long-term and profound social and language link between Beijing natives and migrants, as well as the population superiority of migrants are all possible causes of the observed de-rhotacization. However, it can also be that Young Rhotic speakers are actively affected by Beijing Mandarin and rhotacization, with the effect that they produce as many rhotacized words as Young native speakers. We will continue to study the issue from different angles in the remaining chapters.