

# **A Preliminary Analysis of Thai Tone Errors Made by Japanese Learners**

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## **Abstract**

In this preliminary study, the production of Thai tones was investigated. 16 first year Thai majors and 16 Thai minors were tested on their pronunciation of 100 words that comprised 20 examples of each of the Thai tones. Tone errors as well as the tones substituted for target tones were analyzed. It was found that Thai majors performed better than Thai minors and that contour tones (rising and falling tones) were easier to produce correctly than level tones (particularly the low and high tones). The high tone stood out as generating the most errors. Implications for teaching low-level students are discussed.

## **1. Introduction**

Thai is a tonal language in which variations in pitch create meaning at the level of the word or syllable. Thai has five tones, by which five different words can be formed out of one syllable. For example, when the syllable [khaa] is pronounced with a mid tone (Tone 1), it has the meaning “to be lodged in,” but in a low tone (Tone 2) it means “galangal root.” Likewise, when pronounced in the falling tone (Tone 3), it means “I” or “servant;” in a high tone (Tone 4), “to do business in;” and in the rising tone (Tone 5), “leg.” In addition to vocabulary and grammar, Thai language learners must grapple with tone, especially at the early stages. If learners are unable to perceive lexically significant differences in pitch, they will be unable to

comprehend the spoken language; and if they are unable to pronounce a word with the appropriate tone, they risk being misunderstood.

This study was intended as a preliminary investigation in how Japanese learners at the earliest stages of Thai language instruction begin to use Thai tones. The aim was to find out whether certain tones are more problematic than others in order to improve the teaching of Thai pronunciation to beginners. The study focused on tone production rather than perception, and it used student recordings of tones in citation form rather than connected speech. It found that level tones (especially low tone and high tone) were more difficult to produce accurately than contour tones (the rising and falling tones).

## **2. Review of Literature**

### **2.1 Tone in the Thai Language**

The form of the language taught in Thai language classes is Standard Thai, considered the official variety of Thai “spoken by educated speakers in every part of Thailand, used in news broadcasts on radio and television, taught in school, and described in grammar books and dictionaries” (Tingsabadh & Abramson, 1993). Standard Thai belongs to the family of Tai languages that originated in southern China. Spoken across Southeast Asia, the Tai languages today include Lao and Shan, of Northeastern Myanmar, as well as the languages of smaller ethnic communities scattered across south China and northern Vietnam (Wyatt, 1984). Thai is unrelated to other languages spoken in Southeast Asia, including Khmer, Burmese and Vietnamese.

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Over many decades, research has been carried out on tone in Standard Thai in monosyllabic or citation form (Abramson, 1962, 1975, 1979; Erikson, 1974) and in stressed and unstressed syllables of connected speech (Tingsabadh & Deeprasert, 1997). The research has confirmed that the five tones of Thai can be divided into three level or static tones (low, mid and high) and two contour or dynamic tones (rising and falling). Each tone is defined by its fundamental frequency ( $f_0$ ) shape. According to Abramson (1979), the dynamic tones are characterized by rapid changes of  $f_0$  while the static tones show slow movement of  $F_0$ . He describes the  $f_0$  movement of the Thai tones as follows:

Of the three static tones, it is the mid tone that is most likely to appear occasionally as a level. The high tone is more likely to be seen as a rise high in the voice range in contrast with the low rise of the rising tone. The low tone is likely to appear as a low fall in contrast with the high fall of the falling tone (p. 154).

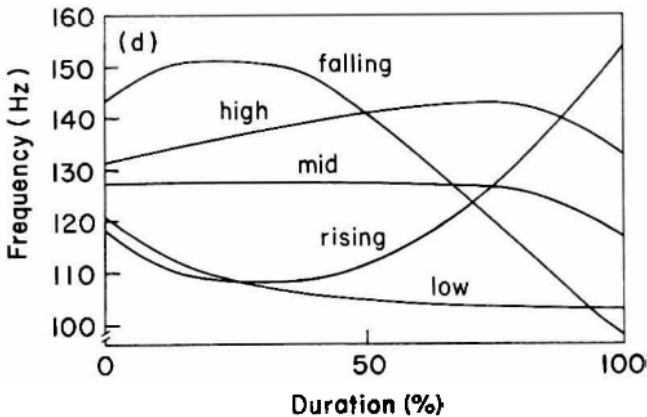


Figure 1: Standard Thai tones in citation form, Abramson (1962)

A five-tone scale pitch system is used by researchers to represent the  $f_0$  height and direction of each tone. Thai tones in citation form can be represented as follows: the mid tone is [33], low tone is [21], falling tone is [52], high tone is [45], and rising tone is [25].

It must be noted, however, that tone in Thai is dynamic and fluid. Tones not only vary across the many Thai dialects but have been evolving for centuries (Tingsabadh, 2001). Ancient forms of the language lacked the rising and falling tones, which split from the high and low tones, respectively. Many studies have also documented how tones in the modern language are continuing to change. For example, Teeranon and Rungrojuwan (2008) documented how words that had been pronounced with a high tone just 30 years ago are now increasingly rendered as a mid-rising tone by the younger generation. It is notable that these changes continue the process by which contour tones have grown out of static tones.

## 2.2 Lexical Tone Languages vs. Others

Whereas lexical tone languages, such as Thai, use pitch to differentiate lexical meaning, stress-accent languages such as English use pitch to carry prosodic meaning. A rise or fall in pitch can turn an utterance into a question or a statement, respectively. Pitch-accent languages, such as Japanese, may be considered to be a sub-group of tone languages because pitch can be applied to certain syllables or moras to create phonemic minimal pairs (Yip, 2002). For example, “ame” can mean “candy” or “rain,” depending on whether the pitch is accented on the second or first syllable, respectively. However, it should be noted that the number of contrasting tones are few, and the distribution of tones within words is restricted to specific syllables. The surprise expressed by most Japanese Thai-language beginners when introduced to the Thai tones assures one that lexical tone is an unfamiliar concept to them.

### **2.3 Learning Tone Languages**

Would a learner whose native language is a tone language have an advantage in perceiving or producing Thai tones over a learner whose native language is a non-tone language? After all, Lado (in Dulay and Burt, 1974), writing about the Contrastive Analysis Hypothesis (CA) states “that individuals tend to transfer the forms and meanings, and the distribution of forms and meanings of their native language and culture to the foreign language and culture,” and that “in the comparison between native and foreign language lies the key to ease or difficulty in foreign language learning” (p. 97). Many studies (e.g. Gandour, 1983; Wayland and Guion, 2004) have supported this notion, suggesting that linguistic experience, particularly the native language, enables listeners from a tone language to perform better than those from a non-tone language. However, recent studies of tone perception have found that L1 influence is complex regardless of whether it is a tone or non-tone language.

Cooper and Wang (2010) pointed out that “native phonetic systems affect the perception of foreign sounds” but that speakers of tone languages do not necessarily perceive tone more accurately than non-tone language speakers. They described a study carried out by Francis, et. al. in which a significant difference in Cantonese tone identification accuracy by English and Mandarin speakers could not be found. Cooper and Wang’s own (2010) study similarly found no significant difference between Thai and English listeners in identification of Cantonese tones. However, they did find that Thai subjects were better at processing non-native pitch in order to accurately identify lexical items, especially after a period of training in Cantonese tone. The Perceptual Assimilation Model (PAM) (Best in Best & Tyler, 2007) attempts to resolve these seemingly contradictory findings by positing that language

learners may use more than phonological or higher-order information (allophones, phonemes) in order to perceive non-native speech. Indeed, learners may be aided by the wide range of phonetic properties found in their native language, including pitch patterns, duration, voice quality, and rhythmic variations in order to process, perceive or assimilate highly dissimilar foreign languages. Gandour (1983) found that both English and Cantonese speakers could perceive Mandarin tones, but that the English speakers tended to focus on pitch height while the Cantonese speakers used both pitch height and direction. So (2010) also demonstrated that Japanese learners can process unfamiliar Mandarin tones by assimilating them to their pitch-accent system.

### **3. Research Questions**

The questions that formed the basis of this study were as follows: 1) Are the five tones of Thai equally difficult for Japanese learners? 2) Are learners more likely to pronounce some tones more accurately than others? 3) Which are the most and least difficult tones to produce? 4) When students make errors, which tones become the most common error types, and will the easiest tones be the most-substituted tones?

### **4. Hypotheses**

The current study set out to test the following hypotheses: 1) The five tones of Thai are not equally difficult. 2) Beginners will produce contour tones (falling tone and rising tone) more accurately than level tones (mid, level and high tones). 3) The most difficult tone to pronounce is Tone 4 (high tone), while the least difficult is Tone 3 (falling tone). 4) When students make errors, Tone 3 (falling tone) will be the tone that students substitute most often (because it is easiest to pronounce), while Tone 4 (high tone) will be the least common error type.

## **5. Methodology**

### **5.1 Participants**

The subjects consisted of thirty-two students enrolled at Kanda University of International Studies, who were divided into two cohorts. 16 of the subjects consisted of 2 male and 14 female Thai majors in their first year of university study. Three subjects had Thai mothers but had never spoken the language before entering university. As Thai majors, students meet ninety minutes each weekday for Thai reading, writing, grammar, speaking and listening classes. The other 16 subjects consisted of 2 males and 14 females who were minors in the Thai language. This group has two 90-minute classes each week; they study grammar, reading and writing on Tuesdays and speaking and listening on Wednesdays. The class for Thai minors is a more heterogeneous group, with students from different majors and in different years of university study (from freshmen to seniors). These subjects had no experience with Thai prior to enrolling in the class. The students ranged in age from 18 – 21 years.

### **5.2 Instrument**

The instrument used to collect the data for this study comprised a list of 100 monosyllabic words, divided into twenty words of each of the five tones in Thai. The words were selected from the list of vocabulary appearing in the “Try Thai” textbook (Wright, 2011) used in the class and that the students studied over the semester. The word list, which included definitions and phonetic transcriptions (see appendix), was prepared and distributed to the students two weeks in advance of the test. The test was conducted during the twelfth week of the first semester. The Thai majors could access audio files posted on the online Moodle platform; they were also encouraged

to meet with Thai exchange students for additional practice. On the other hand, the minor students had no access to online audio files, and they had no chance to practice with Thai exchange students. Both groups of students were familiar with the words, which had been practiced in class.

### **5.3 Procedure**

In the test, each student was given the list of 100 monosyllabic words without phonetic transcription and asked to pronounce the words in the order listed. They were told that the test was part of their final exam and that they had to say all the words in eight minutes. Each student's speech was recorded. In order to rate each subject's tone production, the five-tone scale pitch system was utilized, in which tone 1 is mid tone [33]; tone 2 is low tone [21]; tone 3 is falling tone [52]; tone 4 is high tone [45]; and tone 5 is rising tone [25]. The method of listening to and marking tones was similar to those used in Thai dialect studies. As subjects spoke, the rater marked down the tones produced; later, the rater listened to all the recordings a second time. Errors, as well as the tones produced as substitutes for target tones, were noted. The rater (the author of the present study) is a native speaker of Thai, whose earlier research (Chinchest, 1989) required the identification of tone in monosyllabic words (citation form) and in connected speech. After the data was tabulated, 2-factor ANOVA and post-hoc Tukey's tests were used to test the null hypotheses that no significant differences existed between any of the tones or that no significant difference existed between the scores of the two groups.



## 6. Results

**Results: Mean % Correct, Mean Errors and Standard Deviations**

	<b>Test (100 words)</b>	<b>T 1 (20 words)</b>	<b>T2 (20 words)</b>	<b>T3 (20 words)</b>	<b>T4 (20 words)</b>	<b>T5 (20 words)</b>
<b>All</b> Mean %	81%	84%	81%	90%	65%	86%
Mean errors	18.78	3.19	3.78	1.97	6.97	2.88
St Dev	13.9	3.61	3.87	2.60	4.93	3.59
<b>Majors</b> Mean %	87%	88%	90%	95%	67%	93%
Mean errors	13.43	2.31	2.00	1.06	6.63	1.44
St Dev	10.35	2.06	2.03	1.61	5.58	2.47
<b>Minors</b> Mean %	76%	80%	72%	86%	63%	78%
Mean errors	24.12	4.06	5.56	2.88	7.31	4.31
St Dev	15.22	4.60	4.49	3.10	4.35	4.01

**Two Factor ANOVA**

Group: [F(1,32) = 13.62,  $p < 0.001$ ]

Tone: [F(4,32) = 8.71,  $p < 0.00001$ ]

Interaction - Group X Tone:

[F(3,32) = 0.73,  $p = 0.56$ , *ns*]

**Single Factor ANOVA (Majors)**

Tone: [F(4,16) = 8.41,  $p < 0.0001$ ]

**Single Factor ANOVA (Minors)**

Tone: [F(4,16) = 2.65,  $p < 0.05$ ]

**Table 1: Overall test results and ANOVA analysis**

### 6.1 Overview of Results

The test results were subjected to statistical analyses that examined, firstly, the errors made, i.e. when a student missed the target tone, and then the error types, i.e. the tones that were substituted *in error* for the target tone. In general, these analyses supported the hypothesis that students would encounter more difficulty with level rather than contour tones. On the test overall, the students scored an average of 81% correct (see Table 1). A t-Test showed the difference between the Thai Majors (M=87%) and Thai Minors (M=76%) was significant – ( $t(30)=2.32$ ,  $p < 0.05$ ). It would appear that students fared best with Tone 3 words, which generated a rate of 90% correct responses. This was followed by Tone 5 (86%), Tone 1 (84%), Tone 2 (81%) and Tone 4 (65%).

## 6.2 Analysis of Errors

In order to examine the test results in more detail, the combined errors of both groups were subjected to a two-factor ANOVA, with Group as a between-subjects factor and Tone as a within-subjects factor (see Table 1). The test found a significant effect of Group, meaning that the difference between Majors and Minors was significant. The test also found a significant effect for Tone, meaning that the number of errors generated by one or more of the tones was significant. Post-hoc Tukey's HSD tests were used to look more closely at this effect. The tests showed that the number of errors generated by Tone 4 items differed significantly ( $p < 0.05$ ) from the errors generated by each of the other tones. In contrast, there was no significant difference between any pair of other tones.

The scores of the Majors and the Minors were also subjected to respective single-factor ANOVAs. In both cases the effect of Tone was found to be significant, but the Tukey's tests revealed slight differences for each group. As for the Majors, their performance resembled that of the combined results; that is, Tone 4 stood out as significantly more difficult than all of the other tones. As for the Minors, however, a significant difference was found only between the high number of errors for Tone 4 ( $M=7.31$ ) and low number for Tone 3 ( $M=2.88$ ). Paradoxically, this could suggest that Tones 5, 1 and 2 are simultaneously as "difficult" as Tone 4 and as "easy" as Tone 3. However, as noted above, the performance of the Minors as a group differed significantly from the Majors. It may be that the Tukey's test results showed that the Minors struggled with all the tones, whereas the Majors did relatively well with all the tones except Tone 4.

### 6.3 Analysis of Error Types

**Error types: Tones substituted in error**

	<b>T 1</b>	<b>T2</b>	<b>T3</b>	<b>T4</b>	<b>T5</b>
<b>Errors</b>	202	2	183	16	198
% of total	34%	0%	30%	3%	33%
<b>Majors</b> Sum	74	0	60	0	81
% of total	12%	0%	10%	0%	13%
<b>Minors</b> Sum	128	2	123	16	117
% of total	21%	0%	20%	3%	19%

**ANOVA**

**Two Factor - Tones 1-2-3-4-5**

**Group:**  $[F(1,32) = 8.94, p < 0.05]$

**Tone:**  $[F(4,32) = 15.86, p < 0.00001]$

**Interaction - Group X Tone:**

$[F(4,32) = 0.41, p = 0.41, ns]$

**Single Factor - Tones 1-3-5 (all students)**

**Tone:**  $[F(2,32) = 0.08, p = 0.91, ns]$

**Single Factor - Tones 1-3-5 (Majors)**

**Tone:**  $[F(2,16) = 0.39, p = 0.67, ns]$

**Single Factor 1-3-5 (Minors)**

**Tone:**  $[F(2,16) = 0.03, p < 0.03, ns]$

**Table 2: Data for error types and results of ANOVA**

In addition to looking at the number of errors generated for each tone, the analysis also examined the tones that students substituted *in error*, i.e. the error types. In this way, a better picture emerged of how low-level learners pronounce tone. Table 2 shows the error types that were generated in error for each target. Tone 1 (34%), Tone 5 (33%) and Tone 3 (30%) were the most common error types. In contrast, Tones 4 (3%) and 2 (0%) were virtually nonexistent as error types. Two-factor ANOVA found a significant difference between the Majors and the Minors ( $p < 0.05$ ). The test also found a significant effect for Tone ( $p < 0.0001$ ), which was likely influenced by the extreme difference in the occurrence of Tones 2 and 4 as error types relative to Tones 1, 3, and 5. Additional ANOVAs were carried out to determine whether any significant difference existed between Tones 1, 3 and 5 as “preferred” error types. A two-factor ANOVA for the combined cohort as well as

single factor ANOVAs for the Majors and Minors found no significant difference between Tones 1, 3 and 5 as error types.

<b>ALL STUDENTS</b>						
Target	<i>Mean Response Rates</i>					Total
	T1	T2	T3	T4	T5	
T1	<b>84.06%</b>	0%	8.59%	0.15%	7.18%	100%
T2	3.28%	<b>81.09%</b>	8.12%	2.03%	5.46%	100%
T3	5%	0%	<b>90.15%</b>	0.31%	4.53%	100%
T4	15.46%	0%	5.62%	<b>65.15%</b>	13.75%	100%
T5	7.81%	0.31%	6.25%	0%	<b>85.62%</b>	100%
<b>MAJORS</b>						
Target	<i>Mean Response Rates</i>					Total
	T1	T2	T3	T4	T5	
T1	<b>88.44%</b>	0%	6.56%	0%	5%	100%
T2	2.18%	<b>90%</b>	4.68%	0%	3.12%	100%
T3	3.12%	0%	<b>94.68%</b>	0%	2.19%	100%
T4	12.50%	0%	5.62%	<b>66.87%</b>	15%	100%
T5	5.31%	0%	1.87%	0%	<b>92.81%</b>	100%
<b>MINORS</b>						
Target	<i>Mean Response Rates</i>					Total
	T1	T2	T3	T4	T5	
T1	<b>79.68%</b>	0%	10.62%	0.31%	9.37%	100%
T2	4.37%	<b>72.18%</b>	11.56%	4.06%	7.81%	100%
T3	6.87%	0%	<b>85.62%</b>	0.62%	6.87%	100%
T4	18.43%	0%	5.62%	<b>63.43%</b>	12.50%	100%
T5	10.31%	0.62%	10.62%	0%	<b>78.43%</b>	100%

**Table 3: Response rates for each target tone. Boldface indicates the correct choice.**

The rest of this analysis will look more closely at the error types generated for each target tone.

### 6.3.1 Error Types for Tone 1

The Tone 1 (mid tone) words generated a target response rate of 84.06% correct (see Table 3). Tone 3, with a response rate of 8.59%, and Tone 5 (7.18%) were the only error types as there was only one occurrence of Tone 4 and none of Tone 2. Two-factor ANOVA (see Table 4) found no significant effect of group; that is, no difference between the scores of the Majors and the Minors. There was,

however, a significant effect of Tone ( $p < 0.0001$ ). The contour tones (Tones 3 and 5) occurred equally as errors for Tone 1 while Tones 2 and 4 (level tones) occurred equally infrequently.

### **6.3.2 Error Types for Tone 2**

Target Tone 2 (low tone) generated a rate of 81.09% correct responses. Tone 3 (8.12%) was the most frequent error type, followed by Tone 5 (5.46%), Tone 1 (3.28%), and Tone 4 (2.03%). Among the Minor students, the choice of Tones 3 and 5 as error types was especially frequent: 11.56% and 7.81%, respectively (as opposed to just 4.68% and 3.12% for the Majors). It would appear, therefore, that Tones 3 and 5 are easier to produce than Tones 1 and 4. However, the statistical analysis showed a more complex picture. Two-factor ANOVA (see Table 4) found significant effects for Tone and for Group, meaning that the difference between the Majors and Minors was significant. Indeed, the spread between the Majors (90% correct) and the Minors (72.18% correct) was greater than for any of the other tones, suggesting that Tone 2 is especially difficult for true beginners, such as the Minor students. Post-hoc tests suggested that Major students found Tone 2 to be moderately easy. They tended to substitute either Tone 3 or Tone 5 but never Tone 4 in error. On the other hand, Minor students struggled with or were confused by Tone 2. For they not only substituted the easy-to-pronounce Tones 3 and 5 as error types but also Tone 4, which almost never appeared as an error in any other part of the test.

<b>ANOVA Tone 1</b>	<b>ANOVA Tone 2</b>
<b>Two Factor</b>	<b>Two Factor</b>
Group: [F(1,32) = 3.08, <i>p</i> = 0.08, <i>ns</i> ]	Group: [F(1,32) = 14.08, <i>p</i> < 0.001]
Tone: [F(3,32) = 13.35, <i>p</i> < 0.0001]	Tone: [F(3,32) = 5.08, <i>p</i> < 0.01]
Interaction - Group X Tone: [F(3,32) = 0.89, <i>p</i> = 0.44, <i>ns</i> ]	Interaction - Group X Tone: [F(3,32) = 0.66, <i>p</i> = 0.57, <i>ns</i> ]
<b>Single Factor (Majors)</b>	<b>Single Factor (Majors)</b>
Tone: [F(3,16) = 8.96, <i>p</i> < 0.0001]	Tone: [F(3,16) = 4.52, <i>p</i> < 0.01]
<b>Single Factor (Minors)</b>	<b>Single Factor (Minors)</b>
Tone: [F(3,16) = 6.63, <i>p</i> < 0.0001]	Tone: [F(3,16) = 2.57, <i>p</i> = 0.61, <i>ns</i> ]

**Table 4: ANOVA of error types for targets Tone 1 and Tone 2**

### 6.3.3 Error Types for Tone 3

Tone 3 (falling tone) was the least problematic tone for both Majors (94.68% correct) and Minors (85.62% correct). As for error types, the outcome was similar to that for Tone 1. Tones 1 (5%) and 5 (4.53%) were the most common error types, whereas Tone 2 and Tone 4 were almost nonexistent. Two-factor ANOVA found a significant effect for Group as well as for Tone, and the post-hoc tests showed that the results for tones 1 and 5 differed significantly from those for tones 2 and 4. By contrast, there were no significant differences between Tone 1 and Tone 5 or between Tone 2 and Tone 4. These results then, add to the notion that Tone 3 is relatively easy for Japanese students (given the low number of errors) and that Tones 2 and 4 are difficult as they rarely appeared as an error type.

A Preliminary Analysis of Thai Tone Errors Made by Japanese Learners

ANOVA Tone 3	ANOVA Tone 4	ANOVA Tone 5
<p><b>Two Factor</b>            Group: [F(1,32) = 6.98,  <i>p</i> &lt; 0.01]            Tone: [F(3,32) = 9.70,  <i>p</i> &lt; 0.00001]            Interaction - Group X Tone:            [F(3,32) = 1.80, <i>p</i> = 0.15, ns]</p>	<p><b>Two Factor</b>            Group: [F(1,32) = 0.14,  <i>p</i> = 0.70, ns]            Tone: [F(3,32) = 10.28,  <i>p</i> &lt; 0.00001]            Interaction - Group X Tone:            [F(3,32) = 0.63, <i>p</i> = 0.59, ns]</p>	<p><b>Two Factor</b>            Group: [F(1,32) = 8.50,  <i>p</i> = 0.01]            Tone: [F(3,32) = 10.65,  <i>p</i> &lt; 0.00001]            Interaction - Group X Tone:            [F(3,32) = 2.76, <i>p</i> &lt; 0.05]</p>
<p><b>Single Factor (Majors)</b>            Tone: [F(3,16) = 4.05,  <i>p</i> &lt; 0.05]</p>	<p><b>Single Factor (Majors)</b>            Tone: [F(3,16) = 5.31,  <i>p</i> &lt; 0.01]</p>	<p><b>Single Factor (Majors)</b>            Tone: [F(3,16) = 4.10,  <i>p</i> &lt; 0.05]</p>
<p><b>Single Factor (Minors)</b>            Tone: [F(3,16) = 6.20,  <i>p</i> &lt; 0.0001]</p>	<p><b>Single Factor (Minors)</b>            Tone: [F(3,16) = 5.56,  <i>p</i> &lt; 0.01]</p>	<p><b>Single Factor (Minors)</b>            Tone: [F(3,16) = 7.58,  <i>p</i> &lt; 0.001]</p>

Table 5: ANOVA of error types for targets Tone 3 and Tone 4 Tone 5

6.3.4 Error Types for Tone 4

When tested on Tone 4 (high tone) words, both Majors (66.87%) and Minors (63.43%) performed poorly. They also made similar types of error, with Tones 1 (15.46%) and 5 (13.75%) as the most common error types. Tone 2 did not appear at all as an error, while Tone 3 (5.62%) appeared relatively little. Two-factor ANOVA found no significant effect for Group (both groups performed equally poorly). But it found a significant effect of Tone. As with the target Tone 1 and Tone 3 words, the post-hoc tests found that Tone 2 (nonexistent) differed significantly as an error type from Tones 1 and 5, which occurred frequently. Additionally, however, Tone 3’s low rate of substitution relative to Tones 1 and 5 was also significant, meaning that the latter were significantly more likely to be produced as a Tone 4 error than Tone 3. This suggests that while both Tone 3 (falling tone) and Tone 5 (rising tone) are both contour tones, they are not produced in an arbitrary manner. Indeed, their appearance as errors has much to do with the articulation of the target tone.

### 6.3.5 Error Types for Tone 5

Target Tone 5 (rising tone) resulted in a wide spread between the Majors (92.81% correct) and Minors (78.43%). For target Tone 5, subjects overwhelmingly substituted Tones 1 (7.81%) and 3 (6.25%) as error types. Tones 2 and 4 essentially did not occur as errors. Two-factor ANOVA revealed a significant effect of Group (the majors scored significantly higher than the Minors), and of Tone. Post-hoc tests revealed that the most significant differences lay between the tones that occurred (tones 1 and 3) and those that did not (tones 2 and 4). Target Tone 5 is the only tone for which ANOVA also found a significant effect of Tone X Group. This was likely due to the very high occurrence of Tones 1 and 3 among the Minors (10.31% and 10.62%, respectively) compared with the Majors (5.31% and 1.87%). The Minors clearly struggled with target Tone 5 words, and they substituted equally with Tones 1 and 3. As for the Majors, on the other hand, they produced Tone 3 so little that it was not significantly different from Tone 4 or Tone 2. Finally, it should be noted that while Tone 5 (rising tone) was a frequent error type for Tone 4 (high tone), the reverse was not true. Tone 4 never appeared as an error type in Tone 5.

### 6.3.6 Results – Concluding Remarks

Some of the key results from the above analyses include the following:

- Tone 4 (high tone) appears to be the most difficult tone. It generated the most errors (by both groups), and it rarely occurred as an error type for another target tone.
- Tone 2 (low tone) did not generate significantly more errors than tones 1, 3 or 5, but it never appeared as an error type. The Minors struggled significantly more with Tone 2 than did the Majors.
- Tone 1 (mid tone) did not differ statistically from tones 3 and 5. There was



no significant difference in the number of errors it generated or in how often it appeared as an error type. There was no significant difference between the two groups in how often they made Tone 1 errors or in how often they used Tone 1 as a substitute for some other target.

- Tone 5 (rising tone) did not generate significantly more errors than tones 3 or 1. But it appeared as an error type somewhat more for target Tone 4 than for target Tone 2. The Minors made significantly more errors with Tone 5 than did the Majors.
- Tone 3 (falling tone) generated the fewest number of errors. Among the three common error types (tones 1, 5, 3), it appeared the least. However, it was the most generated error type for target Tone 2.

## **7. Discussion**

The first hypothesis – that the five tones are not equally difficult – was confirmed. Indeed, the subjects responded differently to each tone. Tone 4 was clearly difficult for both Majors and Minors. They made significantly more errors with Tone 4 than any other, and they rarely produced Tone 4 as a substitute for another target tone. Tone 2 was also difficult, though significantly more so for the Minors than Majors. The difficulty associated with producing Tone 2 is more apparent in the way it was never spoken in error for another target tone. While it appeared that no significant difference could be found in the number of errors generated by tones 1, 3 and 5, there were many differences in the way these tones appeared as error types for other target tones (as will be discussed below).

The second hypothesis – that contour tones (tones 3 and 5) would be produced more accurately than level tones (tones 1, 2 and 4) – was largely confirmed.

Tones 3 and 5 did generate substantially fewer errors than Tones 4 and 2, but not significantly fewer than Tone 1. Tones 3, 5, and 1 were also the tones most often produced as substitutions for other target tones. The subjects may have been comfortable producing falling and rising tones because they are similar to pitches used in Japanese to differentiate certain word pairs as well as to convey statement or question intonation, respectively. On the other hand, as noted above, Tone 5 occurred far more often than Tone 3 as an error type for target Tone 4 while Tone 3 occurred more often than Tone 5 as an error type for target Tone 2. When students couldn't produce the high tone, they most often produced rising tone; likewise, when the low tone was the target, they tended to produce the falling tone but not the rising tone. In these cases, the students may have been aware of the target but were unable to articulate it accurately. Regarding Tone 1 (mid tone), the results showed that it is neither especially difficult nor easy. Students often got it wrong (it generated slightly more errors than tones 3 and 5), but they also frequently pronounced it as a substitute for other target tones. Tone 1 does not stand in opposition to any tone in the manner of Tones 2 and 3 or 4 and 5. It may be that the mid tone is chosen when a student is not entirely certain of the appropriate target.

The third hypothesis – that Tones 4 and 3 would be the most difficult and easy, respectively – was proven correct as far as Tone 4 is concerned (see above). While Tone 3 was proven to be easy, it was not possible, based on this research, to produce a hierarchy of tone difficulty with Tones 3 and 4 at opposite ends of the spectrum.

As for the final hypothesis – that Tone 3 will be the most frequent error type for other target tones whereas Tone 4 will be the least frequent error type – it could not be proven correct. Tones 1 and 5 occurred as error types more often than Tone 3.

And Tone 2 occurred even less frequently than Tone 4 as an error type; indeed, Tone 2 occurred as an error type just twice in comparison to Tone 4's 16 occurrences. As the low tone, Tone 2 may be an unfamiliar pitch that has no prosodic function in Japanese (unlike rising and falling pitches). This may be one reason why it was not produced in error for another target. Clearly more research will be required to understand more about all the tones and their frequencies as error types.

Finally, the difference in performance between the Majors and the Minors should be discussed. As mentioned above, the Majors performed significantly better than the Minors on the test overall, suggesting that the extra time spent in the classroom as well as in conversation with native speakers (the Thai exchange students) had a positive effect on their acquisition and production of tone.

## **8. Conclusions: Implications for Teaching**

This research study, though preliminary, suggests strongly that low level students should be introduced to and drilled in the Thai tones from the very start of their study of the Thai language. This study showed that teachers of Thai should place special emphasis on Tone 4 and Tone 2 when they introduce students to Thai tones. Since tone is an integral part of lexical meaning and using the wrong tone can cause misunderstandings, students must learn to use correct pronunciation. Once students have a firm base of pronunciation, they can develop other language skills more smoothly and use them in carrying out longer conversations. Recognizing that the current study looked at tone in citation form, further study of tone production in connected speech is necessary in order to understand better how to help students gain native-like pronunciation. In connected speech it is possible that patterns of error and target tone substitution may be quite different.

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## Appendix

### List of 100 words

No.	words	phonetic	meaning	No.	words	phonetic	meaning
1	หนึ่ง	nùŋ	one	2	สอง	sǔwŋ	two
3	สาม	sǎam	three	4	สี่	sii	four
5	ห้า	hâa	five	6	หก	hòk	six
7	เจ็ด	cèt	seven	8	แปด	pèet	eight
9	เก้า	kâaw	nine	10	สิบ	síp	ten
11	ร้อย	rǔwŋ	100	12	พัน	phan	1000
13	ผม	phǒm	I (for man)	14	คุณ	khun	you
15	พ่อ	phǔw	father	16	แม่	mêe	mother
17	พี่	phii	older	18	น้อง	nǔwŋ	younger
19	ไทย	thay	Thai	20	ยาก	yâak	difficult
21	สวย	sǔay	beautiful	22	ได้	dâay	can
23	แพง	phæŋ	expensive	24	กิน	kin	to eat
25	ช้า	cháa	slow	26	ใหญ่	yây	big
27	ไป	pay	to go	28	เล็ก	lék	small
29	เรียน	rian	to study	30	ไม่	mây	not, no
31	อ่าน	ǐaan	to read	32	เขียน	khian	to write
33	ปิด	pít	to close	34	ลง	loŋ	to go down
35	เดิน	dœn	to walk	36	อุ่น	ǐùn	warm
37	ชอบ	chǔwŋp	like	38	มา	maa	to come
39	เลี้ยว	líaw	to turn	40	เก่ง	kèŋ	skillful
41	เลือก	lúak	to choose	42	ไก่	kây	chicken
43	แต่	têe	but	44	กับ	kàp	and
45	หมู	mũu	pig	46	งู	ŋuu	snake
47	ช้าง	cháaŋ	elephant	48	เต่า	tàw	turtle
49	ผึ้ง	phũŋ	bee	50	ม้า	mâa	horse
51	นก	nók	bird	52	ยุง	yũŋ	mosquito
53	เป็ด	pèt	duck	54	ปู	puu	crab
55	เร็ว	rew	fast, quick	56	หนู	nũu	mouse

A Preliminary Analysis of Thai Tone Errors Made by Japanese Learners

57	เสือ	sǔua	tiger	58	หงส์	hǒŋ	swan
59	อูฐ	ʔùut	camel	60	หมา	mǎa	dog
61	หมี	mii	bear	62	วัว	wua	cow
63	เงาะ	ŋóʔ	rambutan	64	ส้ม	sôm	orange
65	ร้อน	róon	hot (weather)	66	หนาว	nǎaw	cold
67	นี้	nii	this	68	ฝน	fǒn	rain
69	ตก	tòk	to fall	70	ชื่อ	chǐu	name
71	เสื้อผ้า	sǔua	clothes	72	แขน	khǎen	arm
73	หมวก	mùak	hat	74	แว่น	wên	glasses
75	แหวน	wǎen	ring	76	ขา	khǎa	leg
77	ยาว	yaaw	long	78	แล้ว	léaw	already
79	ขาว	khǎaw	white	80	ดำ	dam	black
81	สั้น	sân	short	82	หวาน	wǎan	sweet
83	แดง	dɛɛŋ	red	84	ฟ้า	fáa	sky blue
85	เหลือง	lǐwǎŋ	yellow	86	น้ำ	náam	water
87	เผ็ด	phèt	hot taste	88	ข้าว	khǎaw	rice
89	บ้าน	bâan	house	90	และ	léʔ	and
91	ครับ	khǎp	polite ending for man	92	พูด	phùut	to speak
93	ฟัง	faŋ	to listen	94	ซ้าย	sáay	left
95	กุ้ง	kûŋ	shrimp	96	พบ	phóp	to meet
97	ร้าน	ráan	shop	98	มี	mii	to have
99	เท้า	thǎaw	foot	100	สี	sii	color