THE EFFECT OF INCREDULITY AND PARTICLE ON THE INTONATION OF YES/NO QUESTIONS IN TAIWAN MANDARIN

Yu-Ying Chuang, Yi-Hsuan Huang, & Janice Fon

Graduate Institute of Linguistics, National Taiwan University
{r95142001, r94142011, jfon}@ntu.edu.tw

ABSTRACT

This study explored the effect of incredulity and particle on the intonation of yes/no questions in Taiwan Mandarin. Two types of questions were examined – ones with and without the question particle *ma*. Results showed that to convey incredulity, the overall pitch would be raised and enlarged. Moreover, questions without particles were significantly higher in pitch and larger in pitch range than questions with particles. This thus led to a conclusion that the degree of incredulity being expressed in questions with *ma* might not be as great as that in questions without *ma*.

Keywords: incredulity, yes/no question intonation, question particle *ma*, pitch height, pitch range.

1. INTRODUCTION

Many languages have more than one way of constructing yes/no questions. In English, the most common construction is by switching the order of the subject and the verb of the sentence (VSO). However, in informal contexts, one could also use a statement construction (SVO) with a question intonation to achieve the same function.

On the other hand, in Mandarin, there are at least three ways of constructing yes/no questions. The most common way is by adding the question particle *ma* to the sentence-final position of the statement. Another way is by morphologically transforming the verb into an A-not-A construction (e.g., *ni*^{3} *yao*^{4}-*bu*^{2}-*yao*^{4} 'you want-not-want,' meaning 'do you want to?'). Finally, one can also use a statement construction with a question intonation, as in English. However, unlike English, such a construction is marked, and always conveys a tone of incredulity.

Intonations of yes/no questions in Mandarin have been widely studied [3, 7, 8]. Shen [9] showed that yes/no questions with and without *ma* are overall higher in pitch than the corresponding statements, while the A-not-A yes/no questions end as low as the corresponding statements.

For questions without *ma*, the results corresponded nicely with those found in English [4, 11] and Korean [5], in which the enlargement of the pitch range is associated with both the production and perception of incredulous intonations. However, as for questions with *ma*, studies do not always agree. Sung and Chiang [10] showed that questions with *ma* end high in pitch, which cause a rise towards the end of the sentence. In contrast, Chiang [3] showed that such questions end low, resulting in downward pitch contours. In other words, Sung and Chiang [10] corresponded better with Shen [9]. The discrepancy between Chiang [3] and Shen [9] could be easily explained away by possible dialectal differences, as the former studied Taiwan Mandarin, and the latter Mainland Mandarin. However, the discrepancy between Sung and Chiang [10] and Chiang [3] could not be as easily dismissed, as both studied the Taiwan Mandarin variety.

We suspected that differential elicitation methods might be the reason for the discrepancies in the results. Chiang [3] asked subjects to read sentences without contexts, while Sung and Chiang [10] provided subjects with felicitous discourse contexts for target elicitation. A closer inspection of the contexts used showed that most of the intended targets are incredulous yes/no questions. On the other hand, since Chiang [3] did not provide contexts for subjects, we suspected that it was the default/neutral questions that might have been elicited.

2. AIMS OF THE STUDY

There are two specific aims in this study. The first is to study the effect of incredulity on the realization of yes/no question intonation. If incredulity is the reason for discrepancies in yes/no questions with *ma* in previous studies, then one would expect to find similar intonation patterns in questions with and without *ma* under incredulous contexts, as questions without *ma* are interpreted as incredulous questions by default.

Secondly, we would like to study the effect of the final particle *ma* on incredulous questions. As questions with *ma* are much more common than those without in Mandarin, one suspected that the degree of incredulity might also be different. Considering questions with *ma* indicating a more unmarked situation, one would therefore predict that incredulous questions with *ma* might have a lower pitch height than those without *ma*.

3. METHOD

3.1. Materials

Stimuli were four two-syllable proper names with identical adjacent tones – *Ou*^{1}*la*^{1}, *Liu*^{2}*min*^{2}, *Li*^{3}*mei*^{3}, and *Ye*^{4}*na*^{4}. Each name was assigned a distinct cartoon character. All syllables were sonorants to facilitate pitch extraction. These four names were inserted into a carrier sentence, *ta*^{1} *shi*^{4} _____. 'S/he is_____.' There were four conditions, including incredulous questions without *ma* (IQ), incredulous questions with *ma* (IQm), neutral questions with *ma* (NQm), and neutral statements (NS). Appropriate punctuation marks were used to facilitate production (Table 1). Each sentence along with its corresponding cartoon character was printed on A4 paper. Additional contexts were given verbally for each condition. Incredulity was created by mismatching names and cartoon characters (Table 2). In total there were 4 (names) × 4 (conditions) = 16 stimuli.

Table 1: Stimuli used for elicitation.

Condition	Carrier Sentence
IQ	***ta*^{1} *shi*^{4} _____!?** 'Is he/she _____!?'
IQm	***ta*^{1} *shi*^{4} _____ *ma*^{0}!?** 'Is he/she _____!?'
NQm	***ta*^{1} *shi*^{4} _____ *ma*^{0}?** 'Is he/she _____?'
NS	***ta*^{1} *shi*^{4}** _____. 'He/She is _____.'

3.2. Subjects

Subjects were ten female native speakers of Taiwan Mandarin, aged from 18 to 30.

3.3. Equipment

A PCM-M1 DAT recorder and SONY MDR-7502 dynamic stereo headphones were used for recording.

3.4. Procedure

Subjects were seated in a sound-treated room. They were introduced to the four cartoon characters and their names, and were asked to read the sentences after given the verbal conditions. The sentences were blocked by condition (NQm, NS, IQ, IQm) (Table 2). Within each block, stimuli were randomized in the order of (T1, T4, T2, T3 for NQm and NS, and T2, T3, T1, T4 for IQ and IQm). The four blocks were repeated once. In total, there were 16 (stimuli) × 10 (subjects) × 2 (repetitions) = 320 sentences.

Table 2: The provided contexts for elicitation.

Stage	Provided Context
Prep.	Four cartoon characters and four names, were shown to the subjects.
NQm	"Now since you do not know which name belongs to which character, you will have to ask me one by one." ***ta*^{1} *shi*^{4} *Ye*^{4}*na*^{4} *ma*^{0}?** 'Is she Yena?' 
NS	"Now I will let you know every character's name, and please tell me who they are." ***ta*^{1} *shi*^{4} *Ye*^{4}*na*^{4}.** 'She is Yena.'
IQ	"After a while someone came to you and told you that in fact it is this character that is called *Ye*^{4}*na*^{4}. You were very surprised, and said, …" ***ta*^{1} *shi*^{4} *Ye*^{4}*na*^{4}!?** 'Is she Yena!?' 
IQm	"Now here comes another person. He told you again that the girl with short hair is indeed *Ye*^{4}*na*^{4}. So you were still surprised, and said, …" ***ta*^{1} *shi*^{4} *Ye*^{4}*na*^{4} *ma*^{0}!?** 'Is she Yena!?'

3.5. Judgment test

The judgment test was conducted to only select sentences that succeeded in expressing incredulity. The 320 sentences were divided into four groups respectively, constituting eight groups. Each group had 40 sentences containing every speaker's utterance of all four conditions and all four tones. These 40 sentences in each group were arranged in random order. The interstimulus interval was 4-sec.

24 proficient Mandarin speakers other than the subjects above, aged from 18 to 30, participated in this experiment. They were divided into eight groups. Their task was to decide whether the given sentence was incredulous or not. Each sentence could only be listened to once. No play-back was allowed. Each sentence was judged by three people.

If the judgment of one particular sentence was correct, then that sentence got one point. Only sentences scored above two were included for further data analyses. Data of one speaker were entirely excluded due to her heavy Taiwanese Mandarin accent. In the end, 233 sentences were subjected to statistical analyses (NQm – 43; NS – 72; IQ – 58; IQm – 60).

3.6. Data analyses

Pitch extraction and measurement were done by *Praat* (version 4.5.15). F_0 of eligible sentences were extracted and hand-checked. The two syllables of the proper name in the stimuli was the focus of this study. For *Ou*^{1}*la*^{1}, the initial (H) and final F_0 values (H) were extracted. For *Liu*^{2}*min*^{2}, the initial (L) and final F_0 values (H) of the two rises were extracted. For *Li*^{3}*mei*^{3}, due to a tone sandhi rule of changing the first T3 to a T2 (resulting in *Li*^{2}*mei*^{3}), we measured the initial (L) and the final F_0 (H) of the rise of *li*^{3} and the initial (H) and the final F_0 (L) of the fall of *mei*^{3} (the final rise was often omitted in Taiwan Mandarin). For *Ye*^{4}*na*^{4}, the initial (H) and the final F_0 (L) of the two falls were measured.

4. RESULTS

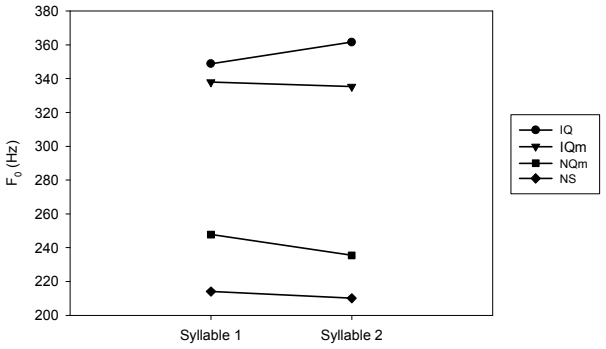
4.1. Pitch height

Two planned statistical analyses were executed. The first was a *Ma* (2) × Syllable position (2) two-way repeated-measures on the H-tone pitch extractions of the bisyllabic proper names to test the effect of the presence of particle *ma* on pitch height for incredulous sentences. Results showed that the main effect of *Ma* was significant [$F(1, 24) = 10.20$, $p < 0.01$, $\hat{\eta}^2 = .30$]. The interaction was also significant [$F(1, 24) = 8.29$, $p < .01$, $\hat{\eta}^2 = .26$].

As in Figure 1, post hoc paired *t* tests showed that pitch was higher in incredulous sentences without *ma* [Syllable 1: $t(24) = 2.57$, $p < .05$; Syllable 2: $t(24) = 3.44$, $p < .01$]. Across syllable positions, Syllable 1 was near-significantly higher than Syllable 2 in incredulous questions without *ma* [$t(32) = -1.82$, $p = .07$]. No Position difference was found for questions with *ma*.

The second analysis was a Incredulity (2) × Syllable Position (2) two-way repeated-measures on pitch height for questions with *ma*. There was a main effect of Incredulity [$F(1, 23) = 175.14$, $p < 0.0001$, $\hat{\eta}^2 = .88$]. The main effect of Position was also near-significant [$F(1, 23) = 3.90$, $p = 0.06$, $\hat{\eta}^2 = .15$] (Figure 1). Post hoc pairwise comparisons using Bonferroni's adjustments showed that incredulous sentences were significantly higher in pitch than neutral ones ($p < .0001$). In addition, Syllable 1 was marginally significantly higher than Syllable 2 ($p = .06$).

Figure 1: The mean highest F_0 values of different sentence types in two positions. The NS (neutral statement) serves as a baseline for comparison.

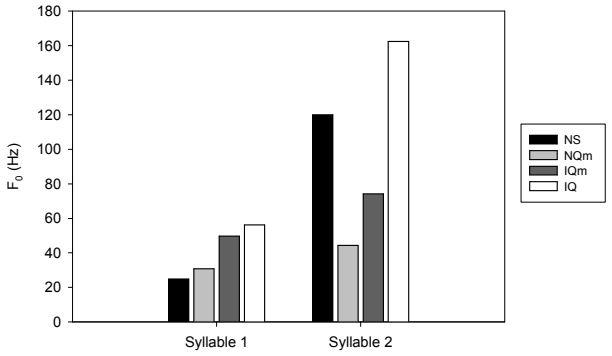


4.2. Pitch range

Figure 2 showed the pitch range of the three contour tones in two syllable positions. Pitch range was calculated by subtraction of pitch extraction at the lowest point of each syllable from its value at the highest point. (Since T1 is level tone, its pitch range was not included.) A *Ma* (2) × Position (2) two-way repeated-measured ANOVA was conducted to examine the effects of particle *ma* on pitch range of incredulous questions. Both of the main effects were significant [*Ma*: $F(1, 17) = 16.05$, $p < 0.001$, $\hat{\eta}^2 = .49$; Position: $F(1, 17) = 21.48$, $p < 0.001$, $\hat{\eta}^2 = .56$]. The interaction effect was also significant [$F(1, 17) = 11.95$, $p < 0.01$, $\hat{\eta}^2 = .41$]. Post hoc paired *t* tests showed that Syllable 2 always had a wider pitch range than Syllable 1 [w/ *ma*: $t(17) = -2.39$, $p < .05$; w/o *ma*: $t(25) = -5.47$, $p < .0001$]. On the other hand, the effect of *ma* was only affecting Syllable 2 [$t(17) = 3.94$, $p < .01$]. No difference was found in Syllable 1.

To explore the influence of incredulity, a similar Incredulity (2) × Syllable Position (2) two-way repeated-measures was conducted on questions with *ma*. Results showed that both of the main effects were significant [Incredulity: $F(1, 16)= 28.68$, $p < 0.0001$, $\hat{\eta}^2 = .64$; Position: $F(1, 16)= 4.64$, $p < 0.05$, $\hat{\eta}^2 = .22$]. The interaction effect was marginally significant [$F(1, 16)= 4.20$, $p = 0.06$, $\hat{\eta}^2 = .21$]. Post hoc paired *t*-test showed that incredulous sentences had significantly wider pitch ranges than neutral ones, regardless of positions [Syllable 1: $t(16) = -2.86$, $p < .05$; Syllable 2: $t(16) = -5.91$, $p < .0001$]. However, the pitch range was much larger in Syllable 2. In addition, Syllable 2 also had a wider pitch range than Syllable 1 for neutral questions [$t(25) = -2.34$, $p < .05$].

Figure 2: The mean pitch range of three contour tones in the two positions for four types of sentences.



5. DISCUSSION

Question intonations in Mandarin, as shown in this study, indeed pattern differently from statement intonations. In general, yes/no questions, with *ma* or without *ma*, in either neutral or incredulous condition, were higher in F_0 than statements. However, the patterning of pitch also varied among different types of questions. It was found that incredulous questions had higher F_0 contours than neutral questions. Further, incredulous questions without *ma* were even higher in F_0 than those with *ma*. This order held true regardless of the tone type.

Similar results were also found in the analyses of pitch range. Incredulous questions had a larger pitch range than neutral ones. In addition, pitch ranges of questions without *ma* were larger than those with *ma*. Taking the two results together, we suggested that higher pitch and larger pitch range were salient features of incredulous intonation. Since larger pitch range tends to indicate greater speaker's involvement [1, 6], this might be why incredulous sentences were wider in pitch range and higher in pitch. Along the same line, we also found questions without *ma* to be wider in pitch range and higher in pitch than questions with *ma*. As the latter is the default form of interrogatives in Mandarin and the former the marked form, there might also be a difference in the degree of incredulity between the two. The results in our data seemed to support this premise.

Another interesting finding was the unequal widening of pitch range in the two syllable positions. Across tones, pitch range of the second tone was significantly larger than that of the first one. We suspected that this might have to do with the word-final stress rule in Mandarin, which specified that stress tends to fall on the last syllable of words [2]. Further analyses should be included to further clarify this point.

6. REFERENCES

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