

Interaction of Syntax-marked Focus and *Wh*-question Induced Focus in Standard Chinese

Yuan Jia¹, Aijun Li¹

¹Phonetics Lab, Institute of Linguistics, Chinese Academy of Social Sciences, China

summeryuan_2003@126.com, liaj@cass.org.cn

Abstract

The present study mainly investigates the interaction of *syntax*-marked focus and *wh*-question induced focus on the formation of F_0 patterns in Standard Chinese (Hereinafter, SC). Acoustic experiment demonstrates that the *syntax*-marked (*lian* or *shi*) focus can co-exist with the *wh*-question induced focus. The results are two folds: (i) the two kinds of focuses can add together to trigger more obvious F_0 prominence on the under-focus constituents and F_0 compression on the post-focus constituents; (ii) they can realize prominences simultaneously on difference constituents in one sentence. Therefore, the F_0 pattern of SC presents itself to observe the *nuclear prominence* and *pre-nuclear prominence* classification as in English. Specifically, the single focus induces the *nuclear prominence* and the dual focus triggers both *nuclear prominence* and *pre-nuclear prominence*.

Index Terms: Syntax-marked focus, *Wh*-question induced focus, nuclear prominence, pre-nuclear prominence

1. Introduction

In Chinese literatures, the '*lian...dou*' and '*shi...de*' constructions are considered to be the typical structures to mark focus (refer to Fang [1], Liu and Xu [2], Xu [3] and Liu [4]). In grammatical studies, the '*lian...dou*' structure is adopted to mark *contrast*, i.e., Fang [1] states that only the constituent immediately following *lian* is the focus bearing unit, and *lian* can be taken as the contrastive focus marker. She further explains the nature of the 'NP' after the marker *lian*: (i) within the *lian* sentence, the NP marked by *lian* is the most extreme element; (ii) the non-nominal element after *lian* bears the nature of a nominal. With regard to the '*shi...de*' structures, *shi* is the closed equivalent of English copula "be," and *de* is a particle with various functions: modification marker (Ross [5]), nominalizer (Chao [6]), and past-tense marker (Song [7]). Previous grammatical studies on the '*shi...de*' construction mainly discuss its focus marking function, i.e., Liu [4] lists three kinds of strong focus marking of *shi...de* structure: (i) *shi*; (ii) *shi+...+de*, and (iii) *shi+...+V+de+ NP*. In addition to the discussions in grammatical aspect, Jia et al [8] deals with the phonetic realization of *shi*-marked focus at the sentential level, results of the study show that the intonational prominence bears corresponding relationships with the *shi*-marked items. The pitch range of the focused item is expanded and the pitch registers of constituents immediately following the *shi*-marked focus being compressed successively.

In regard with the acoustic analysis of *wh*-question elicited focus, previous studies have nevertheless show that the F_0 and durational patterns exhibit both universal as well as language-specific features. Related to the F_0 patterns, both English and Chinese show that the focus extensively modulates the global shape of the F_0 curve, i.e., the pitch range of the under-focus constituents are expanded and the pitch range of the post-focus are compress while leaving the

pitch range of the pre-focus constituent largely intact. Due to the existence of the tones in SC, the essential causes for the expansion of the pitch range of the focused item lie in the raising of the H tones and the lowering of the L tones (Xu [9] [10]). Further, when the focused constituent extends to more syllables, the whole constituents bears F_0 changes, i.e., when five-syllable words are correctively focused and the whole focused constituents are affected by the focus, specifically, focus raises the H tones of each focused syllable and the magnitude of such rising is largest in the final syllable (Jia et al [11]).

From the previous studies on '*lian...dou*' and '*shi...de*' constructions in SC, it can be obtained that the analysis mainly concentrates on their syntactic or semantic function. The phonetic and phonological natures of the interaction of *syntax*-marked focus and *wh*-question elicited focus have not been clearly discussed. Therefore, the purpose of this study is to systematically explore the nature of prominences triggered by different kinds of focuses. i.e., the co-existences and conflicts of *syntax*-marked focus ('*lian...dou*' and '*shi...de*' marked focus) and *wh*-question induced focus (hereinafter, *wh*-focus) on the formation of the F_0 patterns in SC. The study further addresses the following questions: i) what is the effect of *syntax*-marked focus on the F_0 prominence? ii) what constituents the differences of *shi*-marked focus and *lian*-marked focus? iii) what is the co-existing and conflicting manner of *syntax*-marked focus and *wh*-focus in one sentence? iv) what is the phonological nature of the prominences induced by the combined effects of focuses?

2. Methods

2.1. Materials

The aim of the experiment is to test the co-existences and conflicts of the *syntax*-marked focus and the *wh*-elicited focus. The important factors to be considered in the design of the materials are how to include these focuses in the target sentence so that we can observe various kinds of phonetic functions of them. The core set of the test-sentences is formed by the word order of "subject-verb-object" as the unmarked sentence, given in (i), specifically, S=Liumin, V=Tiba, O=Maolan, the *lian...dou* and *shi...de* sentence is composed by *lian* and *shi* being inserted into the proceeding position of the subject constituents in the unmarked sentence (Fang [1]). The insertion of *Le0* in unmarked and *lian...dou* structure is to keep the phonetic balance with the *shi...de* construction, the sentences are listed in (ii)-(iii):

- (i) Liu2 Min2 Ti2 Ba2 Mao2 Lan2 Le0.
liu min elevate mao lan le
(Liumin elevated Maolan).
- (ii) Lian 2 Liu2 Min2 Dou1 Ti2 Ba2 Mao2 Lan2 Le0.
even liu min all elevate mao lan le
(Even Liumin elevated Maolan)
- (iii) Shi4 Liu2 Min2 Ti2 Ba2 Mao2 Lan2 De0.

shi liu min elevate mao lan de
(It was Liumin that elevated Maolan)

A number of factors influence the choice of syntactic structure, e.g., word order of the sentence, lexical items and segmental compositions. As for the former, the following two aspects were considered: (i) the intonation of neutral sentence with the word order as SVO has been studied by different authors (e.g. Xu [10]); (ii) It is also proposed that the word order of SVO is the least marked word order in SC in the sense that they imposes the fewest constrains on the object referent (Xu [12]). As for the tonal combinations, “tone2+tone2” were employed onto each syntactic constituent that can observe the entire changes of F_0 from L-H tones permutation in one sentence. The reason for the selection of the initial of each word as the sonorant is to control the segmental effect upon F_0 (Xu [10]).

The sentence in (i)-(iii) was preceded by different *wh*-questions in order to elicit the production of utterances with various focus readings. The *wh*-question together with the target sentences are listed in part 3.

2.2. Subjects and recordings

All the *asking-answering* sentences were included in the recording schema with two times repetitions. The orders of these sentences were automatically randomized by computer software. Eight Standard Chinese speakers, four females and four males, aged within 20-45, were recruited as the subjects. These subjects were divided into four groups, each contains two women or two men. They were totally native to the purpose of this experiment and were told to read the *answering-answer* pairs fluently.

Recording was conducted in the sound treated booth in Phonetics Lab, Institute of Linguistics Chinese Academy of Social Sciences. Sound files were digitized at 16kHz. During the recording procedure, each *wh*-question and target sentence pair appeared on the screen. The speakers were instructed to read the sentences as naturally as possible, and they were free to repeat them in case they considered their reading not fluent or unnatural. After the presentation of the materials, the subjects were asked to change the asking-answer role. Finally, we got 32 samples for each target sentence for further examination.

2.3. Data labeling and extraction

All the sound files were annotated and extracted from the following steps: i) firstly, all ‘wav’ files were segmented by automatic segmentation software, and then syllable boundaries of each syllable were modified by hand to ensure the accuracy of the data; ii) the “PitchTier” file for each target sentences was modified automatically by praat script; iii) The extraction of F_0 data was based on the PitchTier files with each syllable in the target sentence being selected ten points.

2.4. Measurements and statistical analysis

Since the global range of each target sentence is defined as the difference between maximum and minimum of values of tones, and the local range of every tonal sequence is defined as the difference between the values of the H and L targets. F_0 values of the following set of points in the contour were obtained according to the specific aim of the analysis: (i) the mean F_0 contour of each constituent in the sentence; (ii) the maximum value of H tones and minimum of L tones of target items; (iii) Bonferroni post hoc test was adopted to examine the significance of differences among the constituents in various focus conditions.

3. Phonetic realization of interaction of different kinds of focuses

This part is concerned with the F_0 patterns formed by the interaction of *syntax*-marked focus and *wh*-question elicited focus. In order to explore the co-existence and conflict of the focuses, specific context was designed so that the *syntax*-marked focus and the *wh*-elicited focus can form various relationships, e.g., co-existence on the same constituents or conflict with each other in the formation of the F_0 patterns. Consequently, the F_0 patterns conveyed by different kinds of focuses can be defined by phonological means. Further, a consistent correlation between the F_0 patterning and *syntax*-marked focus can be expressed in terms of the phonological categories and not in terms of variation in physical continua.

3.1. Phonetic realization of *syntax*-marked focus

The major aim of this part is to explore the specific manner of the effect from *lian* and *shi* marked focus. F_0 is taken as the parameter to investigate this effect. In particular, if the *syntax*-marked focus (*lian* or *shi* marked) is found to be consistently signaled by distinctive F_0 means in SC, the effect of the focus should be captured in phonological means. In order to approach this goal, the following *asking-answering* pairs are adopted:

(i) Asking: Fa1 Sheng1 Le0 Shen2 Me0 Shi4?
happen le what case
(What happened?)

Answering:

- Lian2 Liu2 Min2^[+LianF] Dou1 Ti2 Ba2 Mao2 Lan2 Le0.
- Shi4 Liu Min2^[+ShiF] Ti2 Ba2 Mao2 Lan2 De0.
- Liu2 Min2 Ti2 Ba2 Mao2 Lan2 Le0.

It can be observed that the *lian* and *shi* marked focuses always locate on the subject items “liu2min2”, and through the selection of the *wh*-operator ‘Fa1 Sheng1 Le0 Shen2 Me0 Shi4? (What happened?),’ the three target sentences locate in the same context. The only difference of these three sentences is the syntactic structure. Therefore, we can compare the effect from the *syntax*-marked focus and the unmarked sentence.

Figure 1 is adopted to illustrate the mean F_0 in three syntactic structures: Lian2 Liu2 Min2^[+LianF] Dou1 Ti2 Ba2 Mao2 Lan2 Le0, Shi4 Liu2 Min2^[+ShiF] Ti2 Ba2 Mao2 Lan2 De0, and Liu2 Min2 Ti2 Ba2 Mao2 Lan2 Le0. The top part of the X-coordinate describes the contents of each syllable in the sentence, and the bottom illustrates the syntactic structure and the utterances, concretely, ‘LianSB’ denotes an utterance that contains a *lian*-marked focus distributing on the subject constituent. The designation ‘ShiSB’ denotes a *shi*-marked sentence with the subject item serving as the focused item, and ‘Un’ means the sentence is unmarked. The Y-coordinate illustrates the pitch range of the graph, and has a range of 110Hz-260Hz based on the average range of all the speakers.

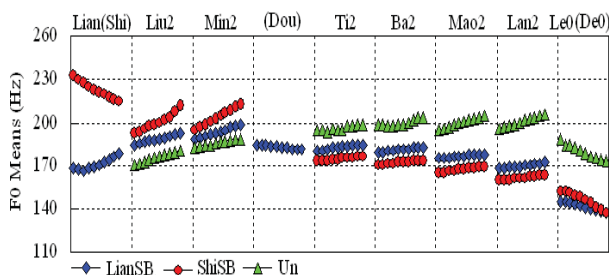


Figure 1: Mean F_0 of *Lian*, *Shi* and unmarked sentences

It can be obtained clearly from the above graph that there appears an F_0 prominence in the contour ‘LianSB’. The prominence in the

sentence distributes on the subject constituent; i.e., the word “liu2min2”. Concretely, the “H” tones of the two syllables are obviously higher than the other syntactic elements within the sentence, while the ‘L’ tones are a little bit higher. Compared to the ‘Un’ contour, the subject constituent in a *lian*-marked sentence also exhibits a higher pitch register. The constituents locating after the *lian*-marked focus (e.g., Dou1 Ti2Ba2 Mao2Lan2 Le0) undergo compression and exhibit a lower pitch register than the unmarked sentence. With regard to the *shi*-marked sentence, the item that locates immediately after *shi*-marked focus exhibits the most obvious prominence among the three subject constituents. The pitch register distributing after the *shi*-marked subject obtains the lowest pitch register. A further One-Way ANOVA was conducted to compare the significance of the minimum and maximum pitch value differences induced by *shi* and *lian* focuses on the positions of subject, verb, and object. Results of the Bonferroni post hoc test shows that the maximum pitch values of all the syntactic entities in the contour are different from each other with $P_{\max} < 0$, however, the minimum value of the L tones of the $L_{\text{iumin}}^{\text{LianSB}}$ is not significantly different from $L_{\text{iumin}}^{\text{ShiSB}}$ with $P_{\min} > 0$.

The study of the F_0 pattern in various syntactic structures developed here shows that the *syntax*-marker can affect the global F_0 patterns of the sentence. Specifically, the marked focus exhibits similar effect with the single *wh*-focus that it can exert F_0 prominence in under-focus position and compresses the F_0 ranges in post-focus positions. In comparison with the focus marker *shi*, *lian* shows a slight effect upon F_0 rising under focus and F_0 compression in the positions after the focus.

3.2. Syntax-marked focus and wh-focus on the same item

This part mainly deals with the additive effect from the *syntax*-marked focus and the *wh*-focus on the formation of the F_0 patterns in SC. Specifically, it concerns with the following issues: (i) the physical correlates of the effect from the addition of *lian*-marked focus or *shi*-marked focus with the *wh*-focus; (ii) the domain over which the focused constituents may extend; and (iii) the phonological means to represent the additive focus in the surface form. The target sentences for the examination of additive focuses are:

- (i) Lian2 Shei2 Dou1 Ti2 Ba2 Mao2 Lan2 Le0?
even who all elevate mao lan le
 (Even who elevated Maolan?)
 Lian2 Liu2 Min2^[+LianF&+F] Dou1 Ti2 Ba2 Mao2 Lan2 Le0.
- (ii) Shi4 Shei2 Ti2 Ba2 Mao2 Lan2 De0?
is who elevate mao lan de
 (It is who that elevated Maolan?)
 Shi4 Liu2 Min2^[+ShiF&+F] Ti2 Ba2 Mao2 Lan2 De0.

The other two target sentences are identical with the (i)-a and (i)-b in part 3.1.

Figure 2 is the mean F_0 of the utterances with four kinds of focus conditions: the addition of *lian*-marked focus and *wh*-focus; the addition of *shi*-marked focus and *wh*-focus; the *shi*-marked focus and *lian*-marked focus. These focus conditions are described by the symbols in the bottom part of the graph. Specifically, ‘LianSB-F’ and ‘ShiSB-F’ denote the case in which the *lian* and *shi* marked focuses combine with the *wh*-focus. The designations ‘LianSB’, ‘ShiSB’ and the Y-Coordinate denote the identical content with Figure 1.

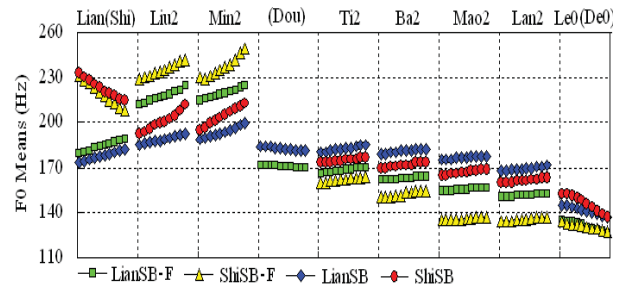


Figure 2: Mean F_0 of sentences in additive focus condition

The mean F_0 contour of ‘LianSB-F’ shows that the subject bearing units clearly exhibit pitch register rising and it is more obviously than the one in contour ‘LianSB’. Moreover, the pitch registers of the successive syllables are significantly compressed, which indicate a compressive effect from the focused subject items. As for the F_0 contour of ‘ShiSB-F’, it replicates the effect of the focus in ‘LianSB-F’ in the way that the sentential prominence locates on the word “liu2min2” and the pitch registers of the following syllables are compressed. The difference found between the two F_0 contours lie in the overall pitch range values. The additive focus from the *wh*-focus and the *shi*-marked focus exert more F_0 expansion on the prominence position and more reduction on the post-focus items. A One-Way ANOVA was conducted to investigate the significance of F_0 differences of the same constituents in various focus conditions, i.e., ‘LianSB-F’, ‘ShiSB-F’, ‘LianSB’, and ‘ShiSB’. Results of the Bonferroni post hoc values are also used to explore the significance of the minimum and maximum pitch values. Further evidence is found from the Bonferroni post hoc test in which the pitch registers of the constituents under the additive focus are significantly different from the single focus condition, with all the $P_{\min} < 0$ and $P_{\max} < 0$.

Thus, the result is that the *lian*-marked focus and *shi*-marked focus can combine with the *wh*-focus in the way that the entire pitch register is raised higher than the single *lian* or *shi* marked focus. And the post-focus constituents observe more compressive effects from the additive focus.

3.3. Co-existence of two kinds of focuses on different constituents

In the previous part, the mechanism of the additive effect upon the F_0 pattern is of main concern. This part mainly deals with the conflicts of the *syntax*-marked focus and the *wh*-focus on the formation of the F_0 patterning in the surface form. The following issues are addressed: (i) the acoustic correlates of two kinds of focuses in one utterance; i.e., *syntax*-marked and *wh*-focus; (ii) the phonological characteristics of the entities involved in expressing the two kinds of focuses. In order to approach this goal, the following *asking-answering* pairs are adopted:

- (i) Lian2 Liu2 Min2 Dou1 Ti2 Ba2 Shei2 Le0?
even liu min all elevate who le
 (Even Liumin elevated whom?)
 Lian2 Liu2 Min2^[+LianF] Dou1 Ti2 Ba2 Mao2 Lan2^[+F] Le0.
- (ii) *Shi4 Liu2 Min2 Ti2 Ba2 Shei2 De0¹?
is liu min elevate who de
 (It is Liumin that elevated whom?)
 Shi4 Liu2 Min2^[+ShiF] Ti2 Ba2 Mao2 Lan2^[+F] De0.

The other sentence is identical with (i)-c in part 3.1. Figure 3 depicts mean F_0 of the contours with a double focus condition in

¹ The asking pair violates the *Unique Strong Focus Principle* which forbids the *wh*-operator after the *shi*.

one utterance: *lian*-marked focus and *wh*-focus, and *shi*-marked focus and *wh*-focus. The symbols in the bottom part of the figure illustrate the focus conditions. Specifically, ‘LianSB+F’ denotes the *lian*-marked focus also locates on the subject constituent, and the utterance also contains a *wh*-focus on the object position; the *shi*-marked ‘ShiSB+F’ contour denotes that, in addition to the *shi*-marked focus on the subject position, there is also a *wh*-focus on the object position; the ‘Un’ contour denotes that the sentence has no marked focus. The top part of the X-Coordinate displays the content of the syllables in the utterances, and the Y-Coordinate provides the pitch range.

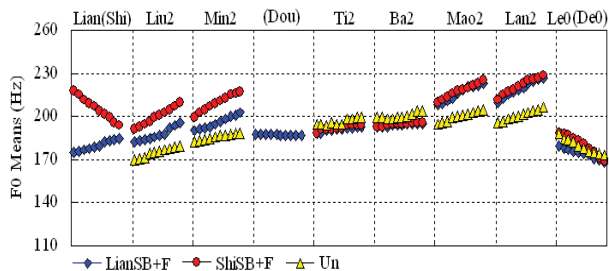


Figure 3: Mean F_0 of sentences in syntax-marked focus and *wh*-focus

It is claimed by Xu [10] and Jia et al [8] that *wh*-focus in SC exerts a compressive effect upon the F_0 register after the focus. The discussion in section 3.1 demonstrates that the *syntax*-marked focus can trigger F_0 rising in focus position and compress the F_0 after the focused constituents. In the investigation of the co-existence of *syntax*-marked focus (*lian*-marked focus or *shi*-marked focus) and *wh*-focus, the following aspects need to be considered: (i) whether the *syntax*-marked focus can realize F_0 prominence simultaneously with the *wh*-focus; and (ii) the F_0 variation of pitch register in the position between the two prominences. Further investigation of the phonetic nature of the *lian*-marked focus in the ‘LianSB+F’ contour in Figure 3 reveals that the most obvious prominence distributing on the object position with the whole pitch register of the object item being raised. And, secondary prominence is due to the effect of the *lian*-marked focus which also exerts a prominence. There is no obvious pitch register lowering between the two focuses. It is apparent in the ‘ShiSB+F’ contour, that the F_0 in Figure 3 exhibits two prominences, one locates on the subject position, and the other one distributes on the object position. Although ‘Shi4 Liu2 Min2 Ti2 Ba2 Shi2 De0?’ (It is Liumin that elevated whom?) violates the USFP, the answering sentence can realize two prominences simultaneously which exhibit a similar acoustic mechanism with the *lian*-marked focus.

On the whole, due to the effect from both *syntax*-marked (*lian* or *shi* marked) focus and *wh*-focus, there appears two prominences in one target sentence. The specific manner of the two prominences is the raising of the pitch registers of the focus bearing units. These two prominences exists level difference with the *wh*-focus inducing the primary one, and the secondary one is triggered by the *syntax*-marked approach. Within these two *syntax*-marked focuses, the *shi*-marked one exerts a more obvious effect on F_0 rising. Although in the ‘*shi*...*de*’ construction, the insertion of the *wh*-focus on the object constituents is ungrammatical, speakers can manifest the information distinction in terms of a prosodic aspect.

4. Conclusion and Discussion

The present study mainly investigates the co-existences and conflicts of *syntax*-marked focus and *wh*-question induced focus on the formation of F_0 patterns. Results of the experiment demonstrate that the *syntax*-marked focus can

trigger F_0 prominence in the target sentence, and they can also co-exist with the *wh*-question in one target sentence. Specifically, (i) the single *syntax*-marked focus, i.e., *shi*-marked or *lian*-marked focus can realized F_0 prominence, and the prominence corresponds with the marked focus; (ii) the *syntax*-marked focus (*shi* or *lian* marked focus) and the *wh*-induced focus can co-occur with each other on one item, and the focus bearing unit shows the most obvious F_0 prominence; (iii) *syntax*-marked focus and the *wh*-induced focus can co-exist with each other on difference items in one sentence, and they can realize F_0 prominences simultaneously. Evidences of F_0 patterns of various kinds of focus obtain the phonological entities of *nuclear accent* and *pre-nuclear accent* as in English (Ladd [13], etc). When there is no *wh*-question induced focus, the *syntax*-marked focus can serve as the major cause for the generation of the nuclear accent. When the *syntax*-marked focus and the *wh*-focus locate on one item, they generate nuclear prominence together. Although the single focus (*shi* or *lian* marked focus) and the additive focus varies in the specific acoustic manifestations, they corresponds with the same phonological entity, nuclear prominence. When the *wh*-focus is inserted into the target sentence, the *syntax*-marked focus loses its effect on the generation of the nuclear prominence with the *wh*-focus serving as the anchor for nuclear prominence. Alternatively, the *syntax*-marked focus performs as *pre-nuclear prominence* in the sentence.

5. Acknowledgements

This research is financially supported by CASS Key Project ‘‘Phonetics and Spontaneous Speech Processing’’ and ‘‘Fundamental Speech Corpus and Pitch Pattern of Standard Chinese’’ YZDN50-05050.

6. References

- [1] Fang, Mei. ‘‘Hanyu duibi jiaodian de jufa biaoqian shouduan (The syntactic approach to mark contrastive focus in SC)’’. Chinese Language 4: 279-288, 1995.
- [2] Liu, Danqing and Xu Liejiong. ‘‘Jiaodian yu beijing huati ji hanyu ‘lian’ ziju (Focus and background, topic and lian-sentence in Chinese)’’. Chinese Language 4: 243-252, 1998.
- [3] Xu, Liejiong. ‘‘Jiaodian de Yuyin biaoqian (Phonetic realization of focus)’’. In *Jiaodian de jiegou he yiyi yanjiu (Study of focus structure and meaning)*, 277-299. Beijing: Foreign Language Teaching and Research Press, 2004
- [4] Liu, Tanzhou. ‘‘Duochong qiangshi jiaodian gongxian jushi (Constructions containing multiple strong foci in Chinese)’’. Chinese Language 3: 952-962, 2008.
- [5] Ross, Claudia. ‘‘On the function of Mandarin DE’’. *Journal of Chinese Linguistics* 11. 2: 214-246, 1983.
- [6] Chao, Yuanren. *A Grammar of Spoken Chinese*. Berkeley and Los Angeles: University of California Press, 1968.
- [7] Song, Yuzhu. Guanyu shijian zhuci ‘de’ he ‘laizhe’ (On tense markers ‘de’ and ‘laizhe’). Chinese Language 4: 271-276, 1981.
- [8] Jia Yuan, Li, Aijun, Ma, Qiuwu and Xiong, Ziyu. Juyou jiaodian biaoqi zuoyong de ‘shi’ zi ju zhongyin fenbu yanjiu (Accents distribution in the focus-marking Shi construction). *Journal of Chinese Information Processing* 3:103-109, 2009.
- [9] Xu, Y. and Xu, C. X. ‘‘Phonetic realization of focus in English declarative intonation’’. *Journal of Phonetics* 33: 159-197, 2005.
- [10] Xu Yi., ‘‘Effects of tone and focus on the formation and alignment of F_0 contours’’, *Journal of Phonetics*, 27, 55-105, 1999.
- [11] Jia Yuan, Li, Aijun and Chen, Yiya. ‘‘Putonghua wuzi jiaodian chengfen yingao he shichang moshi yanjiu (Pitch and duration Patterns of five-syllable constituents in Standard Chinese)’’. *Applied Linguistics* 4: 53-61, 2008.
- [12] Xu, Liejiong. ‘‘Manifestation of informational focus’’. *Lingua* 114: 277-299, 2004.
- [13] Ladd, D. Robert. ‘‘Intonational Phonology’’, Cambridge: Cambridge University Press, 1996.

[This paper was published in *Speech Prosody*, 2010]