Prosodic Phonology of the Chengdu Dialect

By

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A dissertation submitted in partial fulfillment of

the requirements for the degree of

Doctor of Philosophy

(Chinese)

at the UNIVERSITY OF WISCONSIN-MADISON

2022

Date of final oral examination: April 19th, 2022

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Acknowledgments

In the process of writing this dissertation, I have received a great amount of support and assistance.

First, I would like to thank my advisor, Professor Hongming Zhang, whose expertise was invaluable in formulating the research questions and methodology. He is the true definition of a truth seeker and the ultimate role model. This dissertation would not have been possible without Dr. Zhang, whose guidance from the initial step in research enabled me to develop a gradual understanding of the subject. I am thankful for the extraordinary experiences he arranged for me and provided opportunities to grow professionally. His comprehensive feedback pushed me to sharpen my thinking and brought this work to a higher level.

Similarly, I want to thank the members of my dissertation committee - not only for their time and extreme patience but for their intellectual contributions to my development as a scholar. Specifically, I am indebted to Professor Weihua Zhu, who helped me look forward to successfully completing my dissertateded the right direction. I want to thank Professor Yafei Li for guiding me to the field of syntax and thank Professor Anatoly Dewyler for his support and encouragement.

Thanks should also go to my peers, who offered me encouragement and company: I would like to thank Hai Liu, Lu Lu, Fang Yan, Han Yan, Hong Yan, Jun Xu, Rui Wang, Yanwen Wu, Bo Zhan. I also want to thank Matty Wegehaupt for the excellent editing of this dissertation.

I gratefully acknowledge the help of informants: Lingyun Li, Zhangyi Wu, and others.

I am also grateful for my parents. Their constant love and support motivated me and kept me confident. My accomplishments and success are because they believe in me. I am grateful for their unconditional support throughout the entire thesis process and every day of my life.

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Abbreviations

A, AP	adjective, adjectival phrase
AdjR	adjective reduplication marker
Adv, AdvP	adverb, adverbial phrase
C	Clitic
CG	clitic group
CL	initial consonant lenition
Cl, ClP	classifier, classifier phrase
Conj, ConjP	conjunction, conjunction phrase
CRS	currently relevant state
DLM	delimitative aspect marker
D, DP	determiner, determiner phrase
DUR	durative aspect marker
EBA	Edge/End-Based Approach
EXP	experiential aspect marker
F/Ft/Σ	foot
FA	final assimilation
FC	final change
I/INFL, IP	inflection, inflectional phrase
IPh/ι	intonational phrase
LOC	locative marker
M/σ	mora
MOD	modificational marker
MTS	morphological tone sandhi
N, NP	noun, noun phrase
NOM	nominalization marker
NOP	null operator
Num, NumP	numeral, number phrase

OT	Optimality Theory
P, PP	preposition, prepositional phrase
PASS	passive morpheme
PERF	perfective aspect marker
POSS	possessive marker
PPh/φ	phonological phrase
PVP	post-verbal particle
PW/ω	prosodic word/phonological word
Q, QP	quantifier, quantifier phrase
Qu	interrogative particle
RBA	Relation-Based Approach
S	sentence
SLH	Strict Layer Hypothesis
SPE	*The Sound Pattern of English*
t	trace of moved element
T, TP	tense, tense phrase
TS	phonological tone sandhi
UTAH	Uniformity of Theta Assignment Hypothesis
Utt/υ	utterance
V, VP	verb, verb phrase
WFR	word formation rule
X/X^0, XP	syntactic head of type X, full syntactic phrase of type X
X’	intermediate syntactic phrase of type X

Abstract

By referring to the prosodic phonology theory, this paper organizes and summarizes the phonological system of the Chengdu dialect. Following the prosodic hierarchy, this work has three main parts. Part one includes the first two chapters, providing a short prologue to the Chengdu dialect and a concise revisit of early studies related to the phonological system of this particular dialect. By following the introduction, this section also presents the picture of prosodic phonology and summarizes the descriptive inventory of the Chengdu dialect. Part two includes five chapters, chapters three through seven, respectively, discussing prosodic constituents from lower to higher levels in the hierarchy. Each chapter investigates every constituent by definition and role(s) in the Chengdu dialect. Part three, the final section, is the 8th chapter alone, summarizing previous chapters and finalizing conclusions based on the discoveries in this paper.

The process of investigating each constituent in chapters three through seven follows this general pattern:

(1) Confirm the existence or non-existence of the constituent and investigate the particular role in the Chengdu dialect.

(2) Define the domain formation for each constituent.

(3) Confirm the domain for applying different phonological rules, mainly the tone sandhi rule.

Expressly, with linguistic data from the Chengdu dialect, the existence of most prosodic constituents is confirmed except for the foot. By investigating and analyzing these prosodic constituents, this paper illustrates that the definition of the domain of each constituent can be confirmed with both phonological and non-phonological information. In addition, another well supported point is that in the Chengdu dialect, it is also true that different phonological phenomena

refer to the different prosodic domains. Therefore, the application of a phonological rule may be valid when referring to one particular domain while invalid within other domains.

Additionally, based on the investigation of the phonological system of Chengdu, this paper discusses relationships between the phonology and different grammar parts in Chengdu, such as morphology and syntax. Since this work is the principal endeavor in leading an exhaustive investigation of the Chengdu phonological system according to the viewpoint of prosodic phonology, it is my hope that it offers a precise depiction of and discussion about the phonological system of the Chengdu dialect and advances our comprehension of prosodic phonology overall.

Chapter I Introduction

1.1 Writing Purpose

To improve the comprehension of the phonological system of the Chengdu dialect, there is a need for more far-reaching work into understanding the structure of current phonological speculations. Therefore, this paper is an unobtrusive endeavor to make up for this shortcoming. The framework utilized in this investigation is the hypothesis of prosodic phonology, which has been in use since the 1980s and manages the spaces of the phonological phenomenon in the same way as the cooperation between phonology and different parts of the language structure.

Along these lines, the reason for this dissertation is to perform an intensive investigation and provide a more comprehensive depiction of the phonological arrangement of the Chengdu dialect. In the process, a full range of materials will be reviewed and my collected assortment of phonological phenomena in Chengdu, such as tone sandhi, voicing, nasalization, assimilation, and deletion, will be examined. By paying careful notice to the characterizing phonological attributes of this dialect, a complete picture of its phonological marvels will be depicted.

In addition, the insights developed through this investigation are meant to contribute to the improvement in our comprehension of prosodic phonology in general. This paper tries to trace the prosodic constituents in the Chengdu dialect and map constituents in this dialect onto the framework of prosodic phonology. Established in the 1980s, this framework was has benefited from much research, led from numerous points of view, to improve the hypothesis of prosodic phonology. Considering the portrayal of phonological phenomenon, I will characterize distinct prosodic domains and examine the roles they play in the utilization of phonological rules and phonetic realizations in a way that varies linguistic aspects such as phonological, morphological, syntactic, semantic data. In general, this investigation is expected to prove the prosodic phonology

hypothesis through evidence in the Chengdu dialect and improve our comprehension of phonology to be just as complete as that of the interface between the phonological constituents and syntax.

As the primary endeavor here is to build up a methodical investigation of the Chengdu phonological framework based on prosodic phonology, some sections and hypotheses might still require further evidence and phonetic support. However, I still hope this work can dependably introduce the details of the Chengdu phonological system and further our comprehension of prosodic phonology.

1.2 Background information on the Chengdu dialect

Chengdu dialect refers to the dialect spoken by locals who now live in the urban area of Chengdu. Though the Chengdu dialect is only one among many Sichuan dialects, it is a well-deserved representative of Sichuan Mandarin (Xia, 2002). There are three major dialects in Sichuan province: Sichuan, which belongs to Mandarin; Cantonese, which belongs to the Hakka dialect; and the old Huguang, Anhua, Jingzhou, and Changsha dialects, which belong to the Xiang dialect. Therefore, the Sichuan dialect is also known as Sichuan Mandarin. In terms of its origin, a reliable statement says that “in the early Qing Dynasty, a large number of immigrants mainly from the Huguang area (especially Hubei) entered Sichuan, thus forming the system of today’s Sichuan dialect and Southwest Mandarin” (Cui, 1996). From this, it is said that today's Sichuan dialect was formed by the fusion of immigrants and has a history around 300 years.

The accent from Dongdajie to Yanshikou in the Jinjiang District of Chengdu is generally regarded as the standard accent of the Chengdu dialect. As Chengdu is surrounded by Mandarin and Hakka dialects on all sides in the southeast, northwest, and northwest of the urban area of Chengdu, the dialects of the urban area of Chengdu are highly complicated (Huang, 2006). As a result of various contacts with different dialects, the Chengdu dialect presents a phonological

phenomenon that involves many linguistic elements. The earliest work about Chengdu phonology was published in 1900 (Grainger, 1900), indicating a short history of research on this topic. Though many papers have been published on the phonological elements in this dialect, we presently cannot seem to grasps a total comprehension of Chengdu's phonology, thus leaving further possibilities for future studies.

1.3 Literature review on the Chengdu dialect

Various works have already investigated this and relateddialects, with particular focus being paid on different linguistic units. Yang Xiong, the author of the first dialectology book *Youxuan Messenger Jue Dai Yu Shi Bie Guo Dialect* in history, is from Shu. The book records about 16 words about the Sichuan dialect. Later books such as *Erya*, *Yupian*, *All Classics Sounds and Meanings*, *Guangyun*, and *Jiyun* recorded a small amount of the Sichuan dialect.Such is the evidence showing that there have been records and descriptions of Sichuan dialects from long ago (Liu & Guo, 2013). Beginning with these past works, the literature review will proceed sequentially and by language, as the bulk of studies on the Chengdu dialect are in English and Chinese.

1.3.1 Review of literature in Chinese-language

1.3.1.1 *Shu Yu* 蜀语 (The Sichuan dialect)

Shu Yu is the earliest extant textual research on standard dialects and expressions in the Sichuan dialect. It was compiled by Li Shi (1597-1674) in the Ming Dynasty. *Shuyu* is China's first existing dialect vocabulary work that "compiles a book with breaking areas and times" (Wang, 2010). The book contains 563 Sichuan dialect words, which reflect the basic sound of Sichuan dialects in the Ming Dynasty. Therefore, it is practical to study Sichuan dialects from this period. One feature of this book is that the recorded Shu dialect is mainly derived from "ear hearing." In

other words, the author starts from the actual living language and records the dialect from the spoken language. It is entirely different from extracting dialect words or dialect materials from ancient books in the later Qing Dynasty "Dialect" writings based on the language of the literature (Wang, 2010). However, historical changes have taken place in the past three hundred years. From the perspective of contemporary linguistics methods, the nature of Shu dialects and their relationship with the current Sichuan dialects can only be determined based on their phonetic system and the phonetic features reflected in the vocabulary. Therefore, it does not map to any specific Sichuan dialect nowadays; instead, it only provides partial resemblance to various Sichuan dialects.

1.3.1.2 *Shu fangyan* 蜀方言 (Shu dialect)

Shu Dialect was originally called *Jinshu Slang Class Record*, compiled by Zhang Shenyi (1846-1921). It is a dictionary that records Sichuan dialect vocabularies. The dictionary comprehensively records the phonetics of Sichuan dialects and examines the etymology of each entry. The framework is mainly based on the sound of the Chengdu dialect, along with dialects of other parts of Sichuan. It is divided into two volumes and contains a total of 786 words with a wide range and variety, arranged according to category. First, astronomy and geography are listed, followed by titles, body, diseases, medical treatments, movements, clothing, diet, etc. It has high academic value in quoting classics, the evolution of phonology, textual research and revision, and etymology.

1.3.1.3 Fu (1909)

Fu (1875-1917), a native of Jianyang, Sichuan, accompanied his father to Chengdu in his youth. His *General Survey of Chengdu* was first distributed in the prior year of Xuantong (1909). *General Survey of Chengdu* is a reference book of some 700,000 words recording the social

marvels of Chengdu in later Qing. Included are more than ten classes of information of Chengdu, for example, “Chengdu Children and Girls’ Ballads,” which is noticeable for explicitly incorporating Chengdu vernacular and phrases, and archiving words according to authentic oral articulation as much as possible. Subsequently, numerous corpus loads the voice data of that time. It investigates the subtle, which can uncover some essential qualities of the Chengdu dialect in the late 19th century and early 20th century (Yuan & Deng, 2021). However, due to its limitated knowledge of modern linguistics, this book does not offer any descriptive phonological portrayal or phonetic record of the hints of the Chengdu dialect. Instead, data was presented with characters.

1.3.1.4 Tang & Lin (1930)

Shu Lai 蜀籟 (Shu sound) is a linguistics monograph written by Tang Shu and Lin Gao, natives of Suining, Sichuan, during the Republic of China. It collects more than 5,000 Sichuan dialect words and idioms with rich content, all spoken and used in people’s daily lives. The book is arranged according to radicals, but the radical names are not marked. For each radical, stroke numbers of the first character in the word are ordered from fewest to most. Those with the same first character and strokes are in order of the number of characters in total. Words and sentences in the book are not annotated since most of them were familiar to Sichuanese at that time. The corpus of *Shu Lai* reflects the phonetic features of some dialects during the Republic of China. However, most people would not know the exact meaning of many words without textual research and annotation. The book lacks an index, making it largely unsuitable for inspection and because it is not phonemicized, it is difficult to restore the exact pronunciation.

1.3.1.5 Zhen (1958)

In 1958, Zhen made the first comprehensive phonological study of the Chengdu dialect, including initials, finals, tones, and some basic tone sandhi rules. This earliest research utilized

descriptive linguistics, observing and summarizing the historical changes in the phonetic inventory of the Chengdu dialect and comparing the phonological system with Mandarin. Although the speech of the two speakers in this work shows minor differences, it still established the foundation for later studies.

1.3.1.6 Liang (1982)

Sichuan Dialect and Mandarin analyzes Sichuan and Mandarin dialects, exploring their similarities and differences and using their corresponding relationship to help Sichuan people learn Mandarin. The second of its three chapters analyzes the phonetic similarities and differences between Sichuan dialect and Mandarin while the third chapter analyzes the similarities and differences between vocabulary and grammar. Data are collected from the works of Sichuan writers, newspaper and magazine articles written in Sichuan dialect, , local chronicles, Sichuan opera, local operas, dialect monographs, etc., In addition to this written material, there is also much datadata on spoken dialects as well (Liang, 1981).

1.3.1.7 Zhang & Wang & Zhou (1987)

Sichuan fangyan cidian (Dictionary of the Sichuan dialect) was published in 1986. This dictionary contains more than 7,000 words in the Sichuan dialect, different from Mandarin and commonly used in modern times. The entries are primarily literary works of modern writers in the Sichuan area, with a bit of material taken from the spoken language of the Sichuan people. Some of these words are also common in other dialect areas. This dictionary gives both citation and sandhi tones with IPA transcription, making it an essential reference book for phonological guidelines in the Chengdu dialect. However, the author states that due to time constraints, “The entries are mainly taken from writing. Many vivid spoken vocabularies have not been collected in time yet and need to be added in the future” (Wang, 1985).

1.3.1.8 Luo & Leng (1987)

Chengdu fangyan cidian (Dictionary of the Chengdu dialect) has collected more than 4,000 words, which were only the commonly used words back then. These entries are selected from many ancient books, local chronicles, works by Sichuanese writers, Sichuan local opera data, newspapers and periodicals, and Chengdu daily spoken language. It also provides IPA transcription to every entry but mainly describes sandhi tones instead of citation tones.

1.3.1.9 Liang and Huang (1998)

In 1998, Liang and Huang continued the description by generally following the phonetic inventories of Zhen. However, with more details, modern studies used acoustic experiments to ascertain the tone values of this dialect further. While all the experimental outcomes are slightly different, each is quite close to the others. Therefore, it can be concluded that the Chengdu dialect's basic phonological and phonetic systems are clear.

1.3.1.10 Others

Other than the works mentioned before, there have been numerous researches about the Chengdu dialect. These previous accomplishments have contemplated various parts of the dialect, counting its phonology, morphology, syntax, and chronicled advancement. Moreover, by introducing some trademark phonological and morpho-syntactic rules in Chengdu, such as tone sandhi rules and reduplications of different parts of speech, these studies have furthered the comprehension of the Chengdu dialect.

1.3.2 Review of literature in English-language

1.3.2.1 Edkins (1857)

A Grammar of the Chinese Colloquial Language, Commonly Called the Mandarin Dialect, was compiled by a British Protestant missionary and sinologist, Joseph Edkins (1823-1905), a

linguist, translator, and philologist who spent 57 years in China. The author divides Mandarin Chinese into Beijing Mandarin, Nanjing Mandarin, and Western Mandarin. Among them, the language of Chengdu Prefecture in Sichuan Province is regarded as the representative of Western Mandarin. The second chapter clearly states that the Chengdu dialect has four tones: 1st, 2nd, 3rd, and 5th, withthe original 4th and *Ru* tone belong to the 5th tone (Yuan & Deng, 2021). The author also used "natural tones" to indicate the tone change in pitch, speed, and duration, along with a list of detailed explanations of different "natural tones" (Liu, 2018). In the Chengdu dialect, this book contains consonants, vowels, tones, nouns, verbs, quantifiers, etc. There are also detailed records of special situations such as tone sandhi, *Erhua*, and polyphony in Sichuan Mandarin, providing rich corpus for studying the evolution of Western Mandarin Chinese.

1.3.2.2 Adam Grainger, also known as Zhong (1900)

The earliest work on the Chengdu dialect with transcription is *Western Mandarin or the Spoken Language of Western China,* written by a British missionary from the China Inland Mission and published by the American Presbyterian Mission in Shanghai. According to Zhong, this book specializes in commonly used words in spoken language for missionaries to learn while spreading doctrines among the masses. It contains 3786 entries, which including 112 variants, and all the entries are presents with both characters and phonetic transcription. There are also 191 words without certain characters, instead, these words are transcribed with self-made phonetic characters or phonemicized, or expressed by blank symbols with phonetic notation; along with all the entries, there are 13484 examples, including 401 idioms, which are not phonemicized. Interpretation examples are based on spoken language and classical Chinese and foreign words are not collected. When The China Inland Mission went to Sichuan to preach, they went east through Wanxian to Chongqing, north through Guangyuan to Chengdu, and then concentrated on Chengdu in

particular. There is no clear statement in the book to explain that items in the book are the Chengdu dialect. However, Chengdu is the capital city, the political and cultural center, and its language has a high reputation in Sichuan. After arriving in China in 1889, the author lived in Jinma Street, Chengdu, and died there in 1921. Those who worked together on this work for many years were also Chengdu natives. Therefore, it is recognized that what is recorded in the book is the Chengdu dialect at that time (Zhen, 1988).

1.3.2.3 Omar (1917)

Chinese Lessons for First-Year Students in West China is a Chengdu dialect-spoken textbook compiled for the missionaries who had just arrived in West China at that time. The book's author, L. Kilborm Omar (1867-1920), was a Canadian who was sent to China by the Canadian Wesleyan Church in 1891. He then practiced medicine and preaching in Chengdu, Sichuan, for more than 20 years. This book contains 1005 examples. In the first 200 sentences, each Chinese character and the Chinese characters in English annotations are marked with Romanized Pinyin. The difficult words in the following 805 sentences are also marked with Romanized Pinyin. According to the "Preface," the pinyin system utilized came from The Standard System of Mandarin Romanization published by The Educational Association of China in 1904. However, it was slightly modified according to the Chengdu dialect. The author clearly stated in the "Preface" that this textbook is based on the daily spoken pronunciation of Chengdu at that time: "I mean those found in the conversations that we hold every day with servants, teachers, coal merchants, and many others, -all of whom we may adopt as our teachers of Chinese." Also, "In cases where there are two tones, one used in the book language and one in the spoken, the latter is given." Therefore, the dialect corpus in this book should be accurate and reliable (Fan & Liu, 2016).

1.3.2.4 Chang (1954)

In this dissertation, Nien-Chuang T. Chang uses a descriptive method to first study tones in the Chengdu dialect and then intonation of certain types of sentences. This study mainly probes topics on intonation in the dialect and the process of tone sandhi that includes both tone shape and feature change. Both two-syllable and three-syllable groups are discussed with linguistic data collected from long conversations between the author and her father. After analyzing the tape-recorded data, Chang concluded the that in the Chengdu dialect: tones of single characters are different from the same characters in speech; there are more than four tones; in this dialect, and intonation does indeed exist. Though the informant here is just the author's father, this is a very solid work. However, since it is a descriptive study, there is more linguistic fact than analysis behind these phonological phenomena.

1.3.2.5 Mei (1977)

This work talks about sandhi tones in 16th century Mandarin, explicitly focusing on the third tone rules and the neutral tone rule in the Beijing dialect. The author quotes previous research (Cheng, 1966) to show that two low tones in succession undergo tone sandhi in four Mandarin dialects: "The dialects are Peking, Shengyang, Chengdu, and Xi-an, and the tone categories involved are Rising, Yang Level, Yin Level, and Departing." Mei furthered the conclusion in Chengdu, which has two low tones, one rising and one falling, and both undergo sandhi when occurring in identical pairs. It is essential to research that sheds light on later studies on Chengdu's tone sandhi rules. See below:

$$\left\{\begin{array}{ll} \text{Yang Level (31)} & \text{+ Yang Level} \\ \text{Departing (13)} & \text{+ Departing} \end{array}\right\} \rightarrow \left\{\begin{array}{l} \text{Yang Level} \\ \text{Departing} \end{array}\right\} \text{ + Yin Level (45)}$$

Figure 1

1.3.2.6 Duanmu (1990)

From the perspective of modern linguistics, this is the first research that discussed the diminutive suffix [r] in Chengdu in comparison with [r] in Mandarin. According to the author, in Mandarin, the diminutive suffix [r] replaces the coda of the root rime. Furthermore, the replaced segments may be recycled but subject to phonotactic, while the [r] in Chengdu replaces the entire rime, rather than just the coda. Also, prenucleus glides [i u ü] are not replaced in the diminutive form in Chengdu, which was taken as evidence that prenucleus glides are not in the rime but the onset.

1.3.2.7 Chen (2000)

Chen discusses contour dissimilation and register dissimilation in *Tone Sandhi Patterns Across Chinese Dialects*. It was believed that contour dissimilation is very commonly seen among Chinese dialects. Chang (1992) characterized contour dissimilation as the primary sandhi process with instances in the Chengdu dialect and Xi'an, Kunming, Pingyao, and Changzhi. Chen describes the process as:

$$[x-y] \rightarrow [y-x] \ / \ \_ \ [x-y] \tag{1}$$

According to the author, assimilation, registral or melodic, is executed by spreading a tonal node. Then, melodic contours are separated into syntagmatically contrastive successions of pitches. In this manner, they form dissimilation calls for metathesis or permutation of the terminal nodes: *x*-*y* → *y*-*x*, where x and y stand for the terminal nodes [αraised] and [-αraised].

1.3.2.8 Lin (2006)

This study examines the direction of tone sandhi rules in the Chengdu dialect. The author argues that both "left-to-right" and "right-to-left" sandhi operations are found, and "the operation directionalities appear ungoverned." Moreover, it is ascertained that the Chengdu dialect has a

maximal size requirement for the tone sandhi domain, which is three syllables. In other words, if one string exceeds the maximal size of the domain, it would be divided into several independent domains to avoid generating oversized ones. Moreover, the division is believed to be sensitive to morpho-syntactic structures. Finally, to explain tone sandhi rules, the author adopts OT theory to illustrate the motivation behind "unpredictable directions." In short, the author solved the problem of "unpredictable rule application directions observed in the tri-tonal strings" with OT theory.

1.3.2.9 Qin (2012)

This research argued the existence of a phonological word in the Chengdu dialect and concluded that a. phonological word, defined perceptually as an inseparable entity, constituents the convergent domain of applying a few tones and segmental sandhi rules; b. the phonological word cannot be matched with any constituent in the morpho-syntactic hierarchy; c. the domain of the application of some sandhi rules cannot be stated in morpho-syntactic terms. The author's methodology assumes that perceptual break plays an essential role in conveying various kinds of meaning, linguistic or extra-linguistic. The argument claims that "the speaker employs different levels of a perceptual break to express various kinds of intention. The listener tries to reach the speaker's intention by paying attention to these different levels of perceptual break." In this description, the author assumes that the different levels of the perceptual break correspond to different levels of the prosodic hierarchy. According to Qin, the assumption is supported by the definition of a phonological word since one level of a perceptual break is "shown to be the common domain of a few sandhi rules" in the Chengdu dialect. Moreover, this study concluded that a phonological word in the Chengdu dialect might contain two or more terminal elements of the morpho-syntactic tree, which contradicts Nespor and Vogel's claim that a phonological word can only be equal to or smaller than the terminal element of a syntactic tree.

1.3.2.10 Ma and Tan (2013)

This work provides a "comparison on the sound system between Sichuan dialect and English," mainly focusing on phonemes and sound combinations in the Chengdu dialect. The primary purpose of this work is to provide some useful comparisons for language teachers. The most salient part of this work is the comparison of consonants and vowels in the two systems, something not found in previous studies:

Sichuan dialect	p	pʻ		t	tʻ		k	kʻ		ts	tsʻ	tʂ	tʂʻ	tɕ	tɕʻ			m	n	ɲ	ŋ	
English	p		b	t		d	k		g							tʃ	dʒ	m	n		ŋ	l

Sichuan dialect	f				s	z	ʂ	ʐ	ɕ			x											
English	f	v	θ	ð	s	z				ʃ	ʒ		h	j	w								

Figure 2 Comparison of consonants

Sichuan dialect	ɿ		i	e	æ	a	y		ɔ		o	u					ɚ	ai	ei	au	əu		
English		iː	i	e	æ			ɑː	ɔ	ɔː		u	uː	ʌ	ə	əː		ai	ei	au	əu	ɛə	

Sichuan dialect		ia		iæ	ie		ua	uæ	ue		yæ		yo	ye	yu	iai		iao		iəu		uai		uei	
English	ɔi					iə				uə															

Figure 3 Comparison of vowels

1.3.2.11 Shi (2015)

Based on research using a Nasometer, this work studies the nasality contrast of four liquid initials and the intrinsic nasality of the nine basic vowels in the Chengdu Dialect. The result shows that: a. the oral vowels have intrinsic nasality and the nasality degree of first classic vowels are related to the tongue positions; b. the nasality degree of oral vowels and [z] are less than 40, initial nasal consonants are more than 80, and vowels preceding final nasal are between 40 and 80, respectively, reflecting the universal nasality degree; c. the final nasal /-n/ is weak or lost when the preceding vowel is /a/; d. the nasality contrast of initials between nasal and non-nasal is 45,

indicating that the so-called mixed phenomena between /n/ and /l/ are interblended in the sound value and the phoneme distinction, /n/ and /l/ has been merged as one phoneme. Furthermore, there are allophonic variations of nasalized-lateral and lateralized nasal depending on strike conditions.

1.3.2.12 Hu and Zhang (2018)

Hu and Zhang conducted an acoustic experiment to prove He and Rao's work in 2013. The latter one reported a raising phenomenon of /a/ in [Xan]. In this case, X is a consonant or a vowel. In the Chengdu dialect, /a/ is realized as [ɛ] for young speakers but [æ] for older speakers. This claim did not have acoustic evidenceat the time, therefore, this experiment was designed to examines the realization of [Xan] with speakers of different age and gender groups. "X" stands for three conditions: 1) unaspirated consonants C ([p], [t], [k]); 2) aspirated consonants C^h ([p^h], [t^h], [k^h]); 3) high vowels V ([i], [y], [u]).

Their results confirmed the conclusion made by He and Rao in 2013. Young speakers realize /a/ as [ɛ] in /an/, while older speakers mostly realize /a/ as [æ] in daily speaking. Furthermore, female speakers raise more than male speakers within the same age group. However, within the /Van/ condition, older speakers do raise /a/ in /ian/ and /yan/, which is interpreted by the authors as /a/ first assimilates to its preceding front high vowels /i/ and /y/ for older speakers. The authors believed that this shows a possible trajectory of the ongoing sound change in the Chengdu dialect, the details of which can be seen as below:

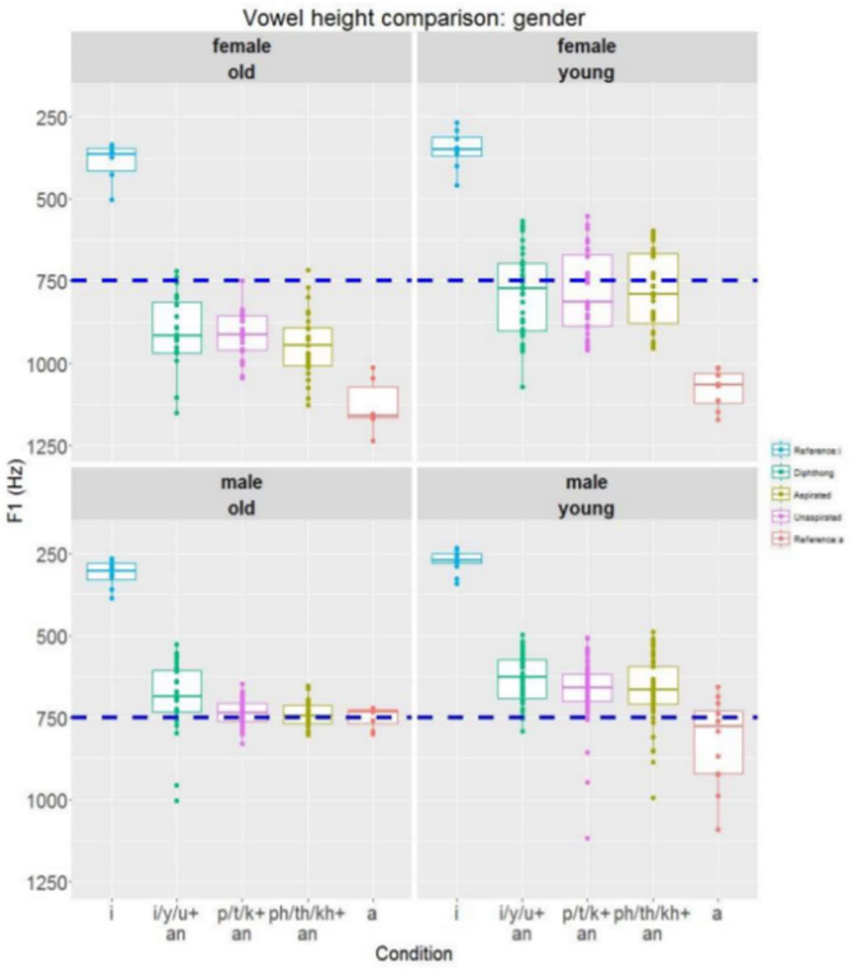


Figure 4

1.3.3 Summary of previous studies

Given the concise survey of the works in both Chinese and English, we can find some outstanding results. One notable difference between English-language studies and Chinese-language studies is that early Chinese studies lack modern linguistic methodology in examining and illustrating phonological phenomena. Each Chinese-language work in section 1.3.1 gives various well-organized information and an exceptionally definite portrayal of certain phonological phenomena. Nonetheless, most of them do not provide satisfactory phonetic investigations that ought to have the option to show the regular analyses of many confounded settings instead of

essentially portraying them. The Chinese language research discussed above focuses on introducing phonological phenomena in detail with accurate linguistic data but without analyses to clarify and push forward. Accordingly, these works are engagingly sufficient to provide systematic linguistic facts and sort pre-existing resources but not sufficient in analyzing and explaining.

Conversely, most English-written research attempts to represent the Chengdu dialect's phonological phenomena within a particular hypothesis from a modern linguistic perspective. Thus these investigations can offer more top to bottom examinations of the phonological phenomena in Chengdu when contrasted with Chinese-language works. However, instead of giving a more thorough investigation of the Chengdu phonological framework, the majority of the English-language work spotlights several of the most special issues in the Chengdu dialect. Moreover, these phonological phenomena can primarily serve as examples of broader theories, like the tone sandhi. Therefore, providing a comprehensive phonological study of the Chengdu dialect with specific research topics alone is not easy.

Additionally, the Sichuan and Chengdu dialects are not strictly distinguished in some Chinese-language and English-language studies. Though the Chengdu dialect is well-recognized as the representative of the Sichuan dialect, there are still subtle differences between the two. For example, the Sichuan dialect covers more areas than the Chengdu dialect, and even nearby cities like Mianyang and Jianyang show dialects with phonological and syntactic differences from the Chengdu dialect. Also, the quantitative method was not commonly applied, especially in Chinese-language studies. Thus, it is necessary to conduct a comprehensive examination stictly focused on Chengdu phonology.

In summary, there have been numerous studies on the phonological system of the Chengdu dialect in both Chinese-language and English-language. These studies either provide an itemized depiction of Chengdu phonological phenomena based on abundant linguistic data or propose consequential hypothetical investigations on particular topics according to a specific phonological system. In this way, these previous studies all contributed to various aspects of Chengdu phonology comprehension. Be that as it may, more exhaustive work is required to deal with the complex phonological framework in Chengdu, just as its interface with other syntax segments.

1.4 Linguistic Data in this dissertation

1.4.1 Previous materials on the Chengdu dialect

The fundamental linguistic data utilized in this paper comes from officially published materials. The primary resources are *Chengdu fangyan cidian*, *Sichuan fangyan cidian*, Zhen (1988), Duanmu (1999 & 2018), and others, and data without IPA transcription from previous studies are not consulted. When both citation and sandhi tones are provided, the latter gets more emphasis. Notwithstanding two dictionaries, I additionally counsel Zhen (1988), Huang (2006), and Qin (2012)'s work for more information since data in these works are both with and without phonological conditions and thus have other possibilities in syntactic conditions.

Data for perceptual and acoustic experiments are from *Chengdu fangyan cidian* and authentic native speakers.

1.4.2 Authentic Data

In addition to the published materials, original supplementary data is provided mainly by two native informants and a small group of other Chengdu dialect speakers. The two primary informants are Lingyun Li and Zhangyi Wu. Both were born in 1988 and raised in Chengdu. Lingyun Li is news broadcasting editoor and Zhangyi Wu is an interior designer. The small group

of others includes but is not limited to: Nima Dengzhu, Mengning Zhou, and Shuting Yan, all born and raised in Chengdu between 1986-1988, educated in the urban area of Chengdu, living here their whole lives with no long-term living experience outside the city. All the informants use the Chengdu dialect as their primary daily speaking language at home and work, along with occasional Mandarin.

1.5 Dissertation structure

This paper's examination of the Chengdu dialect's prosodic phonology comprises eight chapters. The opening chapter provides a detailed introduction to the general writing purpose and background information of the Chengdu dialect, revisiting several representative earlier studies, and explaining the data utilized in the investigation.

Chapter Two begins with a quick review of the theory of prosodic phonology, which includes both original theory and its various applications in Chinese. Compared to the literature mentioned in the first chapter, this chapter focuses on these previous studies that are more specifically related to the topics in this paper from a typological perspective. The second half of the chapter then provides a descriptive background of the Chengdu dialect, including significant phonological phenomena such as tone sandhi, voicing, nasalization, assimilation, and deletion.

Chapter Three investigates the prosodic hierarchy's lowest constituents- the syllable and the foot. It contains an overview of definitions of these two constituents, discussing topics in question in the phonological literature and attempting to analyze the controversies surrounding the syllable and the foot in the Chengdu dialect. Specifically, its focus lies in the domains of phonological rules. The chapter concludes with a further argument on the existence of the foot in this dialect.

Chapter Four first reviews the research on the prosodic word from typological perspectives to define the prosodic word in the Chengdu dialect and then presents major types of morpho-

syntactic words present. It further examines the phonological phenomena within the domain formed by morpho-syntactic words and illustrates the prosodic word domain's role in applying various phonological generalizations in this dialect.

Chapter Five discusses the Clitic groups. Analysing the sound, distribution, morpho-syntactic properties, and phonological behaviors of clitics in the Chengdu dialect, the critical point is made to set the boundary between the phonological word and clitics.

Chapter Six moves to the following prosodic constituent-prosodic phrase. The primary process is to investigate tone sandhi rules at the phrasal level, thus explaining the phonological phenomena and examining the phonological phrase's definition in the Chengdu dialect.

Chapter Seven is about the last constituent-the intonational phrase. Based on the definition and restructuring of the intonational phrase, intonational phrases in Chengdu are then analyzed, followed by appraisals of phonological phenomena, rule application, and constraints.

Chapter Eight is the last chapter, bringing everything from Chapter One to Chapter Seven together by presenting the final model of the prosodic hierarchy in the Chengdu dialect. Finally, with some remarks, this chapter presents the conclusion of this study.

Chapter II Background

This exposition investigates the Chengdu phonological framework inside the system of the prosodic phonology hypothesis. Hence, we being with some theoretical explanation and distinct foundation setting before we proceed onward to the significant points in the accompanying sections. Segment 2.1 spotlights the hypothetical structure expected in this investigation: the turn of events, the fundamental cases of the prosodic phonology hypothesis, and the most exceptional issues in previous studies. Segment 2.2 offers a fundamental review of the Chengdu phonological framework, introducing the phonological inventories in Chengdu and reviewing of some phonological phenomena in this dialect is given.

2.1 General information on the prosodic phonology theory

2.1.1 The diachronic development

Chomsky and Halle (1968) produced the foundation work of prosodic phonology: *The Sound Pattern of English*. It presents a perspective on the phonology of English and has been persuasive in both the field of phonology and the investigation of the English language. Chomsky and Halle present a perspective on phonology as a linguistic subsystem, separate from different segments of the language structure, that changes the underlying phonemic grouping as per rules and yields the phonetic form a speaker articulates. In this SPE model, phonology was treated as a linear association of sections and many phonological rules. The surface syntactic design and the phonological portrayal are connected employing these many rules that produce boundaries into the surface syntactic form. As these phonological rules have different domains, they define the surface syntactic construction boundaries. However, this perspective on phonology is deficient. Based on improvements in the phonological hypothesis, the argument presently lies in the linear connection. It is contended that the phonological units of grammar consist of a combination of interacting

subsystems rather than linear subsystems and that this combination includes lexical phonology, autosegmental phonology, metrical hypothesis, and prosodic phonology (You, 2018).

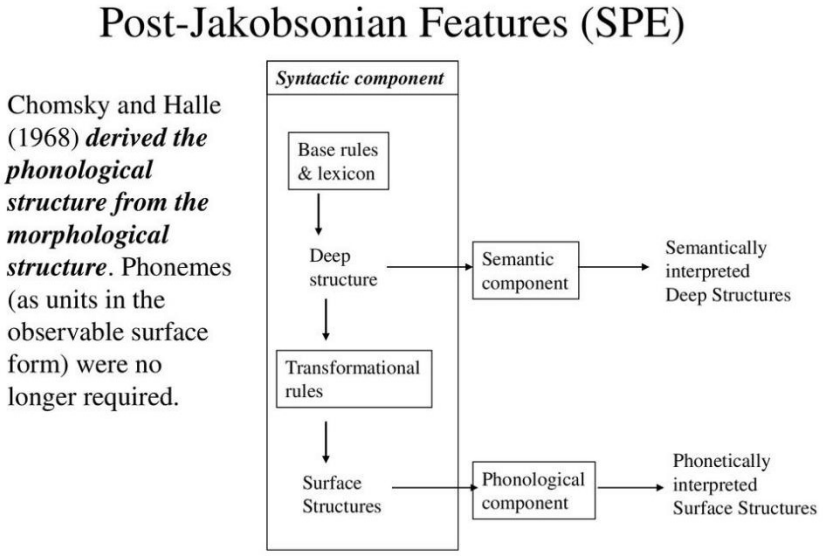


Figure 5

Based on Chomsky and Halle's hierarchical structures embodied in syntactic surface structure trees, Liberman and Prince (1977) also proposed that an adequate characterization of sentences required a description of a separate phonological hierarchy whose constituents were not identical everywhere to those of the surface syntax. They formalized the idea of a phonological tree. In Liberman's theory, branchings below the level of words (referred to as "mots" in his book) accounted for some prominent relationships between syllables in a sentence.

Selkirk (1978/1981) disagrees with Liberman and Prince and claims that the branching of the prosodic tree above the word level was isomorphic to that of the syntactic tree. Therefore, Selkirk presented a phonological tree that contains the intonational phrase, phonological phrase, prosodic word, foot, and syllable. For example:

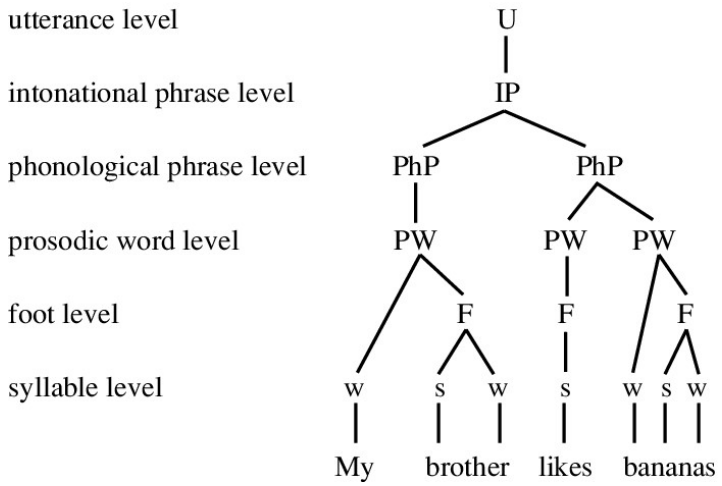


Figure 6

Graph source: An Overview of Prosody and Its Role in Normal and Disordered Child Language Louann Gerken, Karla K Mcgregor, May 1988

Later, Selkirk (1984) proposed that using a metrical grid obviates the need for separately defined prosodic constituents between the intonational phrase and the foot. Along with this new approach, Selkirk also proposed the Strict Layer Hypothesis. In 1986, he claimed the coexistence of prosodic constituency and the metrical grid, a correction to 1984's conclusion. Moreover, this new system acknowledges two different mapping mechanisms: the prosodic constituency is the output of regular mapping rules, with morpho-syntactic structure as its input, while the metrical grid is performed on the domains of prosodic structure, with another set of mapping rules (You, 2018).

In the same year, Beckman and Pierrehumbert (1986) suggested the possibility of an accentual phrase-level between the intermediate phrase and word levels, constructing a hierarchy containing the intonational phrase, intermediate phrase, and word levels. They also argued for the presence of at least one, and possibly two, levels of phrasing between the prosodic word and the intonational phrase. According to their deduction, the "intermediate phrase" groups words into

phrases having at least one accented syllable. In other words, each intermediate phrase contains at least one "pitch accent," which is a pitch maker that makes a phrase and marks the end of the final one with a boundary tone. Their description and definition of this intermediate phrase are similar to the unit that Nespor and Vogel (1986) proposed as a phonological phrase.

Based on Selkirk's theory, Nespor and Vogel (1986) focus on the bits of knowledge they acquired dependent on the information evoked from some languages like Italian and English and thus proposed seven prosodic constituents, making the foundation of units in the prosodic hierarchy: the syllable, the foot, the phonological word, the clitic group, the phonological phrase, the intonational phrase, and the phonological utterance. However, unique to Selkirk's Edge/End-Based Approach, this book proposed the Relation-Based Approach and referred to X-bar concepts in the phrase structure, for example, head-supplement, modifier-head, specifier-head relations, and syntactic expanding (You, 2018).

The next development phase addresses the constraints in the prosodic phonology theory. The idea of constraints comes from Optimality Theory, which proposed a linguistic model that the observed forms of language arise from the optimal satisfaction of conflicting constraints. McCarthy & Prince (1993) developed a theory of categorical alignment and argued that "violable constraints demanding the alignment of prosodic or morphological constituents underlie a wide range of linguistic phenomena." In this way, the constrained-based environment was applied to prosodic phonology for the first time.

In following research, Selkirk (1996) furthered the application of OT in the phonology-morphosyntax interface. Specifically, this work shows how it generates a group of alignment constraints (A_{LING}-XP) and defines edges of prosodic constraints by the edges of the surface syntactic structure. Selkirk also discussed the Layerdness and Headedness of the Strict Layer

Hypothesis and thus concluded that the set of constraints on prosodic domination in this research is a decomposition of the Strict Layering. Therefore, the SLH should instead be factored into more primitive component constraints, each with an independent status in the grammar. This introduced a number of constraint families into the prosodic phonology theory: Truckenbrodt's WRAP-XP (1995, 1999), a group that requires each XP to be contained in the exact phonological phrase along with the ALING-ROC, another group that demands each focused constituent is right-aligned with a phonological phrase boundary; the BINARY-MAP (Selkirk 2000, Prieto 2005, 2006), which requires that a significant phrase must consist of at most and/or at least two minor phrases; UNIFORMITY (Ghini 1993, Sandalo & Truckenbrodt 2002, Prieto 2005, 2006), requiring that a string is ideally parsed into units of the same length; and INCREASING UNITS (Ghini 1993), claiming that phonological phrases on the recursive side are heavier than those in the nonrecursive side (You, 2018).

In sum, prosodic phonology has been evolving for decades. Nevertheless, distinct enough though these early hierarchy proposals may be, there appears to be general agreement that the hierarchy needs to have levels corresponding to the intonational phrase and the prosodic (or phonological) word, and possibly an intervening level. On the other hand, essential principles that require to take prosodic constituents as domains of application, and each consitituent in the hierarchy of the Chengdu dialect have not been discussed much in this manner or academically established.

2.1.3 Essential principles of the prosodic hierarchy theory

2.1.3.1 The prosodic structure

Prosodic phonology deals with domains in phonology and the interactions between phonology and other grammar components, along with related issues such as perception and poetic meter (Nespor & Vogel, 1986). Thus, the main task is to provide a way of making references to

both the morpho-syntactic bracketing of the surface syntactic structure and other syntactic as well as semantic notions. However, not all studies about the interaction have agreed on how phonological processes make reference to morpho-syntactic information as domains for their application. There are two significant opinions regarding this topic: Direct Reference Theory and Indirect Reference Theory. The former claims that the phonological process should be allowed to make direct reference to morpho-syntactic information (cf. Manzini 1983, Kaisse 1985, Odden 1987, 1990, 1996, Rizzi & Savoia 1993), while the latter one claims that the process is not directly sensitive to syntactic information (cf. Selkirk 1978/1981, 1980a, b, 1984, 1986, Nespor & Vogel 1986, 2007, Hayes 1984/1989).

To illustrate this process and the interactions in the prosodic phonology, Nespor and Vogel generated a model that presents mapping rules to group the terminal elements of a string to create units that are not necessarily in a one-to-one relation with the constituents of the morpho-syntactic hierarchy. Furthermore, these units that constituent the domains of application of phonological rules are not isomorphic to the morpho-syntactic constituents (Nespor, 1986). In other words, the syntactic and phonological representations are not isomorphic, and morpho-syntactic constituents are not able to determine the domains of the application for phonological rules and phonetic processes, which suggests a hierarchically arranged organization called Prosodic Structure (You, 2018). Specifically, a given string of sounds is hierarchically arranged into different prosodic constituents and each prosodic constituent serves as the domain of application for specific phonological rules and phonetic processes. Reversely, the phonological rules and phonetic processes that make references to particular prosodic constituents can also be seen as one critical motivation for the foundation of prosodic constituents themselves in a given language. Domains

of prosodic constituents operate through various sorts of both phonological and non-phonological information, but these constituents are not necessarily isomorphic to morpho-syntactic structures.

2.1.3.2 The prosodic hierarchy

As a result of hierarchically arranging prosodic constituents in the Prosodic Structure, a prosodic hierarchy is established. The basic idea of the hierarchy is that prosodic constituents at a given level are composed of constituents on the next level below. Though there have been different attempts and types of prosodic hierarchies in previous research, such as a Focal Phrase between the Phonological Phrase and Intonational Phrase (cf. Kanerva 1990), and a Small Word that comprises part of a Word (cf. Rice 1993), scholars have not reached full agreement. Therefore, this section only introduces three significant examples related to the current study. The first, proposed by Selkirk (1978/1981), can be viewed as the prototype:

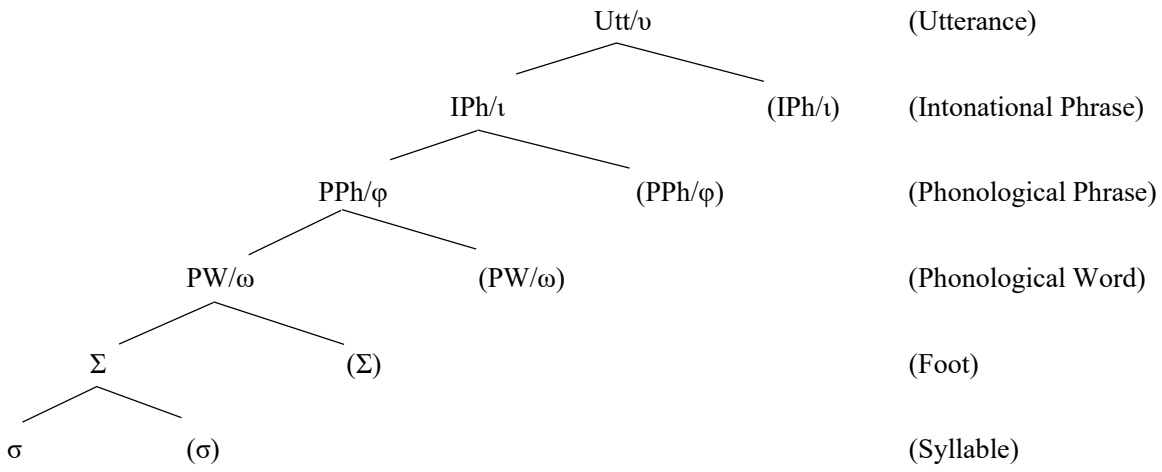


Figure 7 Prosodic hierarchy (Selkirk 1978/1981)

One important change made to the first hierarchy is the insertion of the prosodic constituent clitic group (CG) between the phonological word and phonological phrase by Hayes (1984/1989) and Nespor & Vogel (1986). Next, the mora (μ) was added as the lowest constituent by Zec (1988), suggesting an upgraded hierarchy with eight layers.

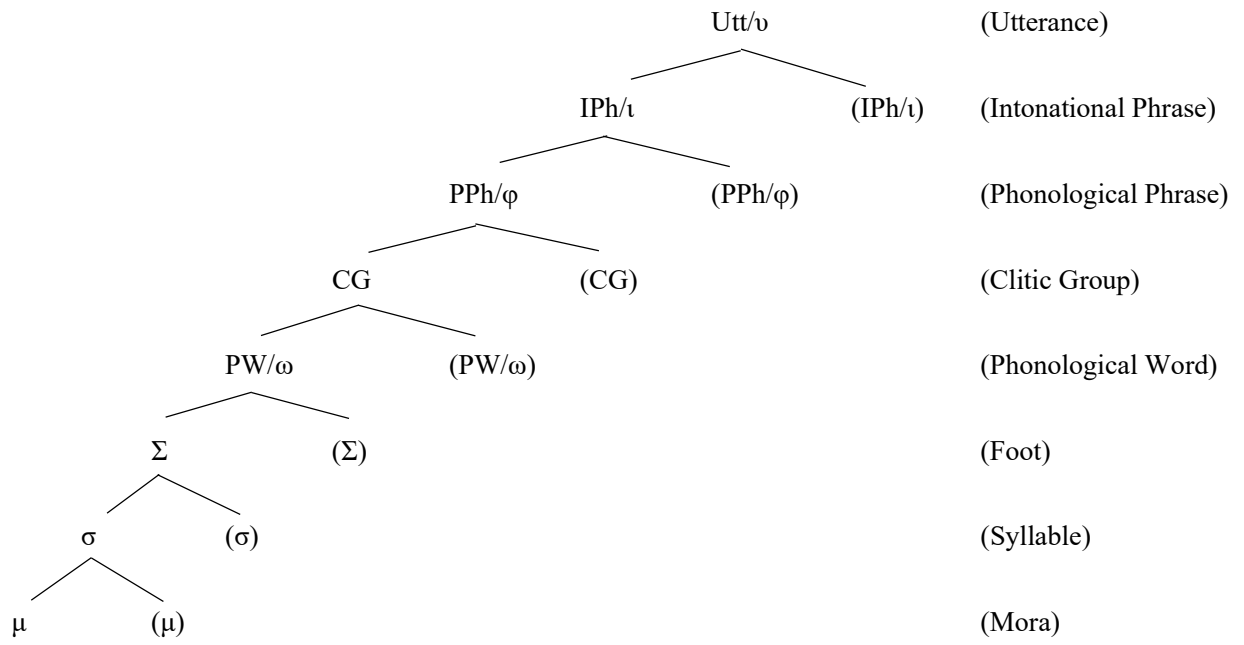


Figure 8 Prosodic hierarchy (expanded)

According to Nespor and Vogel, one crucial criterion to define prosodic constituents is using both phonological and non-phonological information. However, whether a given constituent uses a specific type of information in the definition of its domain is not a free choice. With this information, Zhang (1992, 2017, 2020) proposed a hierarchy based on types of information to which different prosodic constituents in the hierarchy are sensitive.

As Nespor mentioned in the book: "All well-constructed theory provides clearly testable hypotheses." The prosodic hierarchy is also thought to be universal and tested over the years. In some cases, results of evaluations have supported the original proposal of Nespor and Vogel, while some other cases required certain modifications. The crucial step is to decide whether the conflicts indicate language deviations or fundamental issues of these theories. Moreover, the absence of any rules that a referrer to a given prosodic domain in a given language does not necessarily present the absence of this domain in this given language (Selkirk,1980a, Nespor & Vogel, 1986). There are chances that rules alluding to a given domain have not been found, and all the more

significantly, evenif not found yet, the prosodic domain (with no phonological rules make reference to) may in any case still assume an important part in the phonological system of a given language (You, 2018).

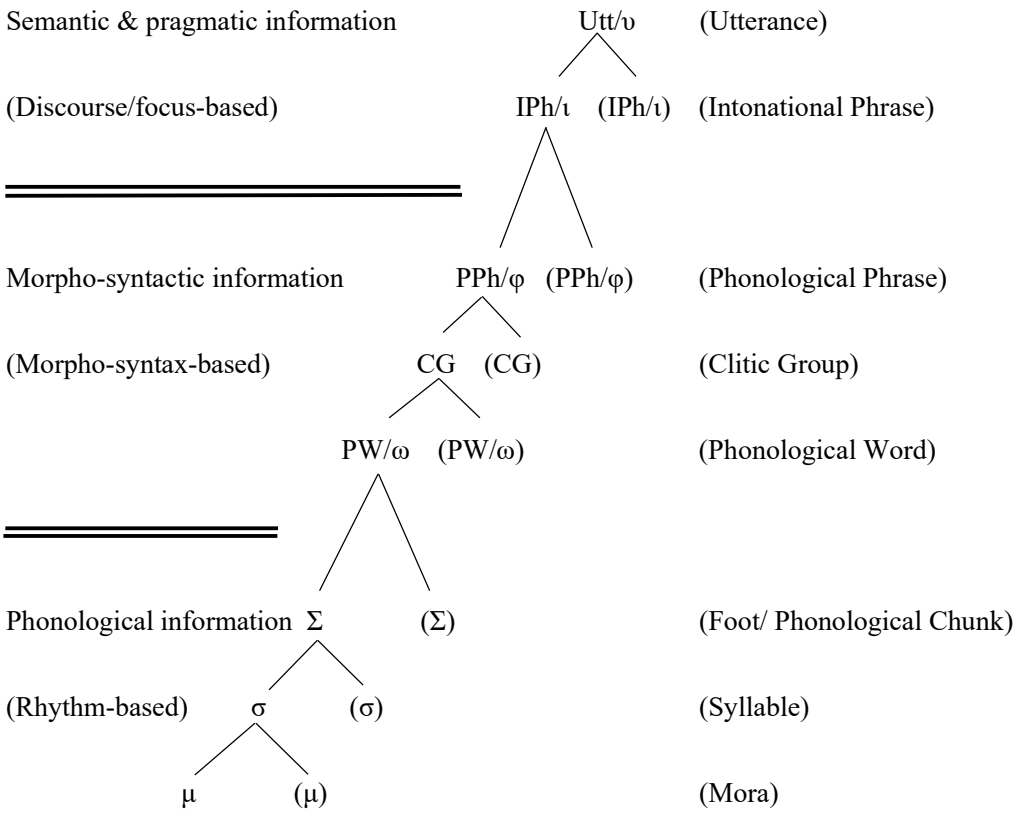


Figure 9 Prosodic hierarchy (Zhang 1992, 2017, 2020)

2.1.4 Approaches and exceptions in the prosodic phonology theory

2.1.4.1 Strict Layer Hypothesis (SLH)

According to Selkirk (1984), the nature of domination relations within a prosodic constituent structure is stipulated by phonological theory. Therefore, a prosodic structure representation is strictly arranged according to the ordered set of categories in the prosodic hierarchy, an idea known as the Strict Layer Hypothesis, a. theory describing the formal relations between constituents of the different prosodic category types in a prosodic structure. Following this hypothesis, a prosodic constituent of a given level *n* immediately dominates only constituents of the level beneath *n-1*

and is exhaustively contained in a constituent of the level immediately above *n+1*. Nespor and Vogel (1986) reformulated the idea as:

(1) a. A given nonterminal unit of the prosodic hierarchy, X^p, is composed of one or more units of the immediately lower category, X^{p-1}.

b. A unit of a given level of the hierarchy is exhaustively contained in the superordinate unit of which it is a part.

One critical piece of information in this hypothesis is that recursion of prosodic constituents is not allowed while it is allowed in syntactic structure. However, exceptions have been found in later studies (You, 2018), and thus suggestions of allowing violations of some aspects of SLH were proposed. Below is an illustration of SLH from Selkirk:

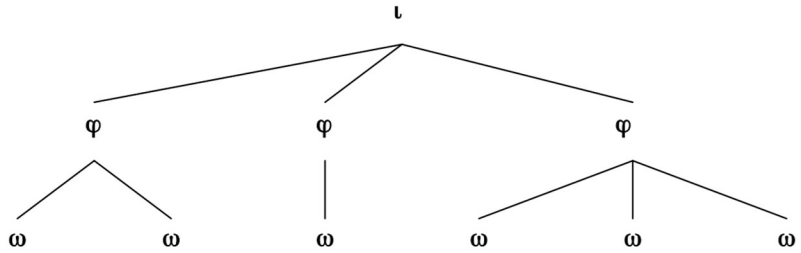


Figure 10

(Selkirk 1981, 1995, Nespor and Vogel 1982, 1986, Pierrehumbert and Beckman 1988, Hayes 1989, Inkelas 1990)

This is a representation that violates the SLH, also from Selkirk:

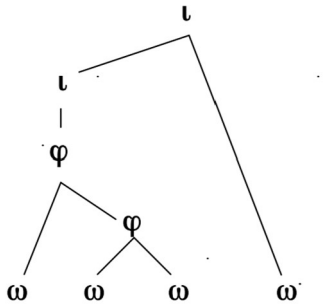


Figure 11

In this violation example, ι dominates ι and φ dominates φ, which suggests the constituent of a particular level *n* dominates another constituent of the same level. When ι directly dominates ω, it suggests a constituent of a particular level *n* dominates a constituent of the level *n-2* or even lower. Therefore, the example violates both aspects assumed in the SLH. Furthermore, the first violation is called recursivity, and the second is called level-skipping (Itô & Mester 1992/2003). Due to such evidence and further criticisms from other scholars regrading SLH (e.g., Ladd 1986, 1996, Odden 1987, Hyman 1987, Inkelas 1989, Itô & Mester 1992/2003, Zhang 1992, 2017, Truckenbrodt 1995, 1999, among others), Selkirk (1996) modified the SLH with the Optimality Theory, and thus factored out the SLH into four more primitive constraints, as listed below:

(3) Constraints on prosodic domination

(where C^n = some prosodic category)

a. Layeredness: No C^i dominates a C^j, $j > i$,

b. Headedness: Any C^i must dominate a C^{i-1} (except if C^i = syllable),

c. Exhaustivity: No C^i immediately dominates a constituent C^j, $j < i$ - 1,

d. Nonrecursivity: No C^i dominates C^j, $j = i$,

Selkirk claims that Layeredness and Headedness are inviolable and should not be universally dominated in the constraint ranking. By contrast, the constraints of Exhaustivity and Nonrecursivity are suggested not to be observed by all languages. Nevertheless, evidence of violation regrading Exhaustivity was reported across languages including Mandarin Chinese (Inkelas 1989, Kanerva 1989, Itô & Mester 1992, 2003, Prince & Smolensky 1993, Mester 1994, Hayes 1995, Vogel 2009, Zhang 2014, 2017, You, 2018). With evidence from Mandarin Chinese, Zhang (2014, 2017) proposes a prosodic hierarchy that demonstrates level-skipping. Namely, the violation of Exhaustivity is allowed in this language:

Prosodic hierarchy in Mandarin Chinese (Zhang)

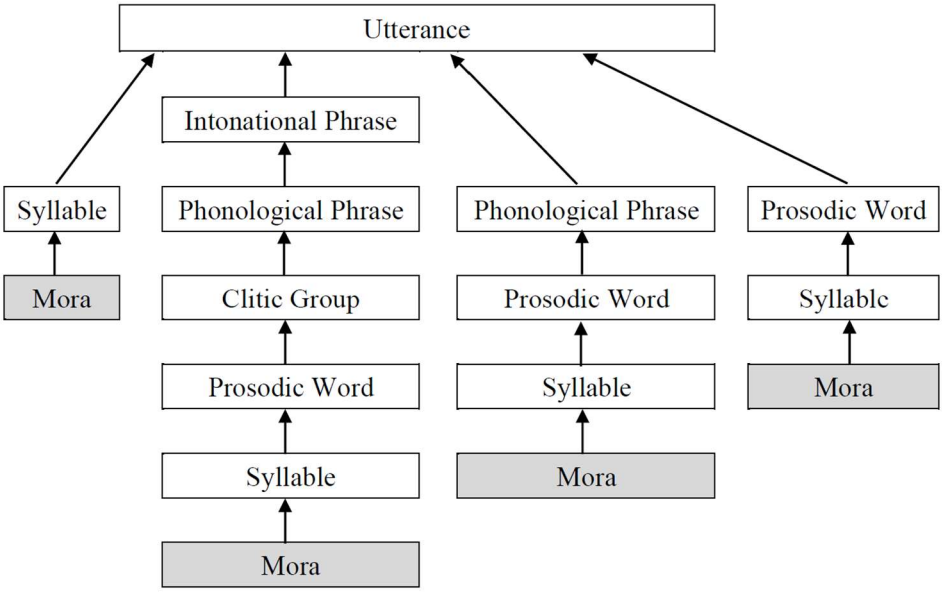


Figure 12

Zhang (1992, 2017) claims that recursivity is permitted in some Chinese dialects. For example, it was found that a clitic group may dominate another clitic group in old Chongming, and a prosodic word in Pingyao may dominate another prosodic word (You, 2018). In addition to Mandarin Chinese, violations of Nonrecursivity have also been found in other languages (cf. Ladd 1986, Odden 1987, Hyman 1987, Inkelas 1989, Truckenbrodt 1995, 1999, among others).

It is noticeable that Zhang (1992, 2017) also found exceptions against the inviolability of Layeredness in the Pingyao dialect, where a prosodic word may dominate a prosodic constituent at a higher level like the phonological phrase. Zhang also suggests that the prosodic recursivity reflects syntactic recursivity and thus only occurs between prosodic constituents in the morpho-syntax-based hierarchy. A supplementary principle to the SLH thus was proposed as follows (Zhang, 1992, 2017):

(4) Stipulation of prosodic recursivity

Prosodic recursivity is prohibited between the units of different hierarchies (language-universal), but optionally in the units of the same hierarchy (language-specific).

With the supplementary principle, the SLH can deal with Nonrecursivity, Layeredness, and Exhaustivity violations. In this way, there is no violation of the Strict Layer Hypothesis among prosodic units within different hierarchies, as shown in the trisected model for prosodic hierarchy. Specifically, Zhang (1992, 2017) pointed out that a phonological phrase cannot dominate an intonational phrase since it belongs to the morpho-syntax-based and focus-based hierarchies. However, among prosodic units in the same hierarchy, the violation of the Strict Layer Hypothesis may occur on a language-specific basis and evidence of this is found in some Chinese dialects, such as Chongming and Pingyao.

In summary, though the Strict Layer Hypothesis was initially seen as a generally well-formed model containing the main qualities of the prosodic structure, it has been shown that the constraints involved in this speculation are not inviolable, as Selkirk designed at the beginning, as per proof across dialects and advancements in the hypothesis. Accordingly, the Strict Layer Hypothesis has been made significantly less severe in the current hypothesis of prosodic phonology.

2.1.4.2 The Relation-Based Approach

The Relation-Based Approach is one of the approaches built up under the theory of prosodic phonology. It refers to X-bar notions of phrase structure, including head-complement, modifier-head, specifier-head relations, and syntactic branching. In a specific language, the recursive side is the direction of branching and the non-recursive side is where specifiers are located. Nespor and Vogel (1986) proposed that reference should be made to the recursive and the non-recursive side

of a head when forming a phonological phrase. Thus, the phonological phrase can be defined as below (Nespor and Vogel 1986):

(5) Phonological phrase (φ) formation

The domain of φ consists of a clitic group which contains a lexical head (X) and all clitic groups on its non-recursive side up to the clitic group that contains another head outside of the maximal projection of X.

To eliminate non-branching φs, Nespor and Vogel (1986) provide an optional rule to restructure these φs:

(6) φ restructuring (optional)

A non-branching φ, which is the first complement of X on its recursive side, is joined into the φ that contains X.

The rules above are exemplified with Raddoppiamento Sintattico (RS henceforth) in Italian. RS lengthens the initial consonant when following a word ending in a stressed vowel and placed before a sonorant (specifically a vowel or other non-nasal sonorants). Examples below are from Nespor & Vogel (1986) and the contexts RS applies are marked with '=,' and the contexts in which RS does not apply are marked with '//':

a. Avrá = trovato il prescecane.

'He must have found the shark.'

b. Devi comprare delle mappe di cittá // molto vecchie.

'You must buy some very old city maps.'

And these sentences are structured in phonological phrases as:

a. [Avrá = trovato]$_{\varphi}$ [il prescecane]$_{\varphi}$

b. [Devi comprare]$_{\varphi}$ [delle mappe]$_{\varphi}$ [di cittá]$_{\varphi}$ // [molto vecchie]$_{\varphi}$

Since the restructuring rule is optional, the participation of the first non-branching complement of a head on its recursive side to the φ that contains the head should also be optional. This optional application in RS can be illustrated as:

[I caribú]φ_[nani]φ [sono estinti]φ

'Dwarf caribous are extinct.'

And the phonological restructuring phrase is:

[I caribú_nani]φ [sono estinti]φ

Nespor & Vogel (1986) additionally investigate Iambic Reversal and the Monosyllable Rule in English, Liaison in French, Vowel Shortening in Chi Mwi:ni, Tone Assignment and the Star Shift Rule in Japanese, Word Initial Voicing Assimilation along with the Reduction Rule in Quechua, and concluded that all these rules are sensitive to the formation of the phonological phrase and the φ restructuring is optional in some languages such as English and Italian, forbidden in some languages like in French), and obligatory in others like Chi Mwi:ni.

Although the definition of the phonological phrase domain from Nespor and Vogel needed modification due to developments in syntactic theory in the later 1980s, many types of research have been done following the Relation-Based Approach, and more examples of phonological rules that are analyzed to apply within the phonological phrase domain have also been found (cf. Cho 1990, Condoravdi 1990, Kidima 1990, Hayes & Lahiri 1991, Frota 2000, among others).

2.1.4.3 The Edge/End-Based Approach

The Edge/End-Based Approach attempts to reduce the syntactic sensitivity of the mapping algorithm to a single property of syntactic phrase structure, namely left or right ends of heads or maximal projections (You, 2018). Chen (1985, 1987) proposed this approach for the tone sandhi

domain in the Xiamen dialect of Chinese, followed by Selkirk's suggestion of parameters for the mapping from the syntactic structure to the prosodic structure, as below:

(7) End parameter settings:

(I)	a.	]Word	b.	Word[
(II)	a.	]Xmax	b.	Xmax[
(III)	a.	]Xhead	b.	Xhead[

Figure 13

There are three prosodic constituents in the parameter setting: the phonological/prosodic word as]$_{Word}$ or $_{Word}$[, the primary phonological phrase as]$_{Xmax}$ or $_{Xmax}$[, and an intermediate item called minor phonological phrase/small phonological as]$_{Xhead}$ or $_{Xhead}$[. In this case, there might be four types of phonological phrase domain, and according to Selkirk (1986), they can be illustrated accordingly: French liaison as an example of]$_{Xhead}$, tone sandhi in Xiamen and stress assignment in Chi Mwi:ni as examples of]$_{Xmax}$, and tone sandhi in Ewe (Clements 1978) as an example of $_{Xmax}$[. No examples for Xh$_{ead}$[. In Chi Mwi:ni, stress assignment applies within the domain of the phonological phrase, and is bounded with the right edge of maximal projection]X$_{max}$ (Selkirk 1986: 390), see below:

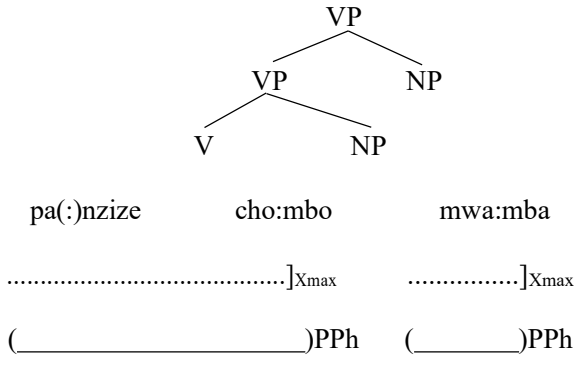


Figure 14 'he ran the vessel on to the rock'

In the example, the verb *pa(:)nzize* and its complement *cho:mbo* form the domain of a phonological phrase, and the adjunct NP *mwa:mba* forms an independent phonological phrase domain by itself. The end-setting]$_{Xmax}$ identifies two right ends of maximal projections and thus marks the right edges of two phonological phrases (You, 2018). Other studies that concern phonological phrasing by following the Edge/End-Based Approach include a Japanese examples from Selkirk & Tateishi (1988), a Shanghai Chinese example from Selkirk & Shen (1990), Cho (1990), and a Korean example from Kenstowicz & Sohn (1997), among others.

Although branchingness has a crucial function in the Relation-Based Approach, it has no direct role in defining a phonological expression in the original algorithm of the Edge/End-Based Approach, which is sensitive to edges alone. However, in some languages, such as Italian, English, and Kinyambo (cf. Bickmore 1990), branchingness is relevant to phonological phrasing. Therefore, Cowper & Rice (1987) and Bickmore (1990) suggested adding the parameter [+/- branchingness] to the Edge/End-Based Approach to solve this problem.

2.1.4.4 Violable constraints applied in the Edge/End-Based Approach

As mentioned earlier in this section, Selkirk (1996, 2000) and Truckenbrodt (1995, 1999, 2002) adopted the notion of violable constraints from Optimality Theory and applied it into the Edge/End-Based Approach. As a result, the formation of the phonological domain becomes the evaluation of potential phonological phrases. This particular process starts from syntactic structures and is verified by a set of violable constraints in order. In utilizing the generalized alignment theory from McCarthy & Prince (1993), Selkirk composes a set of constraints as below:

a. Align (Lex^{max}, R; PPh, R)

b. Align (Lex^{max}, L; PPh, L)

According to Selkirk, the right or left edge of any Lex^{max} in morpho-syntactic structure can map onto the corresponding edge of the phonological phrase. Truckenbrodt (1995, 1999) proposed another set of constraints to describe the syntax-phonology interface later, namely W_{RAP}-XP, and it is defined as:

W_{RAP}-XP: Each lexically headed XP must be contained inside a phonological phrase.

W_{RAP}-XP =

For every XP, XP a projection of a lexical category, there is a phonological phrase φ, such that all terminal elements that are dominated by XP are also dominated by φ.

After applying the above constraints across languages, counterexamples were found (Kimatuumbi, Chichewa), and thus modifications were made accomodating both. The final version of constraints applied in the Edge/End-Based Approach within OT was concluded as:

(I) Constraints on prosodic domination (Selkirk 1996)

a. Layeredness (inviolable) b. Headedness (inviolable)

c. Exhaustivity (violable) d. Nonrecursivity (violable)

(II) Interface constraints

a. A_{LIGN}-XP, L/R (Selkirk 1996, Truckenbrodt 1995, 1999)

b. W_{RAP}-XP (Truckenbrodt 1995, 1999)

(III) Constraints on the effects of focus on phrasing (Truckenbrodt 1995, 1999)

2.1.5 Summary

The section above introduces the theory of prosodic phonology, which deals with the relationship between morpho-syntax and phonology. It contends that there should be a halfway level called prosodic structure in which prosodic constituents are organized in a particular order, which fills in as the domain of application for phonological rules. The discussion above showed

the advancements of the theory as well as its fundamental elements and approaches, including the prosodic structure, the prosodic hierarchy, the Strict Layer Hypothesis, and the application of constraints from the Optimality Theory, etc.

After examining the phonological specifications in the Chengdu dialect, discussions of this study are framed inside the prosodic phonology theory. By following the fundamental structure in the prosodic phonology, I will likely adopt the universal prosodic hierarchy of the Chengdu prosodic hierarchy as below:

Prosodic hierachy in the Chengdu dialect

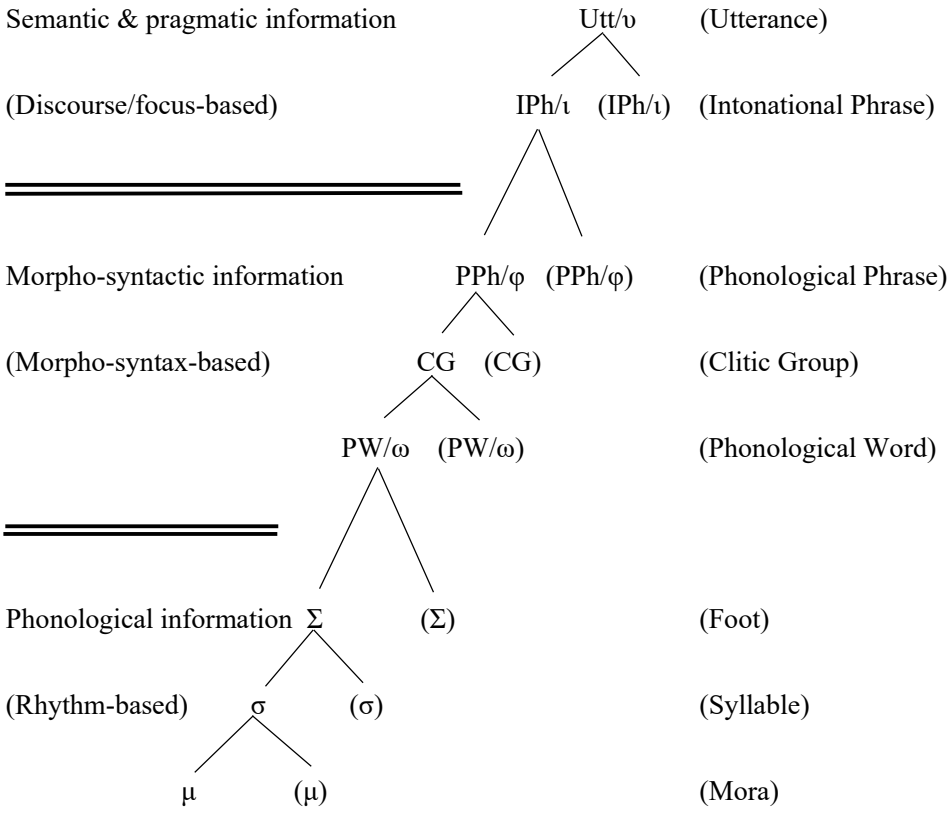


Figure 15

This dissertation will not concern topics about the lowest level (namely mora) because the Chengdu dialect is not a quantity-sensitive dialect, just as Mandarin Chinese is not a quantity-sensitive language (cf. Chan 1985, Zhang 2014, 2017, among others). Thus, the mora does not

directly function in applying any phonological rules or phonetic processes in this particular dialect. Likewise, the highest level (namely the utterance) in Chengdu will not be discussed in this work either, because no relevant phonological phenomena have been found.

Additionally, the weakened SLH is utilized in this dissertation with the pre-set that the violation of constraints of Exhaustivity, Nonrecursivity, and Layeredness may all be allowed in the Chengdu dialect by referring to the previous study (You, 2018). Furthermore, the assumption will be proved with dialectal data in further detailed discussions in the following chapters.

2.2 Phonetic background and phonological phenomena of the Chengdu dialect

2.2.1 Segmental inventories and tones

2.2.1.1 Initials

In general, there are 21 initials in the Chengdu dialect, including a zero initial. Four initials do not exist in Mandarin Chinese: [z], [v], [ŋ] and [nʲ]; while five initials in Mandarin do not exist in Chengdu dialect: [tʂ], [tʂʰ], [ʂ], [ʐ] and [n].

The table below is the initial consonant inventory of the Chengdu dialect, transcribed in the International Phonetic Alphabet (IPA) using every symbol in the inventory, with standard orthography of the particular sound in Pinyin and a Chinese character provided:

Table 1

		Bilabial	Labiodental	Coronal	Alveolar	Alveo-palatal	Velar
Plosive	plain	p b 贝			t d 得		k g 古
	aspirated	pʰ p 配			tʰ t 套		kʰ k 可
Affricate	plain			ts z 早		tɕ j 价	
	aspirated			tsʰ c 草		tɕʰ q 巧	

		Bilabial	Labiodental	Coronal	Alveolar	Alveo-palatal	Velar
Nasal		m m 没		n[1] n 路		nʲ ny 你	ŋ ng 我
Fricative	Voiceless		f f 发	s s 速		ɕ x 小	x h 好
	voiced		v v 五	z r 如			
Zero		ø 儿					

Chengdu dialect lacks [tʂ], [tʂʰ], [ʂ], [ʐ] and [n] in comparison with Mandarin. It has [ŋ] and [nʲ] that Mandarin does not have. It also has an alveolar nasal stop [ŋ̡-], which can consist of a nasal consonantal initial structure of syllable. For example:

Table 2

Character	Chengdu dialect	Mandarin
议	[ŋ̡i]	[ji]
疑	[ŋ̡i]	[ji]
验	[ŋ̡iæ]	[jan]
严	[ŋ̡iæ]	[jan]
业	[ŋ̡iɛ]	[jɤ]
研	[ŋ̡iæ]	[jan]
我	[ŋo]	[wo]
哀	[ŋai]	[ai]
熬	[ŋao]	[au]
咬	[ŋao]	[jau]
偶	[ŋou]	[əu]
暗	[ŋæn]	[an]

[1] The coronal nasal *n* in Chengdu dialect is actually a lateralized nasal sound, which means airflow goes out of the nasal cavity and oral cavity at the same time when it is pronounced (Zhen, 1958). According to Shi (2011), the nasality contrast of nasal initials and non-nasal initials is 45, which suggests that the fusion of /n/and /l/ is not only about the sound value, but also the phoneme distinction, and /n/and /l/ have merged as one phoneme. There are allophonic variations of nasalized-lateral and lateralized nasal depending on strict conditions. This dissertation will mark IPA [n] and [l] according to the tendency of the actual pronunciation.

This nasal initial is presently at the edge of disappearance. Both pronunciations are working well in the dialect, so the zero initial and nasal initial are more like free variation in this case. However, this development process is prolonged, and the nasal initial is still the dominant pronunciation.

2.2.1.2 Finals

There are thirty-six finals in the Chengdu dialect, including four finals that do not exist in Mandarin: [ɛ], [iai], [uɛ], and [jo]. On the other hand, three finals in Mandarin do not exist in the Chengdu dialect: [ɤ], [iŋ], and [əŋ]. What followins is the final inventory of the Chengdu dialect, transcribed in IPA, with a Chinese character using that syllable rime and the standard orthography of that sound in Pinyin provided under every IPA symbol in the inventory below:

Table 3

	-Ø					-i or -u				nasal finals			
Ø-	ɿ i 日	ɚ er 二	a a 大	o o 我	ɛ e 黑	ai ai 街	ei ei 批	au ao 包	əu ou 走	an an 烦	ən en 樱	aŋ ang 帮	oŋ ong 亩
i-	i i 一		ia ia 牙		iɛ ie 叶	iai iai 介		iau iao 标	iəu iu 九	ian ian 变	in in 兵	iaŋ iang 量	
u-	u u 五		ua ua 瓜		uɛ ue 国	uai uai 乖	uei ui 类			uan uan 段	uən un 春	uaŋ uang 光	
y-	y ü 鱼			yo üo 药	ye üe 绝					yan üan 鲜	yn ün 泳		yoŋ iong 蓉

After labial initials, [ɤŋ] is read as [oŋ]. For example:

Table 4

Character	Chengdu dialect	Mandarin
朋	[p^hoŋ]	[p^hɤŋ]
猛	[moŋ]	[mɤŋ]
风	[foŋ]	[fɤŋ]

When preceded by affricate and alveo-palatal initials, [j] becomes [a] finals:

Table 5

Characters	Chengdu dialect	Mandarin
街	[kai]	[tɕjɛ]
鞋	[xai]	[ɕjɛ]
解	[kai]	[tɕjɛ]
敲	[k'ao]	[tɕ'jau]
咸	[xæn]	[ɕjɛn]
晏	[æn]	[jɛn]
项	[xaŋ]	[ɕjaŋ]
巷	[xaŋ]	[ɕjaŋ]
硬	[ŋɛŋ]	[jiŋ]

Some transcriptions of finals like "界戒解解放军届介阶械蟹" is [iai], but in traditional Chengdu dialect, the actual pronunciation of aged native speakers is closer to the higher place of articulation: [iɛi]; Finals [æ], [ɥæ], [uæ] and [jæ] in Chengdu dialect are actually developed from nasal finals [an], [ɥɛn], [wan], [jɛn] in Mandarin. However, these four are still in the process of developing, thus the pronunciation of these finals has not reached any agreement from all native speakers. Younger generations often pronounce them as [æ], [ɥæ], [uæ] and [jæ], especially among some young women. In comparison, older generations prefer to stay in the middle of nasalization, which is presented as the early stage of the final [-n]'s disappearance. That is to say, they prefer to pronounce them as [an], [ɥɛn], [wan], [jɛn] or [ã], [ɥɛ̃], [wã], [jɛ̃] instead of the completely

developed forms of [æ], [ɥæ], [uæ] and [jæ]. However, the general tendency is the weakness and disappearance of the final nasal coda [-n], as fewer and fewer people read them as standard [an], [ɥɛn], [wan], and [jɛn] in Chengdu.

2.2.1.3 Tones

The Chengdu dialect belongs to the "Chengyu dialect," a subcategory of southwest official dialect. Although Chengdu dialect belongs to the northern dialect area, only 47.8% of Sichuan dialect vocabulary is shared in common with the Beijing dialect, which is based on Standard Chinese. This dialect has four tones, whose citation forms are 45, 31, 53, and 213 in Chao's letters. Many scholars tried to provide citations in the past but ended with different results:

Table 6

Tones / Studies	Yin	Yang	Shang	Qu
Zhen (1958)	55	21	53	213
Chang (1958)	35	21	41	213
Liang (1998)	55	21	53	213
Yang (1984)	45/55	21/31	42	24
Yuan (1983)	44	31	53	13
Cui (1997)	55	31	53	13
Lin (2005)	MH	ML	HM	LM
Qin (2014)	45	31	51	213
He (2015)	35	31	52	212

It can be seen that those former studies about the tone values have different results, especially for the tone values and tone tours of Yinping and Qusheng. Some think the Yinping should be a rising tone instead of a level tone, and Qusheng should be a dipping tone instead of a falling one. Many of these past studies were conducted by perception experiments rather than acoustic ones. Perception is somehow arbitrary, even for a strictly trained expert, which explains

the differences in tone values in the Chengdu dialect. Matthew Chen (2001) once pointed out that perceptual phonetic descriptions vary from different theoretical opinions of different linguists. Therefore, the recent experimental result is adopted in this paper.

Table 7

Tone name	Tone contour	Tone value
Yinping (T1)	˥	45
Yangping (T2)	˩	31
Shangsheng (T3)	˧˥	51
Qusheng (T4)	˥˩	213

2.2.2 Outstanding phonological phenomena

In 1958, two inspiring female scholars, one in Chengdu and the other in the UK, published their observations on the tone sandhi phenomena in the Chengdu dialect. Zhen found that tone sandhi phenomena can be found in spoken Chengdu and concluded that reduplications have the most salient feature: when the first tone is reduplicated, the citation tone remains; when the second and fourth tone reduplicates, the latter syllable becomes the first tone; and when the third tone reduplicates, the latter syllable becomes the second tone. In contrast, some cases were observed without successfully generating rules. At the same time, in Chang's descriptive study, the author tried to answer questions such as "whether the tone changes if it follows or is followed by the same or a different one?" "If there is a change, what is it like?" Years have passed and theories developed, with most of their questions now answered. This section focuses on phenomena related to discussions in later chapters, in a way that provides descriptions of each phenomenon with several examples.

2.2.2.1 Tone sandhi

2.2.2.1.1 Morphological Tone Sandhi

As mentioned above, one of the earliest tone sandhi phenomena noticed by linguists is the morphological process of reduplication (Zhen 1958, Chang 1958). According to Zhen, when two identical syllables combine in the Chengdu dialect, MTS applies as below:

Table 8

Tone	Chinese Example	IPA	Tone value change
1	包包	pau ^{55}+ pau^{55}	Unchanged
2	瓶瓶	p'in^{21}+ p'in^{21}	p'in^{21}+ p'in$^{\mathbf{55}}$
3	本本	pən^{51}+ pən^{51}	pən^{51}+ pən$^{\mathbf{21}}$
4	棍棍	kuən^{213}+ kuən^{213}	kuən^{213}+ kuən$^{\mathbf{55}}$

In *Chengdu fangyan cidian* (Li 1998), MTS is described as in most cases:

$$T2+T2 \rightarrow T2+T1 \quad (2)$$

$$T4+T4 \rightarrow T4+T1 \quad (3)$$

While in some cases, the latter syllable remains unchanged. Some kinship terms also remain original tones. Qin in 2015 observed the MTS and summarized it as:

Table 9

Citation tone	Sandhi tone
MH.MH	MH.H
ML.ML	ML.M
HM.HM	HM.ML
LM.LM	LM.H (reduplicated nouns)
	LM.L (other reduplications)

After careful examination and comparison of previous studies, this dissertation is going to adopt MTS rules as below:

Table 10

Tone	Chinese Example	IPA	Tone value change
1	包包	pau ^{45}+ pau^{45}	pau ^{45}+ pau$^{\mathbf{55}}$
2	瓶瓶	p'in^{31}+ p'in^{31}	p'in^{31}+ p'in$^{\mathbf{55}}$
3	本本	pən^{53}+ pən^{53}	pən^{53}+ pən$^{\mathbf{21}}$
4	棍棍	kuən^{213}+ kuən^{213}	kuən^{213}+ kuən$^{\mathbf{55}}$

*Kinship terms do not always follow the rules in the form.

2.2.2.1.2 Tone sandhi within two syllables

Tone sandhi studies of the Chinese language have collected many achievements in history. Traditional Chinese dialectologists first described different dialects with detailed linguistic data and then theoretical linguists generalized rules and patterns from these descriptions. According to previous studies, there are generally two types of tone sandhi patterns in Chinese: "right-dominant" and "left-dominant" (Yue-Hashimoto 1987; Chen 2000; Zhang 2007; Zhang 2014). Right-dominant is often found in "most Min, Southern Wu, and Northern dialects" (Zhang 2014), which indicates that the final syllable keeps the base tone when phonological rules are applied and the other syllable tends to change its tone values. As for left-dominant, which is often detected in Northern Wu dialects, keeping the base tone on the initial syllable after phonological rule application.

Chengdu dialect is a member of the northern dialect group, in which tone sandhi plays a vital role in its phonological system. Nevertheless, there are comparatively fewer studies on this aspect than on other linguistic aspects. According to Yan (2016), among the 16 disyllabic tonal combinations in the Chengdu dialect, 10 out of 16 have tone sandhi. While unlike the analysis in Yan's argument (that ML keeps original tones in disyllabic structures), according to the acoustic

experiment conducted by Qin (2015), all four tones change their values due to different circumstances.

Table 11 Tone Sandhi of 1st Syllable

Initial Position	Final Position	Tone Value Change
T1 (45)	T1/T3	45
	T2/T4	45→35
T2 (31)	T1/T2/T3/T4	31→43
T3 (51)	T1	51→54
	T2/T3/T4	51→55
T4 (213)	T1/T2/T3/T4	213→32

Table 12 Tone Sandhi of 2nd Syllable

Initial position	Final position	Tone Value Change
T1/T3/T4	T1 (45)	45→44
T2		45→33
T1	T2 (31)	31→42
T2		31
T3/T4		31→41
T1/T3/T4	T3 (51)	51→52
T2		51→42
T1/T2/T3/T4	T4 (213)	213→32

In short, the tone sandhi patterns in the Chengdu dialect are rich yet unlikely to be summarized into “right-dominant” or “left-dominant.”

2.2.2.1.3 Tone sandhi within three or more syllables

Tone sandhi rules are applied to tri-syllabic combinations based on disyllabic structures. Theoretically, there are 64 types of tri-syllabic combinations in the Chengdu dialect, and 7 out of 64 have tone sandhi phenomena (Yan, 2016). If the Chengdu dialect is left-dominant, tone sandhi

only happens in one direction. However, among the seven types of tone sandhi, both directions occur. Some can only change to the right and some to the left, which reflects a completely random distribution. Furthermore, the same tonal pattern with different branches can change to the same direction, for example:

(1) Different branches both change from left to right

HM. LM. MH-MH. L. M

[打 字] 机

老 [教 师]

(2) Different branches both change from right to left

HM. MH. MH-H. M. M

[水 仙] 花

小 [西瓜]

Yan's examples theoretically illustrated that tone sandhi directions in the Chengdu dialect have no relationship with syntactic structures. Assuming changes from left to right represent successful tone sandhi application, he summarized the seven types of tone sandhi in tri-syllabic structures as below:

Table 13 Tone Sandhi in Tri-syllabic Structures

	Underlying Form	Surface Form	Direction	Application	Examples
1	MH. LM. MH	MH. L. M	To right	Yes	三字经
2	ML. LM. MH	ML. L. M	To right	Yes	织布机
3	HM. LM. MH	H. L. M	To right	Yes	打字机
4	LM. LM. MH	LM. L. M	To right	Yes	会计师
5	MH. MH. MH	MH. M. M	To left	No	深呼吸
6	ML. MH. MH	ML. M. M	To left	No	除湿机
7	HM. MH. MH	H. M. M	To left	No	水仙花

Since the assumption is to apply tone sandhi from left to right, examples 5-7, fail to verify this assumption. With surface form alone, tone sandhi can be seen in a linear sequence but yet a rule cannot be drawn between syntactic structure and directions out of these structures. Lin (2006) analyzed the process with OT and argued that Chengdu has the maximal number of three syllables on the size of the tone sandhi domain. Moreover, if one string exceeds the upper limit, it is divided into several independent domains to avoid oversized generating. The division point of the strings into different domains is not specially assigned but is sensitive to morphosyntactic structures. This conclusion is analyzed by Yan in theoretical phonology and will be further supported by both the perceptual and acoustic experiments later in this study.

2.2.2.1.4 Vowel Raising

In addition to tone sandhi, He and Rao (2013) reported a raising phenomenon of /a/ in [Xan] when X is a consonant or vowel in the Chengdu dialect. Hu and Zhang designed an acoustic experiment proving that /a/ is realized as [ɛ] for young speakers but [æ] for older speakers. Historically, there were several studies about the vowel-raising phenomena in the Chengdu dialect. Hu and Zhang summarized these studies focusing on [an]:

Table 14

Year of Analysis	1941	1956	1956	c.a. 1982	c.a. 1983	c.a. 2006
Published in	Yang (1984)	Zhen (1958)	Zhen, Hao and Chen (1960)	Liang (1982)	Zhen (1983)	He and Rao (2013)
/iai/	a	ɛ	ɛ	ɛ	NA	ɛ
/ian/	e	æ	ɛ	ɛ	ɛ̃	æ / ɛ
/yan/	e	æ	ɛ	ɛ	ɛ̃	æ / ɛ
/Can/	a	A	æ	NA	ã	æ / ɛ
/uan/	a	A	æ	NA	ã	NA

In this analysis, they conclude that historically /iai/ is almost always realized as [ɛ]. Also, /ian/ and /yan/ are gradually raised whereas /Can/ and /uan/ seem to be raised only very recently. They also pointed out that He and Rao (2013) provide the first and possibly only literature documenting the raising of /Can/. However, many newcomers have noticed this raising effect in Chengdu. immediately recognizing how Chengdu people pronounce [pan] or [fan] differently from people in nearby cities. Additionally, He and Rao (2013) report that female speakers born after the 1980s exhibit the strong raising of /a/ in [an], while male speakers born after the 1990s generally raise /a/ in [an]. Therefore, it seems that female speakers are leading the vowel change.

2.2.2.1.5 Others

Qin (2015) summarized several phonological rules and claims that these can be applied optionally within a phonological word and never across a phonological word boundary and above. Although this dissertation holds different views about the definition of the phonological word in the Chengdu dialect, the phonological phenomena alone are pretty acceptable. Therefore, tones are added by the current study without applying TS rules.

1) Voicing: The voicing rule in this dialect optionally voices a stop when a back vowel precedes it.

a. 咋个 $tsa^{31}ko^{213} \rightarrow tsa^{31}\mathbf{k^h}o^{213}$ 'how'

b. 角度 $ko^{31}tu^{213} \rightarrow ko^{31}\mathbf{t^h}u^{213}$ 'perspective'

2) Nasalization: This rule optionally nasalizes the segment after a nasal:

a. 应该 $in^{213}kai^{45} \rightarrow in^{213}\mathbf{ŋ}ai^{45}$ 'should'

b. 人家 $zən^{31}$ tɕia$^{45} \rightarrow zən^{31}$ **ȵ**ia^{45} 'people'

3) Assimilation: Some sounds in Chengdu are optionally assimilating to the sound before them:

a. 工人 koŋ^{45}zən^{31} → koŋ^{45} **ŋ**ən^{31} ‘worker’

b. 笑人 ɕiau^{213}zən^{31}→ɕiau^{213} **u**ən^{31} ‘funny’

4) Deletion: This rule optionally deletes the final, a consonant, or both a final vowel and the initial after it together:

a. 我们 ŋo^{51}m**ən**^{45} → ŋom^{54} ‘we’

b. 时候 s**ɿ**^{31}**x**əu^{213} → səu^{32} ‘time’

Since rules in this section are optional and insufficient to testify any principles under design, these rules will only be taken as side references in later chapters.

2.2.3 Summary

The first half of this chapter introduces the theoretical background of the Chengdu phonological hierarchy. The second half provides a descriptive image of the overall Chengdu dialect, including tonal and segmental inventories and some phonological phenomena in this dialect. Generally speaking, diverse phonological phenomena in Chengdu apply to various gatherings of sounds: Vowel Raising only occurs within a syllable; MTS can only be seen within reduplications; TS has its particular environment that concerns either two syllables or more than two syllables; and Voicing, Nasalization, Assimilation, and Deletion do not occur across phonological word boundaries, all implying that every phonological process should have a domain for its application.

The latter chapters in this dissertation will thus look at the domains of each application and illustrate how a given phonological rule can be applied in a particular domain even as it gets blocked everywhere else. Each chapter follows a simple two-part structure: first, an introduction of the particular prosodic domain and its application in phonological processes and second, linguistic data from the Chengdu dialect.

Chapter III The Syllable and the Foot in the Chengdu Dialect

This chapter investigates the roles of the syllable and the foot in the prosodic phonology of the Chengdu dialect. It contains an overview of these two unit-related topics that are in question in some phonological literature and attempts to analyze the controversies surrounding them in Chengdu. Specifically, its focus lies in the two units as domains of phonological rules and a further argument on the existence of the foot in this dialect.

3.1 The syllable as an independent constituent

It is widely accepted that the smallest constituent of the prosodic hierarchy is the syllable. Therefore, notions such as stress and accent are customarily included as parts of an entire syllable. This chapter will not deal with the exhaustive treatment of the syllable. Instead, it only discusses the selected issues most relevant to the study of the Chengdu dialect.

3.1.1 The syllable as a prosodic domain-a universal rule

There were arguments about taking syllables as a notion in phonology. In early studies, the syllable was not an entirely accepted constituent in the theory of generative phonology. However, Hooper (1976) introduced the syllable into the framework of natural generative phonology later and consequently followed by an increasing amount of related research. Since then, the general understanding of the syllable and its relationship with various aspects of phonology was significantly developed. Though there are many pieces of research on the syllable, this section will only follow the universal and language-specific principles known and widely accepted.

In many languages, the syllable serves as the domain of application for phonological rules, and it is the smallest constituent in phonology that serves as the domain of (segmental) phonological rules (Nespor & Vogel). Previous research had provided evidence from different

languages to support this conclusion (cf. Kahn 1976, Kiparsky 1979, Booij 1981, van der Hulst 1984, Nespor & Vogel 1986, Jensen 1993, among others).

The first illustration comes from Arabic. There are two types of word-internal vowel shortening in Arabic. One is known as closed syllable shortening (CSS) while the other is open syllable shortening (OSS). CSS is a straightforward phonological process that operates within a syllable to block impermissible syllabification, while OSS operates within a two-syllable sequence to form an iambic foot (Younes, 1993). Examples are from three Arabic dialects: Modern Standard Arabic (MSA), Cairene Arabic, and Palestinian Arabic:

(1) MSA Cairene Palestinian

a. kaan kaan kaan "he was"

b. ʔistašaar ʔistašaar ʔistašaar "he consulted"

When a consonant-initial suffix is added to a hollow verb in the Arabic dialects above, the long vowel is shortened. Specifically, the suffix "ti" is added to the original syllable:

(2) MSA Cairene Palestinian

a. kaan → kunti kunti kunti "you were"

b. ʔistašaar → ʔistašarti ʔistašarti ʔistašarti "you consulted"

CSS takes place to block the formation of:

*a. kaanti

*b. ʔistašaarti

CSS does not occur across syllables. Namely, the syllable is the domain of the CSS rule.

Another example is schwa insertion in Dutch (cf. Booij 1981, Trommelen 1983, van der Hulst 1984, Nespor & Vogel 1986, among others). In certain varieties of Dutch, when the liquid

and the non-coronal obstruent are in the same syllable, a schwa can be inserted. See example (Nespor & Vogel, 1986):

a. [park]σ → par[ə]k ‘park’

b. [help]σ [ster]σ → hel[ə]pster ‘helper (fem.)’

c. [melk]σ [ach]σ [tig]σ → mel[ə]kachtig ‘milklike’

(9) *Schwa Insertion*

Ø → ə / [... L ___ [-cor] C0]σ

Similar examples can be found in Spanish Velarization, Glottalization, and Alveopalatalization in English (You, 2017). With demonstrations across languages, it is clear that the syllable can function as a domain of phonological applications.

3.1.2 The syllable as a prosodic domain: a language-specific rule

In standard Chinese, a segmental process is a change in context that applies to consonants and vowels. The basic syllable structure of Mandarin Chinese is as below (Zhang, 2016[1])

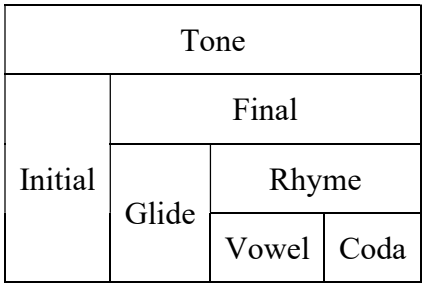


Figure 16

The Chengdu dialect is one of the northern dialects and it has the same basic syllable structure as Mandarin Chinese:

[1] Lecture notes.

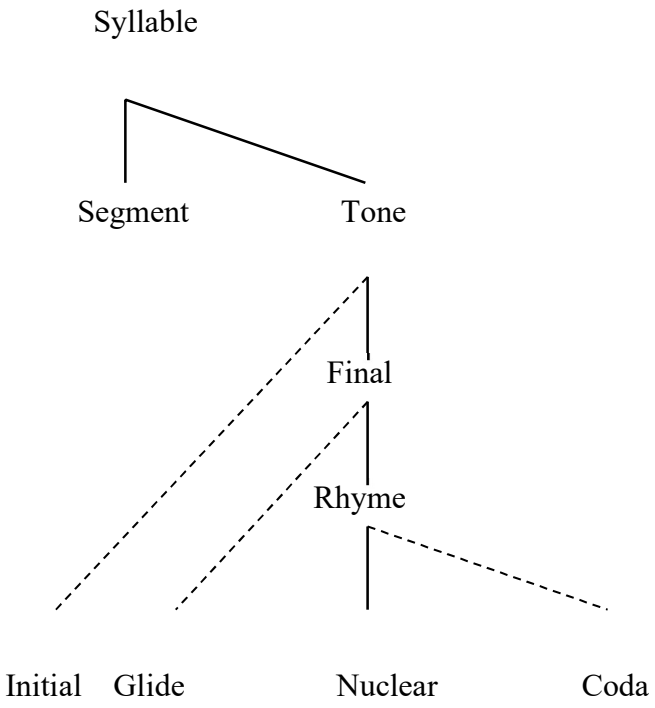


Figure 17

In Mandarin, phonological changes in contexts that apply to consonants and vowels are both found. Consider examples of consonants change as below (Zhang, 2016):

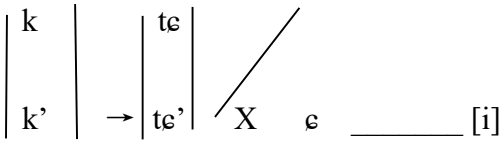


Figure 18

Also, phonological Analysis of Mandarin vowel change:

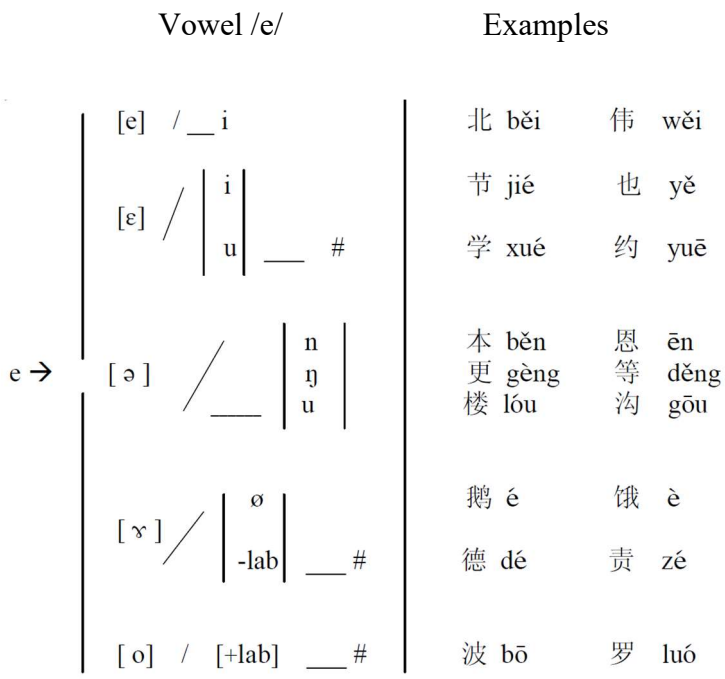


Figure 19

3.1.2.1 Phonological Analysis of Chengdu vowel

3.1.2.1.1 /e/

In Chengdu, there are phonological vowel changes similar to Mandarin. Consider the vowel /e/:

				Examples					
/e/ →	[ə] / ___	n		本	běn	[pən]	恩	ēn	ən
		ŋ		更	gèng	[kən]	等	děng	[tən]
		u		楼	lóu	[ləu]	沟	gōu	[kəu]
	[o] / [+lab] ____#			波	bō	[po]	罗	luó	[lo]

Figure 20

3.1.2.1.2 /a/

He and Rao (2013) reported a raising phenomenon of /a/ in [Xan] when X is a consonant or a vowel in Chengdu: /a/ is realized as [ɛ] for young speakers but [æ] for older speakers. Moreover, in the same age group, female speakers raise more than male speakers. This phonological process is interpreted as /a/ first assimilates to its preceding front high vowels /i/ and /y/ for older speakers, which then becomes phonologized in younger speakers in all conditions, including /C^{h}an/ and /Can/.

Moreover, there were also other early studies of the Chengdu dialect that focused on the rhyme /an/. Thus Hu and Zhang (2018) summarized the measured vowel raising phenomena as below:

Year of Analysis	1941	1956	1956	c.a. 1982	c.a. 1983	c.a. 2006
Published in	Yang (1984)	Zhen (1958)	Zhen, Hao and Chen (1960)	Liang (1982)	Zhen (1983)	He and Rao (2013)
/iai/	a	ɛ	ɛ	ɛ	NA	ɛ
/ian/	e	æ	ɛ	ɛ	ɛ̃	æ / ɛ
/yan/	e	æ	ɛ	ɛ	ɛ̃	æ / ɛ
/Can/	a	A	æ	NA	ã	æ / ɛ
/uan/	a	A	æ	NA	ã	NA

Figure 21

Based on He and Rao's hypothesis, Hu and Zhang conducted an acoustic experiment in 2018 and confirmed the vowel-raising in Chengdu. Furthermore, they claim that the raising of /a/ in young speakers of Chengdu in /Van/, /Can/, and /C^{h}an/ are all verified and it is clear that female speakers lead the change.

3.1.2.1.3 /u/

Carden (2016) reports that CV syllables with a high back vowel /u/ in most cases would surface with a slight change in vowel quality. Nonetheless, in syllables with a labiodental fricative /f/ onset or onset with an epenthetic labiodental glide /ʋ/, the high back vowel is realized as a more centralized vowel [ʊ]. Carden hypothesized that the variant is triggered either by the absence of a rounding feature of these labiodental onsets or simplicity of articulation. See Carden's examples below, where examples (d-e) show the allophonic variant with labiodental onsets:

Table 15

a.	[mu]
b.	[tu]
c.	[su]
d.	[fʊ]
e.	[ʋʊ]
f.	[pu]
g.	[p^hu]
h.	[t^hu]
i.	[nu]

3.1.2.2 Phonological process of Chengdu consonant

In addition to changes on vowels, there are also changes on a consonant in the dialect. For example, the /n/ becomes /ɲ/ when it is placed before a [+front] vowel. Consider the examples:

/n/ → [ɲ] /___ V[+front] [ɲi] 你

[ɲy] 女

[ɲiaŋ] 娘

3.1.3 Summary

Among all the syllabic changes discussed in the last section, the /a/ raising shows a possible trending of the continuous sound change in the Chengdu dialect. In contrast, other phonological phenomena are processes that operate within the syllable domain. Therefore, the syllable is an indispensable prosodic constituent in this dialect. The syllable was not incorporated into the generative theory until Hooper, who included the concept within the generative phonology in 1976 (Nespor & Vogel). Since then, much research dealing with various aspects of the syllable's nature and role in phonology has been done. The rapidly increased outcomes of this topic supported that syllable as a prosodic domain has been illustrated in many languages and dialects. According to the discussion in this section, it can be seen that the syllable as the prosodic domain is not only a universal rule across languages such as Arabic dialects, Dutch, and English but also a language-specific rule that functions as the domain of specific phonological rules of the Chengdu dialect.

3.2 The foot as a prosodic domain across languages[1]

According to Vogel and Nespor, syllables are grouped into feet, and the foot can serve as the domain of application for certain phonological phenomena, including phonological rules and phonotactic constraints, cross-linguistically (cf. Selkirk1978/1981, Nespor & Vogel 1986, among others). In addition to the theoretical assumption, several types of phonological rules have been reported to operate within the domain of the foot across languages (cf. Kiparsky 1979, Selkirk 1980, van der Hulst & Smith 1982, Nespor & Vogel 1986, Jensen 1993). Therefore, many scholars conclude that the foot should be established as an indispensable prosodic constituent in the universal prosodic hierarchy. One main argument of the foot in metrical theory is based on stress

[1] There are already detailed studies reviewing the literature about the foot as a prosodic domain across languages, thus this section doesn't provide a comprehensive revisit of previous studies. Instead, it only provides a brief introduction. For more information of the literature review, please see You (2017) and others.

assignment: the foot was seen as fundamental in determining the positions of stressed and unstressed syllables within words and larger strings. Specifically, the structure of a foot is described as a string of one relatively strong and any number of relatively weak syllables dominated by a single node (Nespor and Vogel, 1986). However, the notion of foot in Mandarin Chinese has long been a controversial topic. As a branch of Mandarin Chinese, the existence of foot thus also remained uncertain in the Chengdu dialect.

The current study does not presume that the foot is an independent prosodic constituent in Chengdu. In other words, this paper does not conduct discussions based on the existence of the foot in Chengdu as in some previous studies. Instead, it testifies to the presence of foot-related features step by step before proceeding with any further discussions. This section consists of two parts. The first half provides a reflection on previous studies concerning stress in Mandarin Chinese and Chengdu. The second half furthers the discussion about stress with an acoustic experiment along with a perceptive argument to investigate the existence of the foot as an indispensable prosodic constituent in the Chengdu dialect.

3.2.1 Previous theoretic studies on the stress

Stress theory began in English. Chomsky (1956) explained this concept in the frame of generative grammar. Studies about stress in Chinese were initiated later than in some major languages in the world. Nevertheless, domestic and foreign scholars have been working on this topic for quite a few years.

Luo and Wang discussed the notion of stress in their book in 1957: There are stresses for words and stress for clauses and sentences. According to their definition, the most sounded syllables in disyllabic words are the “stressed syllables,” and the least sounded ones are “unstressed syllables,” for those in-betweens are “less stressed syllables.” In the example of Russian, they

indicated that although many factors are involved in forming stress, the intensity of a sound should be the most noticeable factor. Furthermore, they defined three different types of "stress." As the first study introducing the concept of "stress" in Chinese scholarship, this work also pointed out the existence of stress in Chinese and established a category for "stress." However, a simple example of Russian failed to be a proper comparison to present stress in Chinese as in other languages. Therefore, presenting a new concept without experimental proof is less convincing.

Zhao is the one who initiated systematic studies of "stress" in Chinese. As with the previous study, he concluded that Chinese has three types of stressed syllables. Since then, scholars have developed many other terms for these three kinds of syllables and agreed that Chinese has three categories of syllables relevant to "stress." The only thing that cannot be agreed upon is the nature of "unstressed" syllables. Some scholars noted that the "unstressed" syllables are solely triggered by intensity, which is entirely irrelevant to all other factors. At the same time, some consider duration and syllable length as the primary triggers. Among all the potential factors that may affect the performance of stress, which one has the most impact remains vague at this stage of the theoretical studies of stress in Chinese. However, eventually, most Chinese scholars accepted that both duration and intensity have a salient impact on forming stress. From this, the newly raised issue evolved to a study about the accuracy of the exact factors. There were again two divisions: some scholars focus on the impact of duration while others insist on intensity. In short, different opinions remain about the nature of the "unstressed" syllable.

Duanmu's analysis mainly borrows the stress theory from English. In English stress theory (Fry), the pitch is the most important feature to distinguish stressed and unstressed syllables, while duration is less critical, and intensity is the least important feature. However, as in the conclusion made by Lin before, in Chinese, pitch plays a crucial role in differentiating meanings, so it loses

the function of outlining stress. Duration does not work either, because all other syllables are equally long when compared with neutral tones. As for the effect of intensity, it is too minor to be noticed. Therefore, Duanmu concluded that it is easy to distinguish neutral tones from all other tones to locate the "stressed" syllable in a disyllabic word. He argues that because linguistic rules are assigned according to the biological features of human beings, and all human beings share the same biological features, so all languages should share the same basic rules. The indication is that if some other languages have "stress" in words, Chinese is also supposed to have it, regardless of the fact that how salient the tonal feature is in Chinese, or how many exceptions and counterexamples can be found, or in some experiments, stress cannot be perceived. By following the general stress theory, Duanmu concluded that Mandarin Chinese has stress. Duanmu's study has had a profound influence on later studies. Some later works attempted to testify, locate, and explain the stress in Mandarin Chinese.

Duanmu and Feng claim that the foot is found in Chinese, then Duanmu and Qin additionally contend that the foot exists in Mandarin and propose that different stress positions can determine the nature of a syntactic unit, such as a phonological word and a phonological phrase. Specifically, they claimed that all disyllabic words in the Chengdu dialect are left-dominant. While Zhang argues that Chinese does not have the constituent foot as in some other languages, according to Zhang[1], the foot requires an inner binary contrast, such as long versus short, strong versus weak, high versus low. However, Chinese does not have this inner contrast as in some other languages. In other words, the feature of the "foot" is missing but Zhang argues that there still exists a phonologically equivalent to the foot.

[1] Lecture notes of EA 631, Fall 2017, at UW-Madison.

The result shows that although the foot is a universal prosodic unit across languages, no independent evidence or valid arguments can be found to demonstrate its existence and its role as a prosodic domain in the Chengdu dialect.

3.2.2 Previous Experimental Studies

Since 1980, scholars have begun using experimental methods to verify the presence stress in Chinese. Lin and Yan selected 29 disyllabic Mandarin words for acoustic analysis and the result indicated that all final characters in disyllabic words are "unstressed." Moreover, they found that these "unstressed" syllables are pronounced shorter in normal speech than being emphasized acoustically. According to their experiment, the intensity of the sound does not have any more substantial impact on stress than other factors such as timbre, pitch, and length. They also noted that the final position characters would lose their original tones when pronounced less sonorant (than alone as a single syllable).

Furthermore, pitches of these syllables regularly change values by following the preceded tones. Although the results of this experiment denote that there are acoustic differences between two positions in a disyllabic word and made some other findings of the "stressed" and "unstressed" contrast, the conclusions drawn from this experiment are pretty likely to be obtained by perception. For example, if the intensity, timbre, pitch, and length have an equal impact on stress, this experiment was not a further step beyond previous studies. Because even without this acoustic analysis, it was still possible to tell the differences by simple perception. This experiment is a milestone in how it began the us of the acoustic method in research, but more details are needed to make these results both more accurate and convincing.

In 1983, Lin conducted another experiment to examine the exact nature of the "unstressed" syllables in the Beijing dialect. He composed several pairs of artificial "stressed-unstressed" words

which sounded very similar to authentic wordsfor native speakers of the Beijing dialect to pronounce. By changing parameters such as duration, pitch, and intensity, the author proved that the fundamental frequency and intensity had no salient impact on distinguishing “stressed” and “unstressed” syllables. Meanwhile, this study found that duration contributes to differentiating the two. Results of this experiment happened to partially match some similar conclusions from experiments in other languages like English and French.Sound intensity is not the main feature to distinguish stress. Instead of intensity, in non-tonal languages, pitch is often applied to differentiate stressed and unstressed syllables. As for Chinese, Lin explained that since Chinese is a tonal language, pitches are already assigned a function to distinguish meanings; therefore, the duration of a sound should rise to be the most salient feature marking stressed syllables. With Lin’s explanation, “pitch” and “duration” have distinct functions in Chinese. The study illustrates that in Mandarin, “stressed” syllables usually have longer durations, wider pitch ranges, and more complete tone tours. If taking the Beijing dialect as an example, the main nature of “unstressed” syllables should be a shortened syllable duration. Therefore, comparatively, “stressed” syllables have a longer duration. Although intensity still impacts the nature of “unstressed,” this experiment showed that the effect of intensity is minor. In contrast, duration is what plays a crucial role. Lin’s view not only assigned precise functions to “pitch” and “duration” but also clarified the role of intensity. It shed light on later studies that would target even more specific situations.

After discussions about the nature of “unstressed” syllables, the focus shifted to disyllabic words. Does stress still exist in a word without the neutral tone (the absolute “unstressed” one)? Wang and Lin pointed out that it is quite unnecessary to classify stresses into subcategories since stress is not a concept that is as necessary for Chinese as it is in English. Gao and Wang noted that it is impossible to perceive stress due to the subtle difference between two syllables in a word.

Meanwhile, acoustic experiments in history also failed to provide enough support to the concept of word stress in Chinese: Lin, Yan, and Sun (1984) proved in their experimental works that the last syllable in a disyllabic/trisyllabic word/phrase usually has a longer duration than the first one. Wang and Wang later proved that the first syllable would be pronounced longer when placed in a sentence. Duanmu thinks that since there are reasonable explanations for both conclusions, it is unlikely to locate the stressed syllable simply from the acoustic aspect. However, he insists on the existence of word stress in Chinese. Several facts from this period are a) it remains unclear if the necessity to define and study stress in Chinese is as important as it is in English; b) it also remains uncertain whether Chinese (Mandarin) has word stress or not; c) it can be ascertained that the neutral tone is "unstressed" when compared with other tones; and d) each syllable is "stressed" when being pronounced solely or being emphasized , rather than as placed in words or normal speech.

3.2.3 Experiment in this study

Zhang clarified that Chinese is a typical tonal language, which, from the typological perspective, shows different phonological features from a typical stress language like English. Therefore, the rules for analyzing English cannot be carried over to Chinese, and in the specific case of Chinese, stress would need experimental proof.

In summary, now there are two different prominent opinions about the stress of Mandarin. One states that Mandarin does have stress and that even though it may be too subtle to be perceived, the existence cannot be denied. The other opinion posits that if "stressed" and "unstressed" syllables cannot be differentiated and testified, then Mandarin may have the same "stress" in English. As for the position of stressed syllables in disyllabic words, Zhao (1968) suggested that

the latter syllable in a disyllabic word is stressed while the former one is not. Zhao's suggestion is supported by a perception experiment from Lin, Yan, and Sun.

Therefore, I conducted a perception and acoustic experiment to examine the "stress" in this dialect. The logic behind this attempt is that if there is a consistent binary contrast within disyllabic words, regardless of right-dominant or left-dominant, then there might be an element corresponding to this concept of "foot." It is true that Duanmu insists that Chinese is left-stressed and especially that: "in some Chinese dialects, all words are left-stressed. For example, Chengdu dialect is one of them. And the stress pattern of this dialect is 'SW.'" However, the specific direction does not matter here, as long as there is a pattern of contrast. Duanmu also notes that the disyllabic VO structure phrases are all stressed on the second syllable instead of the first because the second syllable is the object and the first is the verb. The phonetic performance of this conclusion is that the first syllable (the verb) is shorter than the second syllable (the object). Furthermore, he pointed out that the objects always keep their original tones. Moreover, he thinks all left-stressed disyllabic structures are words, while all right-stressed ones are phrases.

Based on my observation, if the stressed syllable exists in Chinese, the duration would be the most crucial criterion, except for the most distinguishing feature - pitch. Then by following Duanmu's conclusion, listeners of the experiment in this paper should be able to perceive the "stressed syllables" according to syllable durations. If the stress pattern of disyllabic words is SW in the Chengdu dialect, listeners would be able first to perceive that the duration of one syllable is longer than the other one and then affirm that the longer one is stronger than the other one.

There are 256 syllables in the lexicon list, including 80 words, 48 VO words, and phrases. All words and phrases are listed in random order and Python automatically decides the order

without any artificial manipulation. Another list is then composed with VO words and phrases in a random order as presented in Table 8.

Each word is repeated twice according to the order set in the slides. In total, over 384 times, 128 words and phrases were recorded. Six non-native listeners of the Chengdu dialect were asked to listen to the two recordings and mark on an answer sheet which syllable was stronger. The answer sheet included three options for each word or phrase: A. the former syllable is stronger than the latter syllable; B: the latter syllable is stronger than the first syllable; C. they are the same.

With all possibilities of tonal patterns, the result displayed a somewhat random distribution where no clear rules or patterns of stressed syllables could be found. Some structures have a longer first syllables and some, the second. The perception results of nearly half of the words do not match the acoustic results. Some have significant gaps between the acoustic results and perception results, while some have minor gaps, indicating that it may not be at all true that syllables with longer duration are perceived in words as stressed syllables. Besides, this result can also be server as evidence against the conclusion that all objects keep their original tones while only verbs change tones. It is also predictable that even in cases where first syllables have tone sandhi while second syllables are fixed, the conclusion that tones of second syllables remain unchanged would still contradict the accurate perception results. Since these matching words cover an extensive statistic range, this perception experiment also shows that words are not necessarily left-stressed; either phrase must be right-stressed.

When narrowing down the situation to VO structures, these data show even vaguer results about the unbalanced match between Verb-Object and Unstressed-Stressed statement. Although experimental results are distributed randomly instead of suggesting a rule or trend, even for the same tone at different positions, data still can be irrationally different, especially with the clear

preset that all the items are VO structures. Moreover, the results also indicate that the objects in VO structures do not always have longer syllables than verbs despite words or phrases. Again, VO words and phrases cannot be differentiated by simply looking at their syllabic duration or length.

In order to see the association between two variables, syntactic structure and duration, a statistic test is conducted as evidence. The matter in question is if the distribution of the response variable changes in some way as the value of the explanatory variable changes. An association is another way of saying the variables are related. This project wants to find the association between syllable stress and syntactic structure and the Chi-square test is appropriate:

Ho: There is no association between the stress position and syntactic structure

Ha: There is an association between the stress position and syntactic structure

Table 16

Null Hypothesis	Alternative Hypothesis	Test Statistic X2	df	P-value
No Association	Association	0.9084	1	0.3405

X2a=0.05, df=1=3.84 > X2=0.9084, fail to reject Ho.

There is not enough evidence to say that there is an association between syllable stress and syntactic structure.

Since the result shows that there is no actual association between these two variables, the method that uses stress position to decide the syntactic structure will not be valid. The confounding variables could be individual differences in pronunciation. If both speakers emphasize either of the positions, results can be different.

According to the data collected from the acoustic experiment, more than half of the words do not match their theoretical tonal domain pattern with the acoustic results. Moreover, some words have quite large gaps between the supposed syllable duration and acoustic results, while

some have minor gaps. Therefore, it may not be true that all syllables of longer duration are described as dominant syllables in VO words, which keep their base tones and remain unaffected by tone sandhi rules. In addition, this result can also support conclusions drawn from the perceptual experiment in this paper, showing that proof provided by acoustic performance goes against the conclusion that all the objects of VO phrases keep their base tones while only verbs change tones. It is again ascertained that the assumption that first syllables have tone sandhi but second ones are fixed is not reliable, nor is the conclusion that tones of second syllables remain unchanged, propositions that were both contradicted by the actual acoustic results.

It can be concluded that neither left- nor right-dominant is present the Chengdu dialect. Furthermore, since a stress pattern is not found, binary contrast cannot be established either. Therefore, it can be concluded that although the foot is a universal prosodic unit across languages, no independent evidence and valid arguments can be supplied to demonstrate its existence and role as a prosodic domain in the Chengdu dialect without binary contrast.

The experiment results above were presented at the IACL-26 conference and received arguments. One of the scholars who agreed that the Chengdu dialect has a stress pattern argued with another perceptual study supporting his point of view (Ran 2011). However, it is worth noting that the author used contextualized VO structures in the experiment, making it difficult to rule out the sentence emphasis from “disyllabic stress” objectively. Furthermore, there were two speakers, one speaking the Chengdu dialect and the other speaks the Meishan dialect. Therefore, the author draws one conclusion about Sichuan hua (instead of Chengdu hua) based on only Chengdu and Meishan dialect (let alone the phonetic performance of these two are already different), which is not very convincing. The ANOVA test is applied in this study, but since the original data is not

included in this paper, the design seemed to fail to meet one of the three assumptions of the ANOVA test.

Furthermore, in the experiment, the author mentioned that "speakers are trained," which violates the basic setting that speakers in linguistic experiments should not be prepared with linguistics knowledge to diminish subjectivity. Lastly, the paper did not provide direct evidence of 烤肉 *kaorou* (Barbecue meat) or any other data, neither Chengdu *hua* nor Meishan *hua*. Therefore, more relevant studies are needed.

3.2.4 Detailed arguments against the foot as the prosodic domain in Chengdu

3.2.4.1 The Perception Experiment

3.2.4.1.1 Hypothesis

Duanmu notes that the disyllabic VO structure phrases are all stressed on the second syllable instead of the first because the second syllable is the object and the first is the verb. The phonetic performance of this conclusion is that the first syllable (the verb) is shorter than the second syllable (the object). Furthermore, he pointed out that the objects always keep their original tones. Moreover, he thinks all left-stressed disyllabic structures are words, while all right-stressed ones are phrases. An illustration of his statement is as below:

a. huáng yú　　chǎo fàn

　　黄 鱼　　炒 饭

　　yellow fish　　stir rice

　　'yellow croaker'　'stir-fried rice'

In example (a), both first syllables are longer[1] than the second, thus these are words. Likewise, while herein (b), both second syllables are more prolonged, thus, phrases.

b. mǎi yú chǎo fàn

买 鱼 炒 饭

buy fish stir rice

'buy fish' 'stir rice'

The discussions above explained that if the stressed syllable exists in Chinese, the duration would be the most critical criteria, except for the most distinguishing feature - pitch. Then by following Duanmu's conclusion, listeners of the experiment in this paper should be able to perceive the "stressed syllables" according to syllable durations. If the stress pattern of disyllabic words is SW in the Chengdu dialect, listeners would perceive that one syllable's duration is firstly longer than the other one, then affirm that the longer one is stronger than the other one.

3.2.4.1.2 Method

Two native speakers of Chengdu dialect, a 29-year-old male and female, were invited to be recorded in a quiet room. The informants' first language is the Chengdu dialect, their parents and grandparents are all natives of Chengdu, and their daily use languages at home since childhood is the Chengdu dialect. Both of them were educated in Chengdu from kindergarten to university and neither had the experience of being outside of the city or the country for a long time. nor have they every used Mandarin as their main working language. Neither have a medical histories of otolaryngology. They have no linguistic background knowledge of the Chengdu dialect.

[1]The author of this study didn't explain this concept of "being longer than" in his work, so this paper acoustically interprets it as "the duration of the syllable is longer than".

They were provided with a lexicon list without any segmental information. All words are chosen from the common vocabulary of the Chengdu dialect (the word lists did not have any information except characters). Most of these words or phrases have the same orthography in Mandarin, but some are dialectal words selected from dialectal dictionaries. Words are presented on the computer screen as slides.

Materials:

Table 17 Tokens in Experiments

Tonal pattern	1	2	3	4	5
1+1	参加	花圈	公司	担心	天生
1+2	工程	奢侈	安全	垃圾	安逸
1+3	烧烤	花朵	天府	青岛	桑果
1+4	超市	推进	招聘	高兴	偏见
2+1	客车	台湾	维修	陌生	离婚
2+2	积极	银行	完成	药房	集团
2+3	提醒	调理	食品	如果	媒体
2+4	情况	迟到	能力	适当	完善
3+1	保安	海鲜	喜欢	火锅	普通
3+2	打折	美容	选择	感情	纽约
3+3	野马	采访	理解	海岛	岂止
3+4	彩票	长大	老面	改变	马上
4+1	汽车	卫生	上班	闹心	卧单
4+2	自由	建设	伴随	太婆	战略
4+3	效果	炮火	让手	探索	预感
4+4	配送	电器	自助	控制	破坏

Table 18 VO Structures

Tonal pattern	1	2	3
1+1	翻身	开腔	销赃
1+2	加盟	翻船	帮忙
1+3	伸手	张嘴	浇水
1+4	称霸	修路	估价
2+1	疗伤	融资	结婚
2+2	立足	出席	驰名
2+3	拨款	拍手	失枕
2+4	入户	吃饭	行贿
3+1	抢滩	写书	转车
3+2	点头	打牌	减肥
3+3	吸手	烤火	抢险
3+4	耍秤	补票	讲价
4+1	配音	逛街	救灾
4+2	丧德	臊皮	爱国
4+3	上脸	动手	拗口
4+4	亮相	架势	种树

There are 256 syllables in the lexicon list, including 80 words, 48 VO words, and phrases. All words and phrases are listed in random order and Python automatically decides the order without any artificial manipulation. Then another list composed with VO words and phrases in a random order is presented in Table 8. Each word is repeated twice according to the setting order of the slides. In total, over 384 times, 128 words and phrases were recorded. Six non-native listeners of the Chengdu dialect were asked to listen to the two recordings and mark which syllable was stronger on an answer sheet. The answer sheet included three options for each word (or phrase): A. the former syllable is stronger than the latter syllable; B: the latter syllable is stronger than the first syllable; C. they are the same.

3.2.4.1.3 Results

Table 19 Results for all tokens

	A	B	C	A-B			A	B	C	A-B
1+1	56.37	24.54	19.09	31.82		1+1	56.37	24.54	19.09	31.82
2+1	40.91	19.09	40.00	21.82		1+2	52.73	19.09	28.18	33.64
3+1	49.09	15.45	36.36	32.73		1+3	29.09	57.27	13.63	-28.18
4+1	43.63	42.73	13.63	0.91		1+4	73.64	18.18	8.18	55.46
AVE	47.50	25.45	27.27	21.82		AVE	52.96	29.77	17.27	23.18
1+2	52.73	19.09	28.18	33.64		2+1	40.91	19.09	40.00	21.82
2+2	44.55	35.45	20.00	9.09		2+2	44.55	35.45	20.00	9.09
3+2	61.82	23.63	14.54	38.19		2+3	47.27	30.00	22.72	17.27
4+2	66.36	20.00	13.64	46.37		2+4	56.36	22.72	20.91	33.64
AVE	56.37	24.54	19.09	31.82		AVE	47.27	26.82	25.91	20.45
1+3	29.09	57.27	13.63	-28.18		3+1	49.09	15.45	36.36	32.73
2+3	47.27	30.00	22.72	17.27		3+2	61.82	23.63	14.54	38.19
3+3	22.72	59.09	18.18	-36.37		3+3	22.72	59.09	18.18	-36.37
4+3	41.82	50.91	7.27	-9.09		3+4	71.82	19.09	9.09	52.73
AVE	35.23	49.32	15.45	-14.09		AVE	51.36	29.32	19.54	21.82
1+4	73.64	18.18	8.18	55.46		4+1	43.63	42.73	13.63	0.91
2+4	56.36	22.72	20.91	33.64		4+2	66.36	20.00	13.64	46.37
3+4	71.82	19.09	9.09	52.73		4+3	41.82	50.91	7.27	-9.09
4+4	67.27	10.00	22.72	57.28		4+4	67.27	10.00	22.72	57.28
AVE	67.28	17.50	15.22	49.78		AVE	54.77	30.91	14.32	23.87

With all possibilities of tonal patterns, the table above presented a random distribution. Clear rules or patterns of stressed syllables are not found. Some structures have their first syllables

longer, and some have the second ones longer. The results of the VO structures are examined more specifically here:

Table 20 Results of all VO items

	A	B	C	A-B			A	B	C	A-B
1+1	56.37	24.54	19.09	31.82		1+1	56.37	24.54	19.09	31.82
2+1	40.91	19.09	40.00	21.82		1+2	52.73	19.09	28.18	33.64
3+1	49.09	15.45	36.36	32.73		1+3	29.09	57.27	13.63	-28.18
4+1	43.63	42.73	13.63	0.91		1+4	73.64	18.18	8.18	55.46
AVE	47.50	25.45	27.27	21.82		AVE	52.96	29.77	17.27	23.18
1+2	52.73	19.09	28.18	33.64		2+1	40.91	19.09	40.00	21.82
2+2	44.55	35.45	20.00	9.09		2+2	44.55	35.45	20.00	9.09
3+2	61.82	23.63	14.54	38.19		2+3	47.27	30.00	22.72	17.27
4+2	66.36	20.00	13.64	46.37		2+4	56.36	22.72	20.91	33.64
AVE	56.37	24.54	19.09	31.82		AVE	47.27	26.82	25.91	20.45
1+3	29.09	57.27	13.63	-28.18		3+1	49.09	15.45	36.36	32.73
2+3	47.27	30.00	22.72	17.27		3+2	61.82	23.63	14.54	38.19
3+3	22.72	59.09	18.18	-36.37		3+3	22.72	59.09	18.18	-36.37
4+3	41.82	50.91	7.27	-9.09		3+4	71.82	19.09	9.09	52.73
AVE	35.23	49.32	15.45	-14.09		AVE	51.36	29.32	19.54	21.82
1+4	73.64	18.18	8.18	55.46		4+1	43.63	42.73	13.63	0.91
2+4	56.36	22.72	20.91	33.64		4+2	66.36	20.00	13.64	46.37
3+4	71.82	19.09	9.09	52.73		4+3	41.82	50.91	7.27	-9.09
4+4	67.27	10.00	22.72	57.28		4+4	67.27	10.00	22.72	57.28
AVE	67.28	17.50	15.22	49.78		AVE	54.77	30.91	14.32	23.87

Both positive and negative results showed up in the table. For a clearer view, words and phrases are separately labeled as below:

Table 21 Results of VO words

	A	B	C	A-B		A	B	C	A-B
1+1	13.63	53.03	33.33	-39.40	1+1	13.63	53.03	33.33	-39.40
2+1	9.09	81.82	9.09	-72.73	1+2	40.90	28.79	30.30	12.12
3+1	45.45	29.55	25.00	15.91	1+3	15.91	68.19	15.91	-52.28
4+1	9.09	77.28	13.64	-68.19	1+4	68.19	27.27	4.54	40.92
AVE	19.31	60.42	20.26	-41.10	AVE	34.66	44.32	21.02	-9.66
1+2	40.90	28.79	30.30	12.12	2+1	9.09	81.82	9.09	-72.73
2+2	36.36	31.81	31.82	4.55	2+2	36.36	31.81	31.82	4.55
3+2	54.55	29.55	15.91	25.01	2+3	11.37	84.09	4.54	-72.73
4+2	50.00	31.82	18.18	18.19	2+4	59.09	29.55	11.36	29.55
AVE	45.45	30.49	24.05	14.96	AVE	28.98	56.82	14.20	-27.84
1+3	15.91	68.19	15.91	-52.28	3+1	45.45	29.55	25.00	15.91
2+3	11.37	84.09	4.54	-72.73	3+2	54.55	29.55	15.91	25.01
3+3	20.45	50.00	29.54	-29.55	3+3	20.45	50.00	29.54	-29.55
4+3	34.85	59.09	6.06	-24.24	3+4	61.37	29.55	9.09	31.82
AVE	20.64	65.34	14.01	-44.70	AVE	45.45	34.66	19.88	10.80
1+4	68.19	27.27	4.54	40.92	4+1	9.09	77.28	13.64	-68.19
2+4	59.09	29.55	11.36	29.55	4+2	50.00	31.82	18.18	18.19
3+4	61.37	29.55	9.09	31.82	4+3	34.85	59.09	6.06	-24.24
4+4	47.73	6.82	45.45	40.91	4+4	47.73	6.82	45.45	40.91
AVE	59.09	23.29	17.61	35.80	AVE	35.42	43.75	20.83	-8.33

Table 22 Results of VO phrases

Tonal pattern	Phrases	A	B	C	A-B
1+3	浇水	9.09	81.82	9.09	-72.73
1+4	修路	54.55	22.73	22.73	31.82
	估价	40.91	45.45	13.63	-4.55
2+1	结婚	13.63	68.19	18.18	-54.55
2+3	拨款	9.09	90.91	0.00	-81.82
2+4	吃饭	45.45	45.45	9.09	0.00
3+1	写书	13.63	63.64	22.73	-50.01
3+2	减肥	68.19	27.27	4.54	40.92
3+3	洗手	13.63	63.63	22.73	-50.00
3+4	补票	40.91	45.45	13.63	-4.55
4+1	配音	72.73	9.09	18.18	63.64
4+4	种树	68.19	18.18	13.63	50.01
	AVE	37.50	48.48	14.01	-10.99

Notes: AVE stands for average percentage.

Syntactic structures of most tokens are clearly labeled, but structures cannot be easily categorized according to their features.

Table 23 Results for vague VO structures[1]:

Tonal pattern		A	B	C	A-B
2+1	结婚	13.63	68.19	18.18	-54.55
2+4	吃饭	45.45	45.45	9.09	0.00
3+2	减肥	68.19	27.27	4.54	40.92
4+1	配音	72.73	9.09	18.18	63.64
	AVE	50.00	37.50	12.50	12.50

[1] “Vague” structures stand for these ones can be analyzed as both words and phrases.

3.2.4.1.4 Discussion

a. Tone Sanhdi

Even though the phonological studies of tone sandhi of Chengdu dialect are very rare, this paper only did a rough acoustic experiment without tone value description. However, the experiment done by Qin still shows the tone value change in the second syllable.

First, the tone sandhi of final positions is already testified by Qin's experiment. Qin's experiment shows that despite the syntactic structure of words and phrases, the second syllables always follow their tone sandhi rules. Next, if we assume that just like in English, pitch plays the crucial role to differentiate stressed and unstressed syllables, then in Chinese, syllables with higher tone values will be perceived as stressed ones, while lower ones could be the unstressed ones. Therefore, stressed syllables must have a higher tone value than unstressed ones. Listeners would be expected to perceive the higher tone value syllables as the stressed syllables in these disyllabic words. Since VO structures have already been noted in Duanmu's illustrations before, we randomly examine some VO examples. For the convenience of comparison, the supposed tone sandhi value is also marked along with the actual perception result. The tone value change of the first syllables will not be considered in this case:

Table 24 Tone sandhi applied to 2nd syllables

Tone Pattern	Words	Tone Value	A	B	C	A-B	Matching
T1+T1	翻身	45+44	18.18	45.45	36.36	-27.27	N
T2+T1	疗伤	31+33	4.54	86.36	9.09	-81.82	Y
T3+T1	抢滩	54+44	59.09	22.73	18.18	36.37	Y
T4+T1	配音	213+44	72.73	9.09	18.18	63.64	N
T1+T2	加盟	45+42	45.45	36.36	18.18	9.09	Y
T2+T2	立足	31+31	18.18	45.45	36.36	-27.27	N
T3+T2	点头	55+41	59.09	22.73	18.18	36.37	Y

Tone Pattern	Words	Tone Value	A	B	C	A-B	Matching
T4+T2	丧德	213+41	59.09	27.27	13.63	31.82	N
T1+T3	伸手	45+52	27.27	54.55	18.18	-27.28	Y
T2+T3	拨款	31+42	9.09	90.91	0.00	-81.82	Y
T3+T3	洗手	55+52	13.63	63.63	22.73	-50.00	N
T4+T3	上脸	213+52	22.73	68.19	9.09	-45.46	Y
T1+T4	称霸	45+32	68.19	27.27	4.54	40.92	Y
T2+T4	入户	31+32	45.45	36.36	18.18	9.09	N
T3+T4	耍秤	55+32	68.19	22.73	9.09	45.46	Y
T4+T4	亮相	213+32	31.81	9.09	59.09	22.72	N

Notes: N stands for No, Y stands for Yes.

Table 13 shows that almost half of the actual tone values do not match their perception results. Therefore, it may not be true that all syllables with higher tone values are perceived as stressed syllables in words. Moreover, this result can also be a side proof against the conclusion that all the objects keep their original tones while only verbs change tones. Finally, actual perception results clearly contradict the conclusion that tones of second syllables remain unchanged.

For lack of systematic phonological rules about tone sandhi of Chengdu dialect, it may be necessary to consider the possibility in another way. In the previous assumption, first syllables are fixed without tone sandhi, and now the assumption is that if they change simultaneously, will their tone sandhi values approximately match their perceptive result?

Table 25 Tone sandhi applied to both syllables

Tone Pattern	Words	Tone Value	A	B	C	A-B	Match or not
T1+T1	翻身	45+44	18.18	45.45	36.36	-27.27	N
T2+T1	疗伤	43+33	4.54	86.36	9.09	-81.82	N
T3+T1	抢滩	51+44	59.09	22.73	18.18	36.37	Y
T4+T1	配音	32+44	72.73	9.09	18.18	63.64	N

Tone Pattern	Words	Tone Value	A	B	C	A-B	Match or not
T1+T2	加盟	35+42	45.45	36.36	18.18	9.09	N
T2+T2	立足	43+31	18.18	45.45	36.36	-27.27	N
T3+T2	点头	51+41	59.09	22.73	18.18	36.37	Y
T4+T2	丧德	32+41	59.09	27.27	13.63	31.82	N
T1+T3	伸手	45+52	27.27	54.55	18.18	-27.28	Y
T2+T3	拨款	43+42	9.09	90.91	0.00	-81.82	N
T3+T3	洗手	51+52	13.63	63.63	22.73	-50.00	N
T4+T3	上脸	32+52	22.73	68.19	9.09	-45.46	Y
T1+T4	称霸	35+32	68.19	27.27	4.54	40.92	Y
T2+T4	入户	43+32	45.45	36.36	18.18	9.09	Y
T3+T4	耍秤	51+32	68.19	22.73	9.09	45.46	Y
T4+T4	亮相	32+32	31.81	9.09	59.09	22.72	N

Notes: N stands for No, Y stands for Yes.

With the change of both syllables, 9 out of 16 words still do not match the perceptive result. Again, this leaves some doubt about Duanmu's previous statement.

b.Stress of disyllabic words

This perception experiment also shows that in the Chengdu dialect, words are not necessarily left-stressed; either phrase has to be right-stressed. The excerpt of the complete form can illustrate this conclusion:

Table 26 General Results

	A-B		A-B		A-B
参加	27.28	工程	54.55	烧烤	-45.45
花圈	4.55	奢侈	9.09	花朵	-50.01
公司	72.73	安全	54.55	天府	18.19
担心	-13.64	垃圾	50.01	青岛	-40.92
天生	68.19	安逸	0.00	桑果	-22.73
超市	59.10	客车	40.91	积极	40.91
推进	50.01	台湾	22.73	银行	-36.37

	A-B		A-B		A-B
招聘	54.55	维修	40.91	完成	63.64
高兴	54.55	陌生	50.00	药房	-9.10
偏见	59.09	离婚	-45.46	集团	-13.64
提醒	4.55	情况	63.64	保安	27.27
调理	27.27	迟到	-4.55	海鲜	36.37
食品	13.64	能力	63.64	喜欢	50.00
如果	9.09	适当	-9.09	火锅	27.27
媒体	31.82	完善	54.55	普通	22.73
打折	18.19	野马	-18.18	彩票	68.18
美容	36.37	采访	-50.01	长大	0.00
选择	31.82	理解	-45.46	老面	54.55
感情	68.19	海岛	-31.83	改变	54.55
纽约	36.37	岂止	-36.37	马上	86.36
汽车	31.82	自由	18.19	效果	-9.09
卫生	36.37	建设	40.91	炮火	-27.28
上班	-81.82	伴随	27.28	让手	-9.09
闹心	4.55	太婆	54.55	探索	40.92
卧单	13.64	战略	90.91	预感	-40.91
配送	63.64	控制	68.19	自助	54.55
电器	81.82	破坏	18.18		

In Table 15, all shaded data indicate right-stressed examples in perception. Therefore, all these data should accordingly be pointing out phrases. However, among the 20 right-stressed examples in Table 16, only 4 are phrases, and the rest are words. The other 108 examples, which are supposed to be words, are a mixture of words and phrases. Distinguishing words and phrases from the assigned stress on two syllables is not likely to be successful.

Table 27 Right-dominant VO Structures

	A-B
烧烤	-45.45
花朵	-50.01
担心	-13.64
青岛	-40.92
桑果	-22.73
银行	-36.37
离婚	-45.46
集团	-13.64
迟到	-4.55
适当	-9.09
野马	-18.18
采访	-50.01
理解	-45.46
海岛	-31.83
岂止	-36.37
效果	-9.09
炮火	-27.28
让手	-9.09
上班	-81.82
预感	-40.91

c.VO structures do not necessarily have the object longer than the verb.

When narrowing down the situation to VO structures, these data show even vaguer results about the unbalanced match between Verb-Object and Unstressed-Stressed statement. There are several steps to check the results of VO structures. Firstly, a general examination on the big picture of all VO structures that constitute both words and phrases is presented below, organized still with different tone patterns:

Table 28 All VO Structures

	A-B		A-B		A-B		A-B
1+1	-39.40	1+1	-39.40	1+2	12.12	2+1	-66.67
2+1	21.82	1+2	12.12	2+2	9.09	2+2	4.55
3+1	-6.06	1+3	-59.09	3+2	30.31	2+3	-75.76
4+1	-24.24	1+4	22.73	4+2	18.19	2+4	19.70
AVE	-11.97	AVE	-15.91	AVE	17.43	AVE	-29.55
	A-B		A-B		A-B		A-B
1+3	-59.09	3+1	-6.06	1+4	-28.79	4+1	-24.24
2+3	-75.76	3+2	30.31	2+4	19.70	4+2	18.19
3+3	-36.36	3+3	-36.36	3+4	19.70	4+3	-24.24
4+3	-24.24	3+4	19.70	4+4	43.94	4+4	43.94
AVE	-48.86	AVE	1.90	AVE	13.64	AVE	3.41

At this step, instead of a rule or a trend, results are distributed randomly. Even for the same tone at different positions, data can still be irrationally different, especially with the clear preset that all the items are VO structures. However, since in this step the close relation between tone positions and stress is not yet reached, to some extent, it is still possible to indicate that both words and phrases are included if solely observed in table 15. Nevertheless, no matter whether they are words or phrases, it does not mean that all second syllables in VO structures have to be longer than the first syllables. In other words, it does not mean that all second syllables have to carry the stress.

Table 29 VO Words

	A-B		A-B		A-B		A-B
翻身	-27.27	加盟	9.09	伸手	-27.28	称霸	40.92
开腔	-45.46	翻船	4.54	张嘴	-77.27	爱国	4.55
销赃	-45.46	帮忙	22.73	点头	36.37	抢滩	36.37

	A-B		A-B		A-B		A-B
疗伤	-81.82	立足	-27.27	烤火	-50.00	入户	9.09
融资	-63.64	出席	27.27	拍手	-95.45	打牌	13.64
转车	-4.55	驰名	13.64	失枕	-50.00	行贿	50.01
抢险	-9.09	耍秤	45.46	讲价	18.18	亮相	22.72
逛街	-54.55	丧德	31.82	上脸	-45.46	架势	59.09
救灾	-81.82	臊皮	18.19	动手	-36.36	拗口	9.09

Therefore, the next step would be to examine words and phrases separately. Since there are not many, the data can be simply presented by listing them all.

Table 30 VO Phrases

	A-B		A-B		A-B		A-B
浇水	-72.73	估价	-4.55	拨款	-81.82	写书	-50.01
修路	31.82	结婚	-54.55	吃饭	0.00	减肥	40.92
洗手	-50.00	补票	-4.55	配音	63.64	种树	50.01

All the shaded data indicates that the longer syllables are at the first syllable rather than at the second. Moreover, they also indicate that the objects in VO structures do not always have longer syllables than verbs, whether words or phrases. Again, VO words and phrases cannot be differentiated by simply looking at their syllabic duration or length.

3.2.4.2 A Statistic Test

3.2.4.2.1 Design

This test is designed to assess the association between two variables if the response variable's distribution changes in some way as the value of the explanatory variable changes. Specifically, this project wants to find the association between syllable stress and syntactic structure. Therefore, the Chi-square test is applied.

One assumption of the Chi-Square test is that for each cell, we assume the expected frequency is larger than 5, but the contingency table here does not entirely meet this assumption.

Table 31 Contingency table of two variables

Stress Position Syntactic Structure	Left-stressed	Same	Right-stressed	Total
Word	19	0	17	36
Phrase	4	1	7	12
Total	23	1	24	48

However, the category "Same" is not a crucial part of this project, thus it is deleted to meet the assumption.

Table 32 Revised contingency table of two variables

Stress Position Syntactic Structure	Left-stressed	Right-stressed	Total
Word	19	17	36
Phrase	4	7	11
Total	23	24	47

3.2.4.2.2 Results

Ho: There is no association between the stress position and syntactic structure

Ha: There is an association between the stress position and syntactic structure

Table 33

Null Hypothesis	Alternative Hypothesis	Test Statistic X2	df	P-value
No Association	Association	0.9084	1	0.3405

$X^2_{a=0.05,\ df=1}=3.84 > X^2=0.9084$, fail to reject Ho.

There is not enough evidence to say that there is an association between syllable stress and syntactic structure.

3.2.4.2.3 Discussion

Since the result shows no actual association between these two variables, the method that uses stress position to decide the syntactic structure will not be valid. The confounding variables could include the individual differences in pronunciation. If both speakers emphasize either of the positions, results can vary.

3.2.4.3 The Acoustic Experiment

3.2.4.3.1 Assumption

The assumption of the acoustic experiment is similar to the perceptual one. If stressed syllables exist in Chinese, the duration would be the most important criteria. By following the conclusion that stressed syllables should have a longer duration, software used in this paper should picture the "stressed syllables" with longer durations. If the stress pattern of disyllabic words is SW in the Chengdu dialect, the software would draw at least most of the acoustic pictures about duration of the first syllable longer than the second one, affirming the longer one is stronger the shorter one.

Suppose the disyllabic VO structure phrases are all stressed on the second syllable instead of the first (because the second syllable is the object and the first is the verb). In that case, the phonetic performance of this conclusion is that the first syllable (the verb) is shorter than the second syllable (the object). This view pointed out that the objects always keep their original tones and all left-dominant disyllabic structures are words, while all right-dominant ones are phrases.

Both of the second syllables are longer, thus, phrases. This conclusion is already lacking solid acoustic evidence. Even though these two examples are mentioned in many studies, none provided a specific phonological analysis about how the stressed syllable in "炒饭" is defined. Therefore, other factors that may impact perception could not be ruled out. This is also the reason

that an acoustic experiment is conducted in addition to the perceptual one. The primary purpose of this experiment is to diminish the subjectivity brought by human listening.

3.2.4.3.2 Materials and Methods

Materials for software analysis are adopted from the recordings used before in the perceptual experiment. Speakers keep the same identity: two native speakers of the Chengdu dialect, a male and a female were e invited to be recorded in a quiet room.

The lexicon list without any segmental information is provided again (the same one, but in a different random orders compared to the perception experiment). All words are chosen from commonly used words of the Chengdu dialect (the lists for speakers do not have any information except characters). Most of these words or phrases have the same orthography in Mandarin, but some are dialectal words selected from dialectal dictionaries. Words are presented on a computer screen as slides. There are 256 syllables in the lexicon list, including 80 words, 48 VO words, and phrases. All words and phrases are listed randomly and Python automatically decides the order without any artificial manipulation.

Step1. For the recording, two native speakers (1 female and 1 male) of the Chengdu dialect kept the same number and same candidates in the perception experiment. All of them had met the background requirements discussed before.

Step2. Words and phrases are displayed through slides on screen as the earlier experiment did before, but expanded to all kinds of syntactic words with different tone patterns and more phrases instead of only VO structures. However, all these additional tokens are not the purpose of this study. They are only used to distract the speakers' extra attention to some dialectal words and break the possibility of recognizing one specific pattern of words or phrases. Each word is repeated twice according to the setting order of the slides. In total, over 384 slides, 128 words and phrases

were recorded. The speakers were informed to simply read the tokens naturally and were given no hints or explanation of the syllables being stronger or weaker.

Step3. Input the Audacity recordings to Praat, play recordings, manually locate word boundary one by one, cut off, and take screenshots.

Again, there are many methodological options for techniques. Python is the primary tool used to distribute random order to tokens in this paper. Python has been applied again on slide numbers for better random distribution when the tokens of words and phrases are provided for speakers to read. Next, Excel and the professional statistic language R are applied for statistic tests. Audacity is applied for recordings, but it is challenging for Audacity to map the duration and length of each syllable since the boundary between syllables is hard to locate, leading to difficulties in acoustic analysis. Another option could be Mini-speech lab software since it was applied in most Chinese studies mentioned in previous studies, but it requires authorized access. Finally, after considering all the feasible possibilities of complicated manipulation, Praat is applied to the acoustic analysis.

3.2.4.3.3 Results and Discussions

Only part of the results will be presented and explained in this paper. The rest can be found in the appendix.

Table 34 Replacement examples

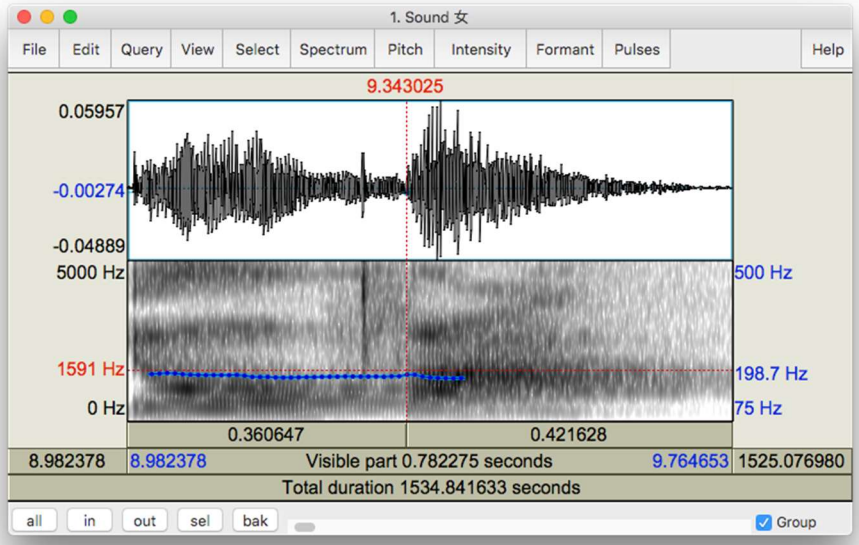
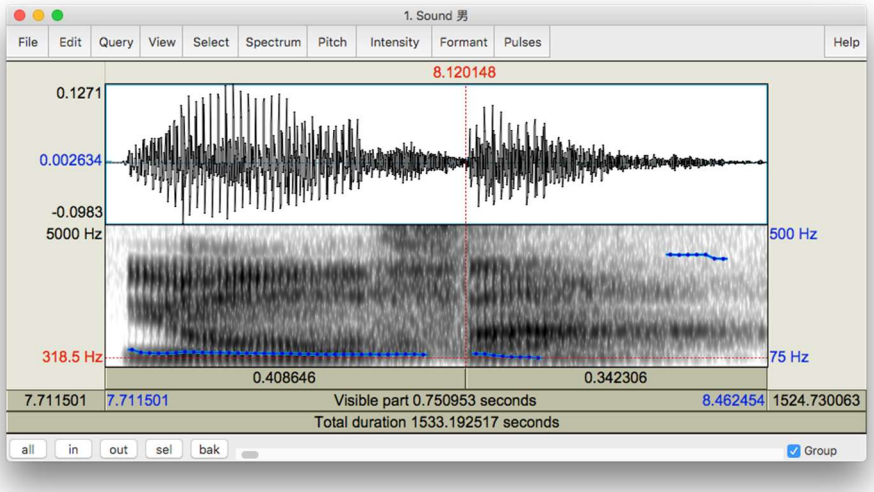
	Examples	Replacement
C+C: T2 + T2	黄鱼	药房
V+O: T3 + T4	炒饭	补票

Take the phonetic description of the examples discussed before to check the syllable length. Since “黄鱼” and “炒饭” might both be too familiar, even for people who have no linguistic

background knowledge, the best way to avoid the risk is to skip these two structures in the experiment, but make up for them with something similar. Specifically, the tone pattern of these two structures are “T2 + T2” and “T3 + T4”, and their syntactic structure is CC and VO. So two replacements from the data are selected and shown in Table 22.

Lookinto into the syllable length of these two structures, both female and male recordings are presented to get a more precise comparison:

Table 35 The acoustic performance of “药房”

Gender	Screenshot of Acoustic analysis
Female	
Male	

First of all, if we just put the specific syllable length with numbers aside and compare the female version and male version of durations, it is interesting to find that even for the same structure, speakers produce a different length of syllables: the female speaker produced the first syllable longer than the second, while the male speaker did the opposite. Is it because they have different speaking speed habits that either of them may prolong one syllable more than the other? Let us calculate the complete duration for this word to see:

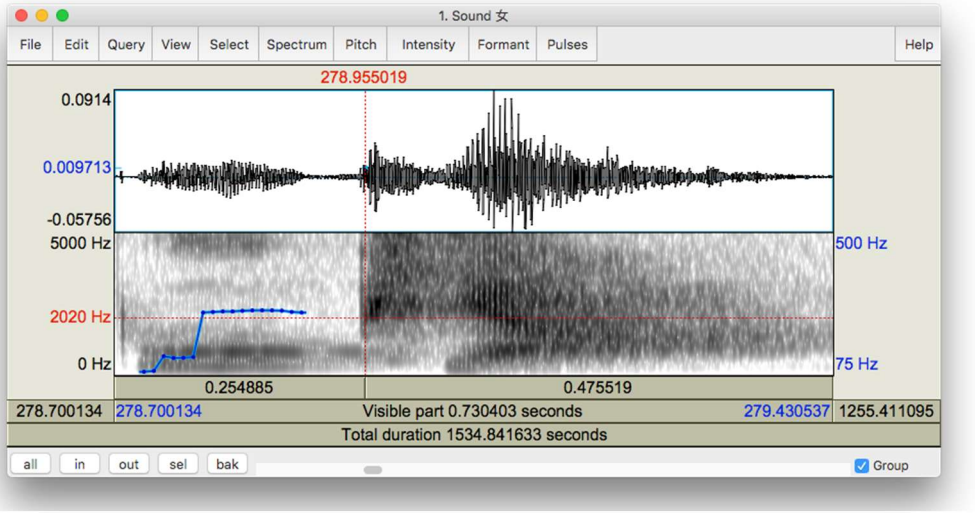
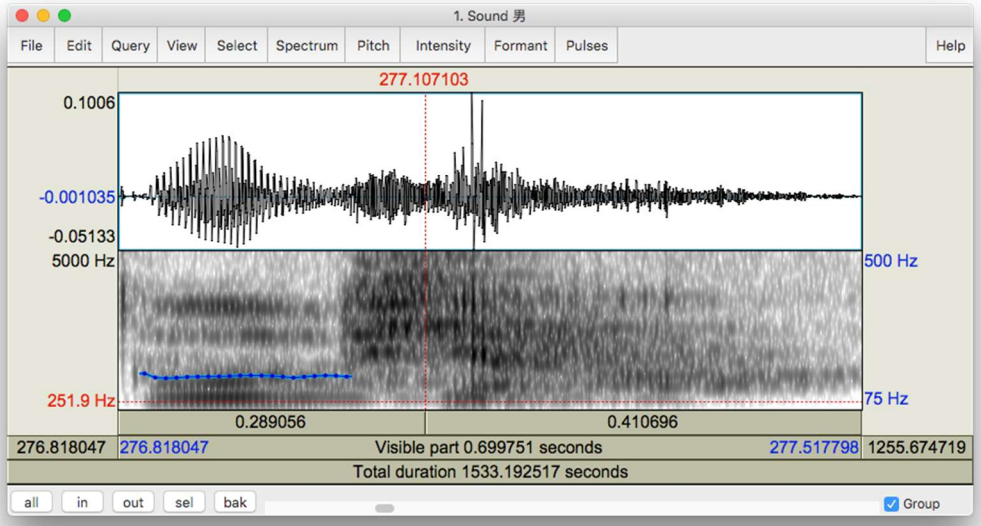
Table 36 The total duration of "药房"

	1st Syllable	2nd Syllable	Total
Female	0.360647	0.421628	0.782275
Male	0.408646	0.342306	0.750952

The answer is no. The total durations show a very slight difference when considering the the Praat measurements (it is in seconds here), so this can be ignored.

"补票" satisfied the assumption that VO structure phrases have longer Object than Verb in disyllabic structures. Both female and male speakers produced the first syllable longer than the second. Moreover, the duration is not slightly longer; instead, the second syllable is almost twice the duration as the first one, by average. It seems that this example well supported the left-dominant theory here to verify this conclusion. Next, we examine more VO structures with different tone patterns.

Table 37 The acoustic performance of “补票”

Gender	Screenshot of Acoustic analysis
Female	
Male	

“浇水” as a VO phrase is evident in the information above, but this result violates the assumption. Moreover, it matches neither of the assumptions. If it is defined as a phrase, then the duration of the second syllable should be longer than the first one, but this is not seen. If it is defined as a word, then the first syllable should be longer than the second, but this is still not true. It turned out that two syllables in this structure have almost the same duration. From the acoustic

description alone, there is no clue to indicate whether this is a left-dominant word or a right-dominant phrase.

Table 38 Excerpts from VO structure

Tone Pattern	Examples
T1 + T3	浇水
T2 + T4	吃饭
T4 + T1	配音

Table 39 The acoustic performance of "浇水"

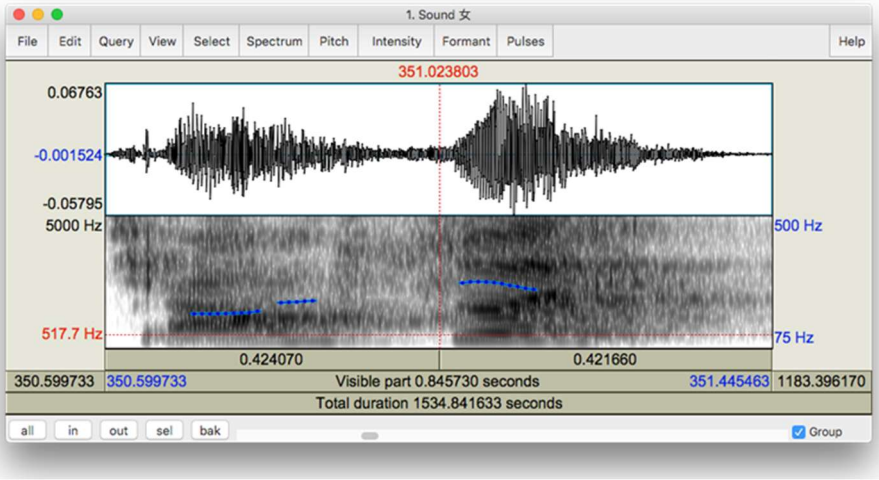
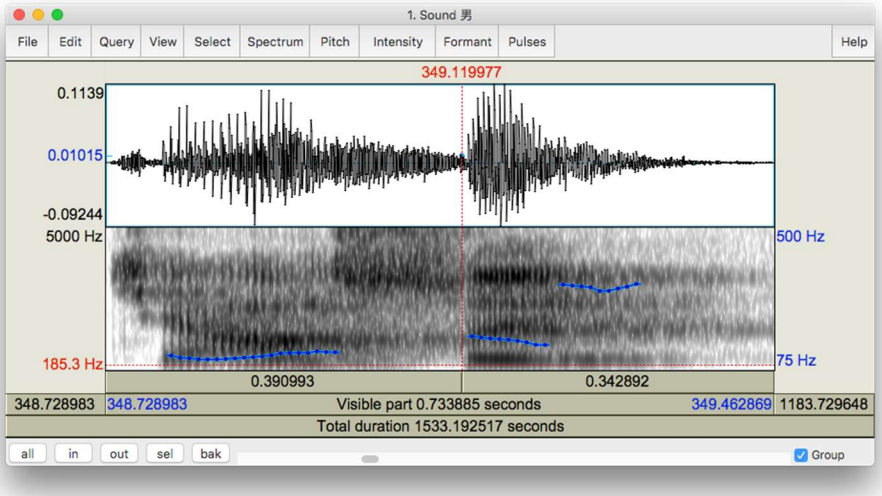
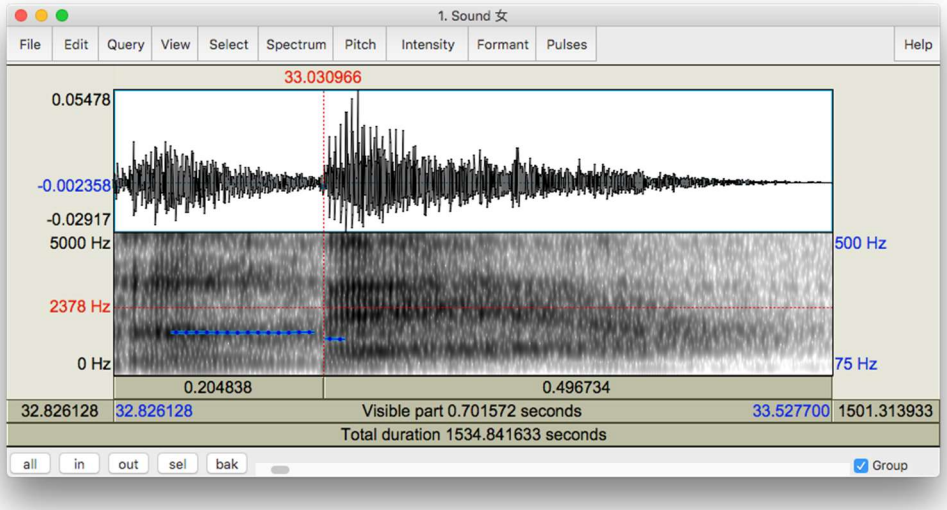
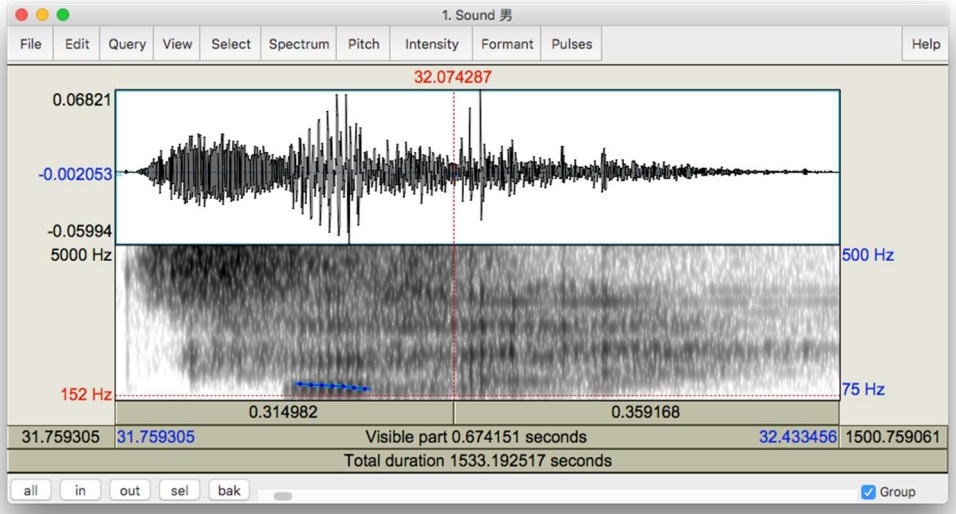
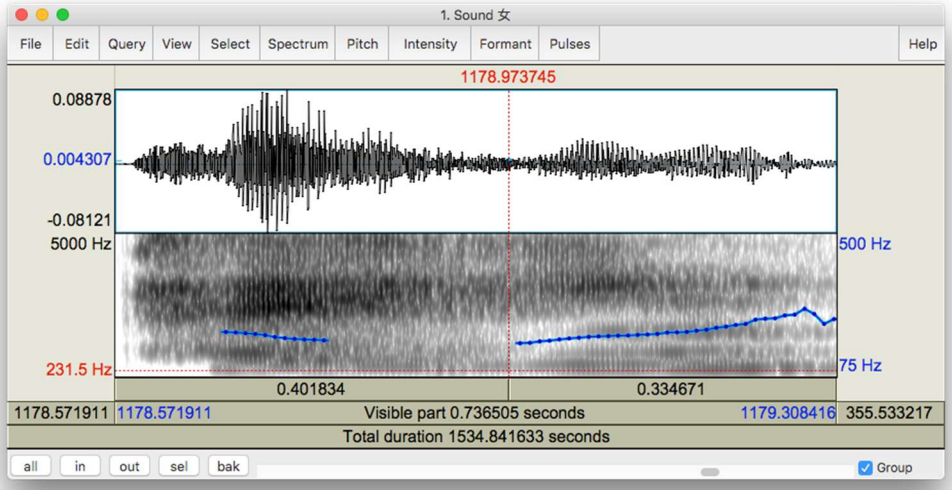
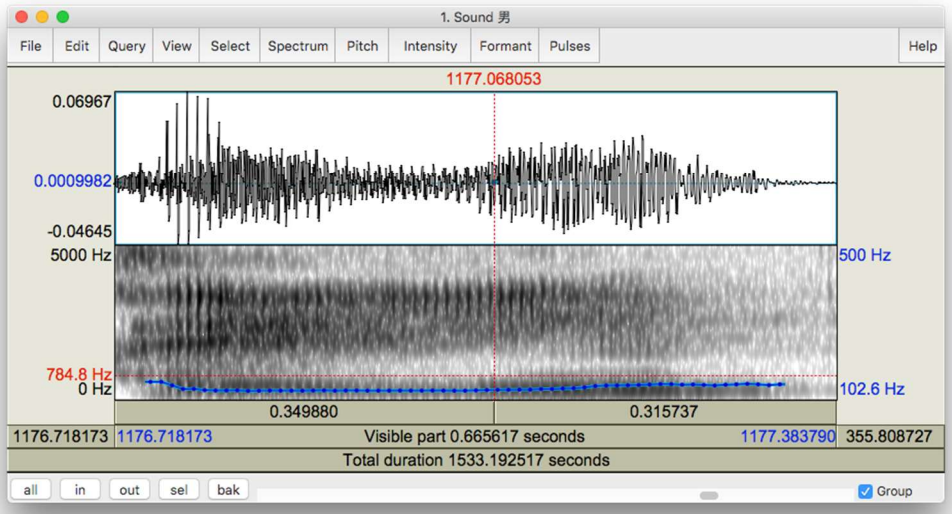
Gender	Screenshot of Acoustic Analysis
Female	
Male	

Table 40 The acoustic performance of “吃饭”

Gender	Screenshot of Acoustic Analysis
Female	
Male	

In the example of “吃饭” shown in the table above, both speakers produce the second syllable longer than the first one, primarily showing the salient difference in the female speaker’s record. This one is another example that illustrates the assumption.

Table 41 The acoustic performance of “配音”

Gender	Screenshot of Acoustic Analysis
Female	
Male	

Again, this is another result that falsifies the assumption. “配音” as a phrase is also the given information, supposing that the second syllable has a longer duration than the first one. However, the acoustic data shows a different result, especially in the female’s speech. These three examples are all VO phrases, but only one matches the theory that phrases are right-dominant in the Chengdu dialect. The rest either go to the opposite or keep the same duration, and thus not providing any

valuable information to the theory. To take a closer look at the results of VO phrases, we select all the VO phrases out of the whole and reorganize the acoustic results: A means the first syllable is longer, B means the second syllable is longer, and C means the duration is equal.

Table 42 Results of VO phrases in the acoustic experiment

	Tonal pattern		Female	Male
1	1+3	浇水	C	A
2	1+4	修路	A	A
3	1+4	估价	B	C
4	2+1	结婚	B	A
5	2+3	拨款	B	B
6	2+4	吃饭	B	B
7	3+1	写书	A	A
8	3+2	减肥	B	A
9	3+3	洗手	B	A
10	3+4	补票	B	B
11	4+1	配音	A	A
12	4+4	种树	A	A

Because B stands for the longer second syllable, according to the assumption that all VO phrases should be right-dominant, this table would present all “B” acoustic results. However, among the 24 results, only 10 match the theory, which is less than 50%. Examples 3, 4, 8, 9 show ambiguity, since female and male speakers produced different acoustic traces. That is to say, only 6 out of 24 results match the right-dominant assumption. In total, 5 phrases are being produced differently. Only one example, number one, shows compromise. How much difference is there for the other four ambiguities? Is it possible that these are merely coincidences? The following data is presented:

Table 43 The acoustic performance of “估价”

	1st syllable	2nd syllable	The longer one
Female	0.276180	0.444613	2nd
Male	0.320920	0.319096	1st

Table 44 The acoustic performance of “结婚”

	1st syllable	2nd syllable	The longer one
Female	0.356109	0.480010	2nd
Male	0.374383	0.368036	1st

Table 45 The acoustic performance of “减肥”

	1st syllable	2nd syllable	The longer one
Female	0.316240	0.356500	2nd
Male	0.388765	0.276852	1st

Table 46 The acoustic performance of “洗手”

	1st syllable	2nd syllable	The longer one
Female	0.407285	0.456517	2nd
Male	0.419476	0.271742	1st

For “估价” and “结婚,” the female speaker displayed evident differences between the two syllables, while the male speaker performed just a slight difference, with a longer first syllable. For “减肥” and “洗手,” gender difference seems to play an essential role in the acoustic performance. Thus, it is hard to detect which factor has more impact on acoustic performance. “减肥” itself has a vague syntactic structure that can be analyzed as either phrase or word, making it

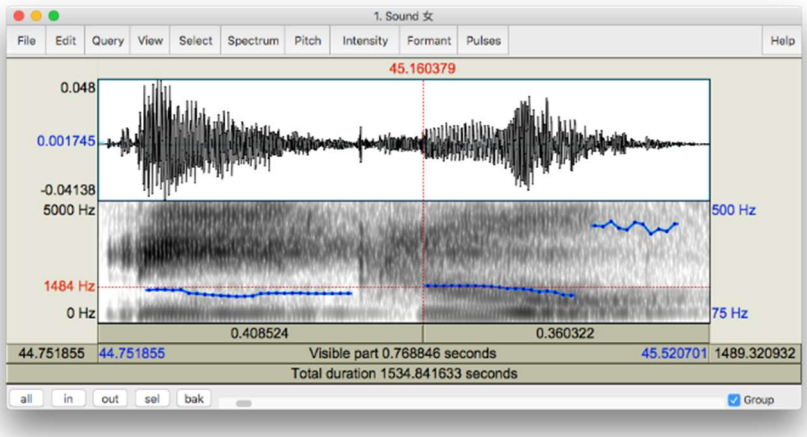
more difficult to provide useful information. One way to reduce the ambiguity is to compare the perceptual result with the acoustic one to see if the results match:

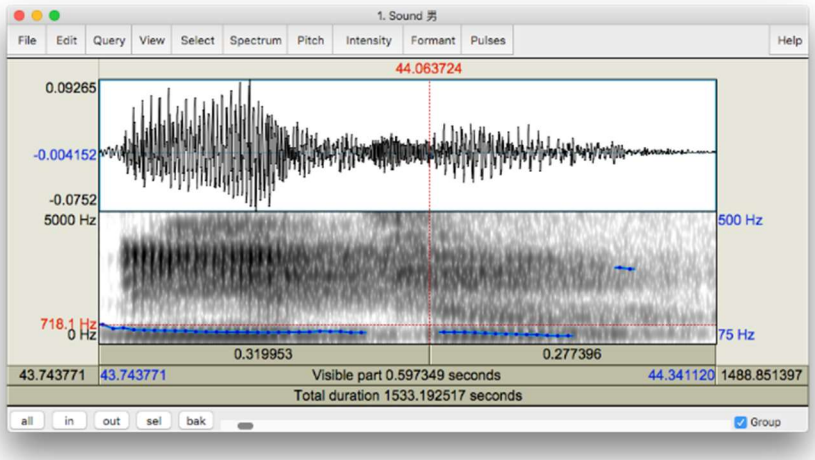
Table 47 Partial comparison between perceptual and acoustic results

	Perceptual	Acoustic	
		Female	Male
估价	B	B	A
减肥	A	B	A
结婚	B	B	A
洗手	B	B	A

After roughly comparing the results of the two experiments, it is still hard to draw any conclusion to rule out the impact of gender. The gender difference is not the target of this study, so the most likely answer is that although this study cannot exclude the effect of gender, neither can it establish a regular relationship between syntactic structure and the tonal-domain either. The distribution of the tonal domain is rather odd instead of clear.

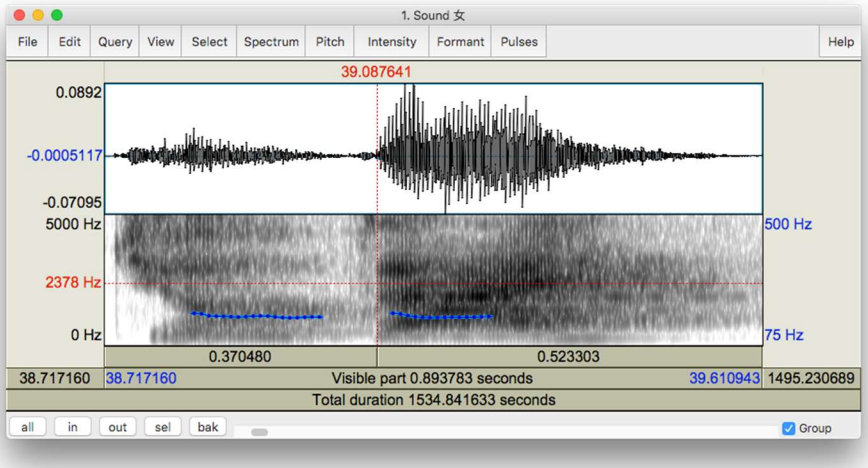
Table 48 The acoustic performance of "立足"

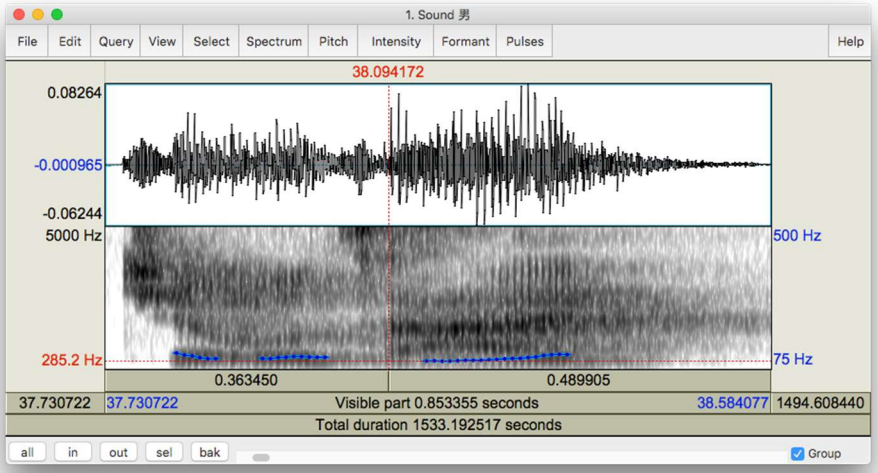
Gender	Screenshot of Acoustic Analysis
Female	

Gender	Screenshot of Acoustic Analysis
Male	

On the other side, we can also examine the VO words. The assumption here is that if VO words in the Chengdu dialect are truly left-dominant, then all the VO words in this dialect should have first syllables longer than the second. This is supposed to be presented in Table 36.

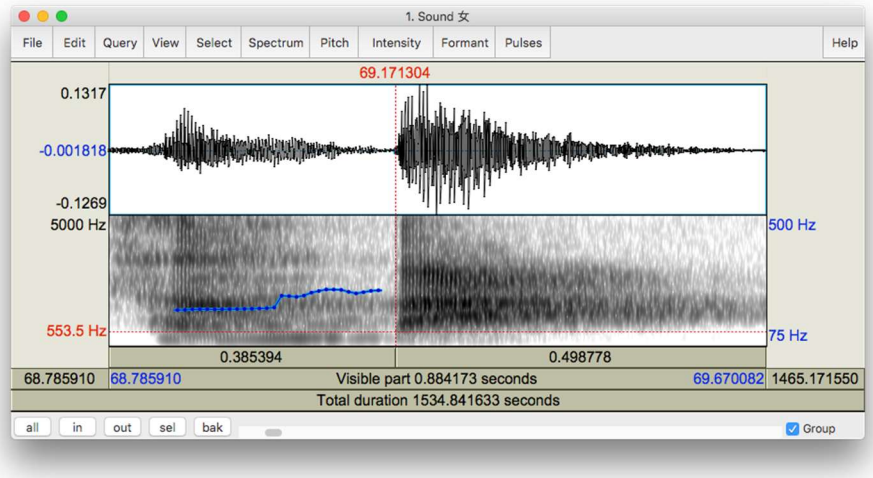
Table 49 The acoustic performance of "救灾"

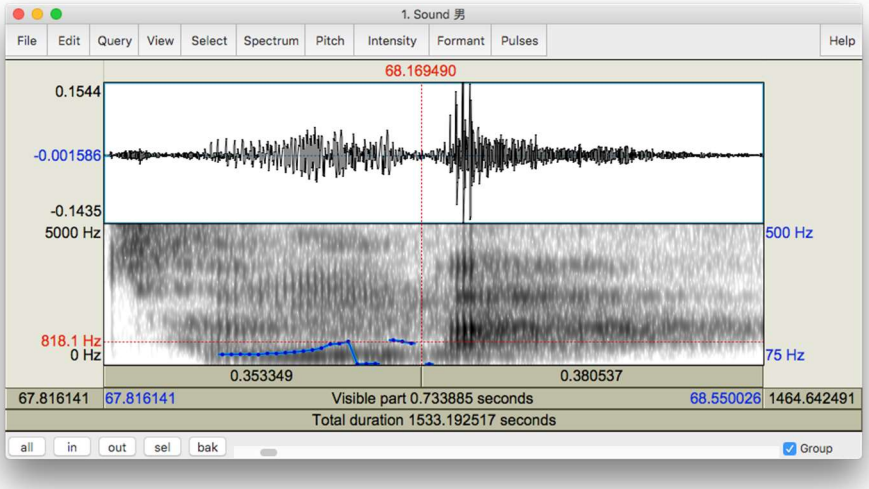
Gender	Screenshot of Acoustic Analysis
Female	

Gender	Screenshot of Acoustic Analysis
Male	

This typical example matches the (all the VO words are left-dominant) assumption. Both speakers performed the first syllable much longer than the second one, as clearly differentiated in the above samples. However, from this single example, the relationship between syntactic structure and tonal-domain could not be established. More counterexamples like “救灾” and “称霸” can also be found in Table 37 and Table 38.

Table 50 Acoustic performance of “称霸”

Gender	Screenshot of Acoustic Analysis
Female	

Gender	Screenshot of Acoustic Analysis
Male	

The given information here is that both examples are VO words, thus verbs should be longer than objects. The female speaker produces each word longer than the male ones in that her "visible part" is longer than his, but this difference does not make a distinct impact on the result. Despite the total duration of each word, both speakers evidently produced longer last syllables than former ones. Although the male one only has a 0.03-second difference and can be entirely ignored, the result still would not match the assumption for left-dominant VO words (every example cannot be listed in this single paper but will be attached as an appendix). A more specific way to see the whole picture is to check all the VO words among the total tokens and reorganize them as below:

Table 51 Results of VO words in the acoustic experiment

	Tonal pattern		Female	Male
1	1+1	翻身	B	A
2		开腔	C	B
3		销赃	C	A
4	1+2	加盟	A	A
5		翻船	B	A
6		帮忙	B	B

	Tonal pattern		Female	Male
7	1+3	伸手	B	A
8		张嘴	B	B
9	1+4	称霸	B	B
10	2+1	疗伤	B	C
11		融资	B	A
12	2+2	立足	A	A
13		出席	A	A
14		驰名	C	A
15	2+3	拍手	B	B
16		失枕	B	B
17	2+4	入户	B	A
18		行贿	B	A
19	3+1	抢滩	B	A
20		转车	A	B
21	3+2	点头	B	A
22		打牌	B	B
23	3+3	烤火	A	A
24		抢险	A	A
25	3+4	耍秤	B	B
26		讲价	B	A
27	4+1	逛街	B	B
28		救灾	B	BB
29	4+2	丧德	B	A
30		臊皮	B	B
31		爱国	B	A
32	4+3	上脸	B	B
33		动手	B	A
34		拗口	C	A
35	4+4	亮相	A	B
36		架势	A	A

Among all the 36 tokens above, only six out of 36 matches entirely the assumption about left-dominant VO words. That is to say, the acoustic performance does not support the conclusion. Only the VO part data could not prove the relationship between tonal-domain and syntactic structure. There are also other syntactic structure tokens in this study that can be verified in a future study. However, according to the result of the VO part, it seems more that the relationship would fail to be established.

According to the data summary in this section, more than half of the words do not match their theoretical tonal domain pattern with the acoustic results. Some words have quite large gaps between the supposed syllable duration and acoustic results, while some have minor gaps, indicating that it may not be true that all syllables with longer durations are described as dominant syllables in VO words that keep their base tones and are not affected by tone sandhi rules.This result can also support conclusions drawn from the perceptual experiment in this paper, which offers proof from acoustic performance that goes against the conclusion that all the objects of VO phrases keep their base tones while only verbs change tones. Furthermore, since the statistical data in the matched ones cover large statistic ranges, it is again verified that the assumption of first syllables having tone sandhi but second syllables being fixed is not reliable, as both were contradicted by the actual acoustic results.

3.3 Conclusion

In summary, this chapter examined the two prosodic constituents of the universal prosodic hierarchy, the syllable and the foot, focusing on their existence and roles in the Chengdu dialect., There are phonological rules that refer to the syllable and the foot as the domain in numerous languages. However, in the Chengdu dialect, the results are not the same.

The first part of this chapter illustrated that the syllable is an indispensable constitution in the Chengdu dialect. It also serves as the domain of specific phonological rules in this dialect, since consonant and vowel changes occur within syllables.

The second part falsified three main conclusions in the study of the Chengdu dialect. These were illustrated via a perception experiment with a standard size of samples and an acoustic experiment with the same recordings. As a result of both experiments, it can be concluded that a). Disyllabic words in the Chengdu dialect are not always left-stressed, and they are either right-stressed, the distribution of stress detected by perception is quite random; b). Whether in VO words or phrases, the objects (or second syllables) do not always maintain the same tone value andtone sandhi works all the time; c). The objects in VO structures do not always have a longer duration than verbs and it is almost always distributed equally; and d). Stress is not a proper means to differentiate words and phrases in the Chengdu dialect. The data shows that not all phrases are right-stressed and not all words are left-stressed. Without such a binary contrast, it can be concluded that the foot is not a prosodic constituent in the dialect. Therefore, the foot does not serve as a domain for phonological rules in the Chengdu dialect either. The next chapter will focus on the lexical level, the prosodic word.

Chapter IV. The Prosodic Word

This chapter focus on the prosodic word in the Chengdu dialect, first presenting a brief introduction to its definition, then revisiting previous studies on the concept from a typological perspective. After comparing major morpho-syntactic words in this dialect with the universal prosodic word to see what extent, Chengdu prosodic words fall into the scheme, examples will be given of the phonological phenomena within the domain formed by morpho-syntactic words, leading to a final conclusion. Summarizing the prosodic word domain in Chengdu.

4.1 Prosodic word across languages

4.1.1 How to define the prosodic word

According to Hall (1999), the prosodic word (also called pword or PrWd and symbolized as ω) is a constituent in the phonological hierarchy higher than the syllable and the foot but lower than the intonational and phonological phrases. Alternatively, it can be called a "phonological word," for it happens to be the size of a morpho-syntactic word. It is broadly accepted as a prosodic domain in which phonological features within the same lexeme may spread, starting with one morph then onto the next, from one clitic to a clitic host, or from one clitic host to a clitic.

Nespor and Vogel defined the phonological word as the lowest constituent of the prosodic hierarchy, constructed on the basis of mapping rules that make substantial use of nonphonological notions. It is a prosodic constituent representing the interaction between the grammar's phonological and morphological components. By following Nespor and Vogel's establishment of the concept of "prosodic word," many later studies illustrated that the prosodic word is an independent prosodic constituent in the hierarchy and the domain for applying various phonological generalizations.

The present study also follows Nespor and Vogel's definition and considers the "prosodic word" as the "lowest constituent of the prosodic hierarchy."

4.1.2 What is the domain of prosodic word

A commonly agreed assumption states that due to the roughly similar size of a morpho-syntactic word, three possibilities are usually discussed for the domain of the prosodic word: it is either larger, smaller, or equal to the morpho-syntactic word, or, the terminal node of the syntactic tree (among others, Booij 1983, 1996).

Nespor & Vogel (1986, 2007: chap. 4) narrowed down the possibilities based on their observation and claimed that there were only two possibilities—first, the domain of the prosodic word may be either the same size or smaller than the terminal node of the syntactic tree. They defined the prosodic word domain as:

A. The domain of ω is the terminal node of the syntactic tree.

or

B. I. The domain of ω consists of

a. a stem;

b. any element identified by specific phonological and/or morphological criteria;

c. any element marked with the diacritic [+W].

II. Any unattached elements within the terminal node of the syntactic tree form part of the adjacent ω closest to the stem; if no such ω exists, they form a ω on their own.

Typological proofs for supporting the definition above are also given. Examples for Type A would be languages like Greek and Latin, which refer to a prosodic word that includes a stem and all adjacent affixes, or both members of a compound (cf. Nespor & Vogel 1986: 110-116, Nespor & Ralli 1996). Type B indicates a prosodic word that is smaller than the terminal node of the

syntactic tree including several subtypes. Examples for subtype BIa would be Turkish and Sanskrit, in which each member of a compound forms a prosodic word domain (cf. Nespor &Vogel 1986: 117-122, Nespor & Ralli 1996). Examples for subtype BIb are Hungarian and Italian, in which prefixes form a prosodic word by itself, while the stem plus suffixes form one prosodic word (cf. Booij1984, Nespor &Vogel 1986: 122-134). Yidiɲ is also a typical example of subtype BIb, in which affixes satisfying minimal word requirements (e.g., disyllabicity in Yidiɲ) can form their own prosodic words (cf. Dixon 1977a, Nespor & Vogel 1986: 134-136). The last subtype BIc addresses the prosodic word composed of affixes idiosyncratically marked with a diacritic feature [+W] (e.g., Dutch; cf. Nespor & Vogel 1986: 136-140, van der Hulst 1984: 66ff). Finally, type BII is a response to the requirement of the Strict Layer Hypothesis, which says elements that do not include stems will permanently join a prosodic word within the terminal node of the syntactic tree or form a prosodic word by themselves.

Nespor and Vogel's definition has been challenged from from two perspectives. One concerns the second part of Type, which allows clitics to form their own prosodic words. This has been considered as an over-assignment of the ω status to elements like clitics and thus raised objections (cf. among others, Itô & Mester 1992, Selkirk 1996). Constituents like clitics should not be analyzed as prosodic words, let alone should this be taken as information into the definition of the prosodic word domain. The other perspective concerns the analysis that clitics do not form prosodic words. According to Booij (1996), the sequence of a lexical host plus a clitic can form an independent prosodic word. Since a clitic forms a syntactic terminal node by itself, the domain of this type of prosodic word should be larger than the terminal node of the syntactic tree.

Therefore, the domain formation of the prosodic word across languages remains questionable though linguists agree on the existence of a word-sized prosodic domain (the prosodic

word). The disagreement makes sense since languages vary, such that certain morpho-syntactic information is integrated into the formation of the prosodic word domain.

4.2 Evidence of the prosodic word across languages

In previous works, linguists verified the presence of the prosodic word domain in various languages. Nespor and Vogel provided Greek and Latin examples to illustrate that the prosodic word domain is equal to the terminal element of the syntactic tree. They also used Turkish examples to illustrate that the prosodic word domain is equal to stem plus affixes. Hungarian, Italian, Yidiɲ are examples to explain the prosodic word domain and additional morphological and phonological factors. Moreover, the Dutch example shows the prosodic word domain and diacritic features. By analyzing all these examples across languages, Nespor and Vogel finalized the general prosodic word construction and conclusion about the standard diagnostics for the prosodic word, including the prosodic word as the domain for segmental rules, prosodic/suprasegmental rules, phonotactic constraints, and minimal word requirements.

Prosodic word as the domain for segmental rules is found in the process of Vowel Harmony in Hungarian. The harmonizing feature for all vowels other than [i], [í], and [é] participate in the process is [+back]. Booij (1984), Nespor and Vogel (1986, 2007) claim that this rule only applies if both the trigger and target are parts of the same prosodic word. Furthermore, they indicate that the stem plus suffix(es) sequence forms an independent prosodic word where Vowel Harmony applies. On the other hand, the two members of a compound form two different prosodic words, while the prefixes form prosodic words by themselves, as seen in the following examples:

(1) a. stem+suffix: (ölelés-nek)ω ‘embracement + (dat. sg.)’

stem+suffix: (hɑjó-nɑk) ω ‘ship + (dat. sg.)’

b. stem+stem: (könyv)ω (tɑ ́r)ω ‘library’

c. prefix+stem: (oda)ω (menni)ω ‘to go there’

Turkish has a similar Vowel Harmony process as well. Other examples are include Penultimate Lengthening in Yidiɲ (cf. Dixon 1977a, b), Final Voicing examples in Sanskrit (Selkirk, 1980a), and Nasal Assimilation and Stop Voicing examples from Greek (Nespor & Vogel, 1986). Examples from Italian include Intervocalic s-Voicing, Vowel Raising, and Vowel Lengthening (cf. Nespor & Vogel 1986). Typologically, Polish (cf. Booij & Rubach 1987), Korean (cf. Kang 1992), English (cf. Raffelsiefen 1993), and French (cf. Hannahs 1995a, b) all provide supportive evidence.

To verifiy prosodic word as the domain for prosodic/suprasegmental rules, we can look at the Main Stress Rule in Turkish: Turkish assigns stress to the last syllable within but not across the prosodic word domain. Furthermore, it was observed that both monomorphemic words and derived words could form independent prosodic words. By contrast, each compound member forms its prosodic word and thus has its primary stress on the last syllable. Additionally, it can be seen that stress assignment rules have been used to refer to the prosodic word for a long time, as reflected in many related studies, such as Dixon (1977a, b) on Yidiɲ, Nespor & Vogel (1986, 2007) on Latin, Russell (1999) on Cree, Raffelsienfen (1999) on English, and Vigário (2003) on European Portuguese. Similarly, in some pitch accent languages, pitch accent assignment is found to be sensitive to the domain of the prosodic word. One salient example is that Godjevac (2000) argues that pitch accent assignment in Serbo-Croatian only applies to the prosodic word but not clitics. Therefore, pitch accent assignment can be used as a diagnostic to examine the prosodic word in such languages.

The prosodic word can also serve as the domain for phonotactic constraints. Some linguists think that these constraints can cue the prosodic word since phonotactic constraints in some

languages only hold at the edge of the prosodic word domain or prosodic word internally (cf. Booij 1995, 1999, Peperkamp 1997, Hall 1999, Raffelsiefen 1999, Vigário 2003, among others). For example, Peperkamp (1997) notes that in Italian there is a phonotactic constraint barring the sound [ʎ] at the beginning of a prosodic word. Booij (1999) then introduced a Dutch Syllable Contact Law,.a rule where the first consonant should be more sonorous than the second in a sequence of adjacent consonants, i.e., *(VC1.C2V)ω if C2 is more sonorous than C1. Finally, Hall (1999) argued that short lax non-low vowels in German, i.e., [ɪ], [ʏ], [ɛ], [oe], [ʊ], [ɔ], are not permitted at the right edge of the prosodic word domain. In English, according to Raffelsiefen (1999), there are more consonantal clusters ω-internally than ω-initially or ω-finally. Therefore, phonotactic constraints barring or allowing certain sounds in a language can also be used as a common diagnostic.

The last criterion is that the prosodic word serves as the domain for minimal word requirements. In some languages, there is a restriction on the minimal size of the prosodic word, usually being at least disyllabic or bimoraic. Linguists found an interesting fact that not all sequences of sounds can form morpho-syntactic words. For example, prefixes and suffixes can constitute prosodic words on their own if they exhibit minimal word requirements. For example, Yidiɲ imposes a disyllabic minimum for its prosodic words, thus disyllabic affixes form independent prosodic words in Yidiɲ (cf. Dixon 1977a, Nespor & Vogel 1986: 134-136). Also, some languages have rules that conspire to maintain the minimality restriction. For example, SiSwati is a language presenting the minimal word syndrome and having a disyllabic minimality requirement to form imperatives. Therefore, the imperative form of a verb must contain the suffix *-ni*, if the original verb stem is monosyllabic (cf. Downing 1999). However, not all languages have minimal word requirements. Generally, languages are categorized into three types concerning the

minimal size of the prosodic word (cf. Dixon 1977a, b, McCarthy & Prince 1986, 1990, Kenstowicz 1994):

Type 1: disyllabic (e.g., Yidiɲ, cf. Dixon 1977a, b; Lardil, cf. Hale 1973)

Type 2: bimoraic (e.g., German, cf. Hall 1999, Japanese, cf. Itô 1990; Estonian, cf. Prince 1980; Choctaw, cf. Lombardi & McCarthy 1991; Iraqw, cf. Mous 1993)

Type 3: no minimal word requirements: a prosodic word may consist of a single mora/syllable. (e.g., Irish, cf. Green 1997; Brazilian Portuguese, cf. Bisol 2000; European Portuguese, cf. Vigário 2003)

Though phonological phenomena across languages can refer to the prosodic word domain, which is evidence and diagnostic for the prosodic word domain, You (2017) pointed out that not all languages can be verified since some diagnostics may only demonstrate the existence of the prosodic word in a particular language. Therefore, to investigate the existence of the prosodic word in a particular dialect, the following section presents the prosodic word as the domain of phonological phenomena in the Chengdu dialect, along with examples.

4.3 Major morpho-syntactic word types in Chengdu

4.3.1 Monomorphemic words

As a branch of the northern dialect, the Chengdu dialect has many monomorphemic words, including disyllabic monomorphemic and monomorphemic words containing three or more syllables. Some basic examples of Chengdu monomorphemic words are as below:

(1) a. Monosyllabic:

云	yn	‘cloud’	雨	y	‘rain’
肥	fei	‘fat’	瘦	səu	‘thin’
给	kei	‘to give’	说	so	‘to say, to speak’

好	hau	‘good’	孬	pʰiɛ	‘bad’
快	kʰuai	‘quick’	慢	man	‘slow’
吃	tsʰ ʅ	‘to eat’	喝	xo	‘to drink’
黑	xɛ	‘black’	白	pɛ	‘white’

b. Disyllabic:

骆驼	nˡo to	‘camel’	玻璃	po nˡi	‘glass’
蜈蚣	v koŋ	‘centipede’	巴适	pa si	‘good’
尴尬	kan ka	‘embarrassing’			

c. Trisyllabic:

棒老二	paŋ lau ɚ	‘bandit’
癞疙宝	lai kʰɛ pau	‘toad’
雅加达	ia tɕia ta	‘Jakarta’

4.3.2 Derived words

When a new word is created from one preexisting word through specific applications of morphological rules, it is called a derived word. For example, in the Chengdu dialect, several affixes are primarily attached to the stem of nouns to derive new nouns. See examples:

4.3.2.1 Prefix 老- [nˡau242]

老 means ‘old’ (same in Mandarin) when by itself as a free morpheme. The prefix, 老- can be attached to a family name to address people with a sense of familiarity. It can also be used before certain nouns to form words indicating kinship, as in (8b). The exception of the familiarity sense would be presenting 老- in animal terms, as in (8c).

a.	老王	nˡau uaŋ	‘Old Wang’	老罗	nˡau lo	‘Old Luo’
b.	老汉	nˡau xaɚ	‘Dad’	老妞	nˡau nʲiɚ	‘wife’
	老表	nˡau piau	‘cousin’			
c.	老虎	nˡau fu	‘tiger’			

4.3.2.2 Suffix -子[tsi]

子 in the Chengdu dialect means ‘son’ or ‘child’ when by itself as a free morpheme. It can be attached to nouns or to adjectives to refer to a certain group of people as a suffix.

(1) Monosyllabic + 子

a.	坝子	pa tsi	‘flat ground’
b.	刀子	tao tsi	‘knife’
c.	矮子	ai tsi	‘short person’

(2) Disyllabic + 子

d.	瓜娃子	gua ua tsi	‘stupid person’
e.	儿娃子	ɚ ua tsi	‘boy’

4.3.2.3 Suffix -头[tʰəu]

In Mandarin, when by itself, 头 [tʰau^{51}] means the head of a human or an animal body as a free morpheme, but this meaning is barely applied in Chengdu dialect where 头 is used much more often as a suffix that can be attached to nouns. As a part of nouns, 头 does not have precise meanings. See examples:

a. 地头 ti tʰəu ‘field’

b. 丢头 tiu tʰəu ‘disposal’

c. 先头　ɕian tʰəu　‘earlier (time)’

d. 赚头　tsuan tʰəu　‘profit’

e. 块头　kʰuai tʰəu　‘size’

f. 后头　xəu tʰəu　‘inside/behind’

4.3.2.4 Suffix -儿[ɚ]

儿 is a free morpheme meaning ‘son’ or ‘boy’ in Chengdu dialect. One of its usages is like its counterpart in Mandarin, attached to the final preceding syllable, while as a suffix, 儿 is an independent syllable that forms a word. See examples：

(1) animals

a. 猪儿　zu ɚ　‘pig’

b. 耗儿　xau ɚ　‘mouse’

c. 猫儿　mauɚ　‘cat’

d. 雀儿　tɕʰo ɚ　‘bird’

e. 兔儿　tʰɚ　‘rabbit’

(2) specific groups of people

a. 娃儿　ua ɚ　‘child’

b. 傻儿　xa ɚ　‘stupid’

c. 妹儿　mei ɚ　‘younger sister’

d. 幺儿　iau ɚ　‘youngest child’

(3) objects

a. 刀儿　tau ɚ　‘knife’

b. 帽儿　mau ɚ　‘hat’

c. 肚儿　tu ɚ　‘tummy’

d. 裤儿　kʰu ɚ　‘pants’

(4) locations

a. 这儿　tsɚ　‘here’

b. 哪儿　nˡɚ　‘where’

c. 那儿　nˡɚ　‘there’

4.3.2.5 Suffix-些[ɕi]

些 means ‘some’ in the Chengdu dialect and it attaches to nouns to indicate generalized plural forms with a casual tone. It resembles 们 in Mandarin but differs in the way it can be attached to abstract nouns.

a. 老师些　nˡau si ɕi　‘teachers’

b. 妈老汉儿些　ma nˡau xaɚ ɕi　‘parents’

c. 水些　suei ɕi　‘water’

d. 想法些　ɕiaŋ fa ɕi　‘thoughts’

e. 林黛玉些　nˡin tai y ɕi　‘Lin Daiyu-like people’

f. 兄弟姐妹些　ɕio ti tɕie mei ɕi　‘siblings’

g. 那儿些　nˡɚ ɕi　‘thoes ones’

4.3.2.6 Suffix-家[tɕia]

As a free morpheme, 家 means family and home. The affix 家 is attached to the end of a noun indicating a certain group of people, periods, or sometimes at the end of a phrase to indicate

a way to do something. The affix usage of 家 came from the grammaticalization of its original meaning.

(1) a certain group of people

a. 男人家 nʲan zən tɕia ‘men’

b. 娃娃家 ua ua tɕia ‘kids’

c. 婆嬢家 pʰo nʲiaŋ tɕia ‘women’

d. 夫妻家 fu tɕʰi tɕia ‘couples’

e. 姐妹家 tɕie mei tɕia ‘sisters’

f. 朋友家 pʰoŋ iəu tɕia ‘friends’

g. 外人家 uai zən tɕia ‘ousiders’

(2) Time

a. 白天家 pɛ tʰian tɕia ‘daytime’

b. 晚上家 uan saŋ tɕia ‘evening’

c. 冬天家 toŋ tʰian tɕia ‘winter’

d. 往天家 uaŋ tʰian tɕia ‘usual days’

(3) Measure word +家 to indicate a way to do something

a.	饭	要	一	口	一	口	家	吃
	fan	iau	i	kʰəu	i	kʰəu	tɕia	tsʰi
	meal	ASP	one	MEASURE	one	MEASURE	way	eat

‘Meals need to be eaten = one mouthful/bite at a time

b. 只 能 过 捧 捧 家 抓， 不 准 颗 颗 家 挑

tsi nˡən ko pʰoŋ pʰoŋ tɕia tsua pu tsuən kʰo kʰo tɕia tʰiau

only can use handful handful way grasp not allow particle particle way pick

‘(Someone) can only grasp bunch by bunch, can not pick particle by particle.’

(4) Others

a. 头家 tʰəu tɕia ‘the first one’

b. 尾家 uei tɕia ‘the last one’

c. 耍家 sua tɕia ‘player’

4.3.3 Compounds

A compound is a lexeme, or less precisely, a word or sign that consists of more than one stem. Compounding, composition, or nominal composition is the process of word-formation that creates compound lexemes. Based on the syntactic and semantic relationship between and among elements, compounds in Chengdu can be subdivided into four major types as described in the following section.

4.3.3.1 Coordination compounds

A coordination compound is formed by the combination of stems, which have either identical, similar, related, or opposite semantic meanings. See examples:

(1) Stems with identical or similar meanings

a. 滴点 ti tiɔ̃ ‘drop’ + ‘drop’ ‘a little drop’

b. 歹毒 tai tu ‘vicious’ + ‘venom’ ‘vicious’

(2) Stems with related meanings (the meaning of the new compound is not the result of the combination of two stems)

a. 淡白 tan pɛ ‘bland’ + ‘white’ ‘poor’

b. 伸展 tsʰən tsan ‘to stretch’ + ‘to present’ ‘good-looking’

c. 倒拐 tau kuai ‘to fall’ + ‘abduct’ ‘to turn’

d. 街沿 kai tɕian ‘street’ + ‘edge’ ‘sidewalk’

e. 家门 tɕia mənɚ ‘family’ + ‘door’ ‘people have the same family name’

(3) Stems with related meanings (the new word inherits the meaning from one of the stems or the other way around)

a. 抵拢 ti loŋ ‘arrive’ + ‘approach’ ‘reach the end’

b. 饭米 fan mi ‘meal’ + ‘rice’ ‘rice’

c. 松活 soŋ xo ‘loose’ + ‘live’ ‘relaxed’

d. 国家 kuɛ tɕia ‘country’ + ‘family’ ‘country’

e. 脑壳 nau kʰo ‘head’ + ‘shell’ ‘brain’

f. 铺盖 pʰu kai ‘to pave’ + ‘to cover’ ‘quilt’

(4) Stems with opposite meanings

a. 开关 kʰai kuan ‘to turn on’ + ‘to turn off’ ‘switch’

b. 长短 tsʰaŋ tuan ‘long’ + ‘short’ ‘discrepancy’

4.3.3.2 Modifier-head compounds

Modifier-head compounds can be further divided into attribute-noun and adverbial-verb/adjective.

(1) Attribute-noun compounds

a. 麻糖 ma taŋ ‘sesame’ + ‘candy’ ‘sesame candy’

b. 绿茶 ly tsʰa ‘green’ + ‘tea’ ‘green tea’

c. 漏瓢 ləu pʰiau ‘leak’ + ‘ladle’ ‘colander strainer’

d. 疲匠 pʰi tɕiaŋ ‘tired’ + ‘artisan’ ‘procrastinator’

e. 偏东雨 pʰian toŋ y ‘eastward’ + ‘rain’ ‘summer shower’

f. 壳子大王 kʰo tsɿ ta uaŋ ‘shell’ + ‘king’ ‘bragger’

(2) Adverbial-verb/adjective compounds

a. 精瘦 tɕin səu ‘smart’ + ‘thin’ ‘skinny’

b. 寡淡 kua tan ‘tasteless’ + ‘bland’ ‘bland’

4.3.3.3 Verb-object compounds

When two stems are combined and the stem on the left takes the stem on the right as its object, a verb-object compound is formed.

a. 开腔 kʰai tɕʰiaŋ ‘open’ + ‘tune’ ‘to speak’

b. 失枕 sɿ tsən ‘lose’ + ‘pillow’ ‘stiff neck’

c. 架势 tɕia sɿ ‘put away’+ ‘momentum’ ‘put in energy’

4.3.3.4 Verb-complement compounds

a. 把稳 pa uən ‘control’ + ‘stable’ ‘cautious’

b. 把细 pa ɕi ‘control’ + ‘slender’ ‘careful’

c. 擦黑 tsʰa xɛ ‘rub’ + ‘black’ ‘nightfall’

d. 擦痒 tsʰa iaŋ ‘rub’ + ‘itch’ ‘set one’s nerves on edge’

4.3.4 Reduplication words

It is commonly seen that the Chengdu dialect utilizes the morphological process of reduplication, thus resulting in a large number of reduplication words. These words can be divided

into a few subtypes. The meanings of the resulting words are not always equal to original stems, as you can see below.

4.3.4.1 Reduplication of monosyllabic nouns

a.	坝	pa	‘dam’
	坝坝	pa pa	‘flat ground’
b.	洞	toŋ	‘hole’
	洞洞	toŋ toŋ	‘small hole’
c.	崽	tsai	‘baby animals’
	崽崽	tsai tsai	‘kids’
d.	杯	pei	‘cup’
	杯杯	pei pei	‘small cups’

4.3.4.2 Reduplication of monosyllabic verbs

a.	转	tsuan	‘turn’
	转转	tsuan tsuan	‘idea’
b.	铲	tsʰuan	‘to shovel’
	铲铲	tsʰuan tsʰuan	‘shovel’
c.	揪	tɕiəu	‘pull’
	揪揪	tɕiəu tɕiəu	‘braid’
d.	盖	kai	‘to cover’
	盖盖	kai kai	‘cover’

4.3.4.3 Reduplication of monosyllabic measure words

a.	盘	pan	‘to raise kids with difficulty’
	盘盘	pan pan	‘every time’
b.	下	ɕia	‘down’
	下下	xa xa	‘every beat’

4.3.4.4 Reduplication of monosyllabic adjectives

(1) AA type

a.	瓜	kua	‘melon’
	瓜瓜	kua kua	‘stupid people’
b.	憨	xan	‘silly’
	憨憨	xan xan	‘silly people’
c.	弯	uan	‘curve’
	弯弯	uan uan	‘turning/people without fashion’
d.	乖	kuai	‘good-looking’
	乖乖	kuai kuai	‘good-looking kids’

(2) ABB adjectives

a.	阴黢黢	yin tɕʰy tɕʰy	‘sneaky’
b.	瓜兮兮	kua ɕi ɕi	‘stupid’
c.	霉扎扎	mei tsa tsa	‘mildewed’
d.	水垮垮	suei kʰua kʰua	‘unreliable’

(3) AABB type

a. 白白生生	pɛ pɛ sən sən	‘white and cute’

(4) ABAB type

a.	阴痛阴痛	in tʰoŋ in tʰoŋ	‘faint pain’
b.	慢悠慢悠	man iəu man iəu	‘slow and casual’
c.	苦茵苦茵	kʰu in kʰu in	‘faint bitter’

4.3.4.5 Diminutives

(1) ABB type

a.	手爪爪	səu tsua tsua	‘hands’
b.	坟包包	fən pao pao	‘tomb’
c.	纸飞飞儿	tsɿ fei fɚ	‘little piece of paper’

(2) AAB type

a.	巴巴掌	pa pa tsaŋ	‘palm’
b.	岔岔裤	tsʰa tsʰa kʰu	‘open-seat pants’
c.	面面药	mian mian yo	‘powder pill’
d.	板板车	pan pan tsʰei	‘board cart’

4.3.4.6 Irregular reduplications

Reduplication words in this section seem to be a simple combination of different words. However, in this dialect, there are no alternatives for these words. Changing any of the characters would result in losing meaning or being ungrammatical.

(1) AABB type

a.	旮旮角角	kʰa kʰa ko ko	‘corner’
b.	盆盆罐罐	pʰən pʰən kuan kuan	‘pots, pans and cans’

(2) AABC type

a.	丁丁猫儿	tin tin mənɚ	‘dragonfly’
b.	吹吹稀饭	tsʰuei tsʰuei ɕi fan	‘hot porridge’

(3) ABCC type

a.	鼻子尖尖	pi tsi tɕian tɕian	‘end of the nose’
b.	耳朵洞洞	ɚ to toŋ toŋ	‘ear cavity’
c.	筷子筒筒	kʰ tsi tʰoŋ tʰoŋ	‘chopsticks container’

(4) ABBC type

a.	打掰掰脚	ta pai pai tɕo	‘single-leg jump’
b.	打漂漂儿	ta pʰiau pʰiauɚ	‘float’
c.	骑马马肩	tɕʰi ma ma tɕʰian	‘ride on shoulders’

(5) ABAC type

a.	火燎火烧	xo nliau xo sau	‘burning hot’
b.	白眉白眼	pɛ mi pɛ ian	‘bland’
c.	巴心巴肝	pa ɕin pa kanɚ	‘wholeheartedly’

(6) ABCB type

a.	恍兮惚兮	xuaŋ ɕi fu ɕi	‘careless’
b.	上好八好	saŋ xau pa xau	‘in perfect condition’

c. 清醒白醒 tɕʰin ɕin pɛ ɕin ‘clear mind’

4.3.7 Summary

This section investigated the major types of morphological words in the Chengdu dialect and some subtypes. The following section will testify to applications of several phonological phenomena with these morpho-syntactic words in the domain of prosodic words.

4.4 Phonological words as the domain for the application of phonological rules in Chengdu

As discussed in the second chapter, there are several phonological rules in Chengdu: TS, Voicing, Nasalization, and Assimilation. This section revisits these phonological phenomena and investigates whether the prosodic word is the domain of each phenomenon or not.

4.4.1 Tone Sandhi

4.4.1.1 TS in major types of words in Chengdu

TS rules usually apply to lexical items such as morpho-syntactic words (Chen & Norman 1965a, Chan 1985, Zhang 1992, 2017.) In other words, it can apply in the domain formed by the main types of prosodic words. The analyses of applications of TS below start with monomorphemic words, then derived words, compounds, and lastly, the application of reduplications. Sandhi tones are marked in bold. Application of TS in:

(1) Monomorphemic words

Disyllabic:

a. 骆驼 n^{l}o^{31} to^{31} → n^{l}o$^{\mathbf{43}}$ to^{31} ‘camel’

b. 玻璃 po^{45} n^{l}i^{31} → po$^{\mathbf{35}}$ n^{l}i$^{\mathbf{42}}$ ‘glass’

c. 蜈蚣 v^{31} koŋ^{45} → v$^{\mathbf{43}}$ koŋ$^{\mathbf{33}}$ ‘centipede’

d. 巴适 pa^{45} si^{213} → pa$^{\mathbf{35}}$ si$^{\mathbf{32}}$ ‘good’

e. 尴尬 kan^{45} ka^{213} → kan$^{\mathbf{35}}$ ka$^{\mathbf{32}}$ ‘embarrassing’

f 美国 mei^{51} kuɛ^{31} → mei$^{\mathbf{55}}$ kuɛ$^{\mathbf{41}}$ ‘the United States’

Trisyllabic:

a. 棒老二 paŋ^{213} nˡau^{51} ɚ^{213} → paŋ$^{\mathbf{32}}$ nˡau$^{\mathbf{52}}$ ɚ$^{\mathbf{32}}$ ‘bandit’

b. 癞疙宝 nˡai^{213} kʰɛ^{31} pau^{51} → nˡai$^{\mathbf{32}}$ kʰɛ$^{\mathbf{41}}$ pau$^{\mathbf{42}}$ ‘toad’

c. 雅加达 ia^{51} tɕia^{45} ta^{31} → ia$^{\mathbf{54}}$ tɕia$^{\mathbf{44}}$ ta$^{\mathbf{42}}$ ‘Jakarta’

(2) Derived words

Prefix + root:

a. 老妞 nˡau^{51} niɚ^{45} → nˡau$^{\mathbf{54}}$ niɚ$^{\mathbf{44}}$ ‘wife’

b. 老虎 nˡau^{51} fu^{51} → nˡau$^{\mathbf{55}}$ fu$^{\mathbf{52}}$ ‘tiger’

Root + suffix:

a. 坝子 pa^{213} zi^{51} → pa$^{\mathbf{32}}$ zi$^{\mathbf{52}}$ ‘flat ground’

b. 地头 ti^{213} tʰəu^{31} → ti$^{\mathbf{32}}$ tʰəu$^{\mathbf{41}}$ ‘field’

c. 猪儿 zu^{45} ɚ^{31} → zu$^{\mathbf{35}}$ ɚ$^{\mathbf{42}}$ ‘pig’

d. 这儿 ts^{213} ɚ^{31} → ts$^{\mathbf{32}}$ ɚ$^{\mathbf{41}}$ ‘here’

e. 儿娃子 ɚ^{31} ua^{31} zi^{51} → ɚ$^{\mathbf{43}}$ ua$^{\mathbf{42}}$ zi$^{\mathbf{42}}$ ‘boy’

Root + two suffixes:

a. 那儿些 nˡa^{213} ɚ^{45} ɕi^{45} → nˡa$^{\mathbf{32}}$ ɚ^{45} ɕi$^{\mathbf{44}}$ ‘those ones’

Prefix + root + suffix:

a. 老汉儿些 nˡau^{51} xa^{213} ɚ^{31} ɕi^{45} → nˡau$^{\mathbf{55}}$ xa$^{\mathbf{32}}$ ɚ$^{\mathbf{41}}$ ɕi$^{\mathbf{44}}$ ‘fathers’

(3) Compounds

Coordination:

a. 滴点 ti^{45} tiə̃^{51} → ti^{45} tiə̃$^{\mathbf{52}}$ ‘a little drop’

b. 歹毒 tai^{51} tu^{31} → tai$^{\mathbf{35}}$ tu$^{\mathbf{32}}$ ‘vicious’

Modifier-head:

a. 漏瓢 ləu^{213} pʰiau^{31} → ləu$^{\mathbf{35}}$ pʰiau$^{\mathbf{42}}$ ‘colander strainer’

b. 疲匠 pʰi^{31} tɕiaŋ^{213} → pʰi$^{\mathbf{43}}$ tɕiaŋ$^{\mathbf{32}}$ ‘procrastinator’

c. 寡淡 kua^{51} tan^{213} → kua$^{\mathbf{55}}$ tan$^{\mathbf{32}}$ ‘bland’

Verb-object:

a. 开腔 kʰai^{45} tɕʰiaŋ^{45} → kʰai^{45} tɕʰiaŋ$^{\mathbf{44}}$ ‘to speak’

b. 失枕 sɿ^{31} tsən^{51} → sɿ$^{\mathbf{43}}$ tsən$^{\mathbf{42}}$ ‘stiff neck’

Verb-complement:

a. 把细 pa^{51} ɕi^{213} → pa$^{\mathbf{55}}$ ɕi$^{\mathbf{32}}$ ‘careful’

b. 擦黑 tsʰa^{31} xɛ^{31} → tsʰa$^{\mathbf{43}}$ xɛ^{31} ‘nightfall’

4.4.1.2 TS in reduplication words

TS is blocked in the domain formed by reduplication words as below, and tones in question are marked in bold. TS in:

monosyllabic nouns

a. 坝坝 pa^{213} pa^{213} → *pa$^{\mathbf{32}}$ pa$^{\mathbf{32}}$ ‘flat ground’

b. 洞洞 toŋ^{213} toŋ^{213} → *toŋ$^{\mathbf{32}}$ toŋ$^{\mathbf{32}}$ ‘small hole’

monosyllabic verbs

a. 铲铲 ts^huan^{51} ts^huan^{51} → *ts^huan^{55} ts^huan^{52} ‘shovel’

b. 盖盖 kai^{213} kai^{213} → *kai^{32} kai^{32} ‘cover’

monosyllabic measure words

a. 盘盘 pan^{31} pan^{31} → *pan^{43} pan^{42} ‘everytime’

b. 下下 xa^{213} xa^{213} → *xa^{32} xa^{32} ‘every beat’

monosyllabic adjectives

a. 瓜瓜 kua^{45} kua^{45} → *kua^{45} kua^{44} ‘cute stupid people’

b. 乖乖 $kuai^{45}$ $kuai^{45}$ → *$kuai^{45}$ $kuai^{44}$ ‘good-looking kids’

ABB adjectives

a. 阴黢黢 yin^{45} $tɕ^hy^{45}$ $tɕ^hy^{45}$ → yin^{45} $tɕ^hy^{44}$ $tɕ^hy^{44}$ ‘sneaky’

b. 瓜兮兮 kua^{45} $ɕi^{45}$ $ɕi^{45}$ → kua^{45} $ɕi^{44}$ $ɕi^{44}$ ‘stupid’

c. 霉扎扎 mei^{31} tsa^{51} tsa^{51} → mei^{43} tsa^{42} tsa^{52} ‘mildewed’

d. 水垮垮 $suei^{51}$ k^hua^{51} k^hua^{51} → $suei^{55}$ k^hua^{52} k^hua^{52} ‘unreliable’

AABB type

a. 白白生生 $pɛ^{31}$ $pɛ^{31}$ sən ^{45}sən^{45} → $pɛ^{43}$ $pɛ^{31}$ sən ^{43} sən^{44} ‘white and cute’

ABAB type

a. 阴痛阴痛 in^{45} $t^hoŋ^{213}$ in^{45} $t^hoŋ^{213}$ → *in^{35} $t^hoŋ^{32}$ in^{32} $t^hoŋ^{32}$ ‘faint pain’

b. 慢悠慢悠 man^{213} iəu^{45} man^{213} iəu^{45} → man$^{\mathbf{32}}$ iəu^{44} man^{213} iəu$^{\mathbf{32}}$ ‘slow and casual’

c. 苦茵苦茵 kʰu^{51} in^{45} kʰu^{51} in^{45} → kʰu$^{\mathbf{54}}$ in$^{\mathbf{44}}$ kʰu$^{\mathbf{52}}$ in$^{\mathbf{44}}$ ‘faint bitter’

4.4.1.3 TS in diminutives

(1) ABB type

a. 手爪爪 səu^{51} tsua^{51} tsua^{51} → *səu$^{\mathbf{55}}$ tsua$^{\mathbf{55}}$ tsua$^{\mathbf{55}}$ ‘hands’

b. 坟包包 fən^{31} pao^{45} pao^{45} → *fən$^{\mathbf{43}}$ pao$^{\mathbf{44}}$ pao$^{\mathbf{44}}$ ‘tomb’

c. 纸飞飞儿 tsi^{51} fei^{45} fɚ^{45} → *tsi$^{\mathbf{54}}$ fei$^{\mathbf{44}}$ fɚ$^{\mathbf{44}}$ ‘little piece of paper’

(2) AAB type

a. 巴巴掌 pa^{45}pa^{45}tsaŋ^{51} → *pa^{45}pa$^{\mathbf{44}}$tsaŋ$^{\mathbf{52}}$ ‘palm’

b. 岔岔裤 tsʰa^{51}tsʰa^{51}kʰu^{213} → *tsʰa$^{\mathbf{55}}$tsʰa$^{\mathbf{52}}$kʰu$^{\mathbf{32}}$ ‘open-seat pants’

c. 面面药 mian^{213}mian^{213}yo^{31} → *mian$^{\mathbf{32}}$mian$^{\mathbf{32}}$yo$^{\mathbf{41}}$ ‘powder pill’

d. 板板车 pan^{51}pan^{51}tsʰei^{45} → *pan$^{\mathbf{55}}$pan$^{\mathbf{52}}$tsʰei$^{\mathbf{44}}$ ‘board cart’

4.4.1.4 TS in Irregular reduplications

(1) AABB type

a. 旮旮角角 kʰa^{45}kʰa^{45}ko^{31}ko^{31} → *kʰa^{45}kʰa$^{\mathbf{44}}$ko$^{\mathbf{43}}$ko^{31} ‘corner’

b. 盆盆罐罐 pʰən^{31}pʰən^{31}kuan^{213}kuan^{213} → *pʰən$^{\mathbf{43}}$pʰən^{31}kuan$^{\mathbf{32}}$kuan$^{\mathbf{32}}$ ‘pots, pans and cans’

(2) AABC type

a. 丁丁猫儿 tin^{45}tin^{45}mənɚ^{45} → *tin^{45}tin$^{\mathbf{44}}$mənɚ$^{\mathbf{44}}$ ‘dragonfly’

b. 吹吹稀饭 $ts^huei^{45}ts^huei^{45}ɕi^{45}fan^{213}$ → $*ts^huei^{45}ts^huei^{\mathbf{44}}ɕi^{\mathbf{44}}fan^{\mathbf{32}}$ ‘hot porridge’

(3) ABCC type

a. 鼻子尖尖 $pi^{31}tsi^{51}tɕian^{45}tɕian^{45}$ → $*pi^{\mathbf{43}}tsi^{\mathbf{42}}tɕian^{45}tɕian^{\mathbf{44}}$ ‘end of nose’

b. 耳朵洞洞 $ɚ^{51}to^{45}toŋ^{213}toŋ^{213}$ → $*ɚ^{\mathbf{54}}to^{\mathbf{44}}toŋ^{\mathbf{32}}toŋ^{\mathbf{32}}$ ‘ear cavity’

c. 筷子筒筒 $k^h{}^{213}tsi^{51}t^hoŋ^{31}t^hoŋ^{31}$ → $*k^{\mathbf{32}}tsi^{\mathbf{44}}t^hoŋ^{\mathbf{43}}t^hoŋ^{31}$ ‘chopsticks container’

(4) ABBC type

a. 打掰掰脚 $ta^{51}pai^{45}pai^{45}tɕio^{31}$ → $*ta^{\mathbf{54}}pai^{45}pai^{\mathbf{44}}tɕio^{\mathbf{52}}$ ‘single-leg jump’

b. 打漂漂儿 $ta^{51}p^hiau^{45}p^hiauɚ^{45}$ → $*ta^{\mathbf{54}}p^hiau^{45}p^hiauɚ^{\mathbf{44}}$ ‘float’

c. 骑马马肩 $tɕ^hi^{31}ma^{51}ma^{51}tɕ^hian^{45}$ → $*tɕ^hi^{\mathbf{43}}ma^{\mathbf{42}}ma^{\mathbf{52}}tɕ^hian^{\mathbf{32}}$ ‘ride on shoulders’

(5) ABAC type

a. 火燎火烧 $xo^{51}liau^{31}xo^{51}sau^{45}$ → $*xo^{\mathbf{55}}liau^{\mathbf{41}}xo^{\mathbf{54}}sau^{\mathbf{44}}$ ‘burning hot’

b. 白眉白眼 $pɛ^{31}mi^{31}pɛ^{31}ian^{51}$ → $*pɛ^{\mathbf{43}}mi^{\mathbf{42}}pɛ^{\mathbf{42}}ian^{\mathbf{42}}$ ‘bland’

c. 巴心巴肝 $pa^{45}ɕin^{45}pa^{45}kanɚ^{45}$ → $*pa^{45}ɕin^{\mathbf{44}}pa^{\mathbf{44}}kanɚ^{\mathbf{44}}$ ‘wholeheartedly’

(6) ABCB type

a. 恍兮惚兮 $xuaŋ^{51}ɕi^{45}fu^{31}ɕi^{45}$ → $*xuaŋ^{\mathbf{54}}ɕi^{\mathbf{44}}fu^{\mathbf{42}}ɕi^{\mathbf{33}}$ ‘careless’

b. 上好八好 $saŋ^{213}xau^{51}pa^{31}xau^{51}$ → $*saŋ^{\mathbf{32}}xau^{\mathbf{52}}pa^{\mathbf{41}}xau^{\mathbf{42}}$ ‘in perfect condition’

c. 清醒白醒 $tɕ^hin^{45}ɕin^{51}pɛ^{31}ɕin^{51}$ → $*tɕ^hin^{\mathbf{45}}ɕin^{\mathbf{52}}pɛ^{\mathbf{41}}ɕin^{\mathbf{42}}$ ‘clear mind’

According to the results of the TS application, it can be seen that TS applies in the domain formed by monomorphemic words, derived words, compounds, and reduplicated words in Chengdu. However, TS is invalid in diminutives and irregular reduplications.

4.4.2 Application of MTS

In the Chengdu dialect, the application of MTS is valid only with finite situations, which are certain reduplicated disyllabic morpho-syntactic words. For example:

Table 52 Morphological tone sandhi (MTS)

Tone	Chinese Example	IPA	Tone value change
1	包包	pau ^{45}+ pau^{45}	pau ^{45}+ pau$^{\mathbf{55}}$
2	瓶瓶	p'in^{31}+ p'in^{31}	p'in^{31}+ p'in$^{\mathbf{55}}$
3	本本	pən^{53}+ pən^{53}	pən^{53}+ pən$^{\mathbf{21}}$
4	棍棍	kuən^{213}+ kuən^{213}	kuən^{213}+ kuən$^{\mathbf{55}}$

The sandhi tone of the second syllable within the domain of MTS is conditioned by the citation tone and the preceding tone. According to linguistic data above, in the Chengdu dialect, MTS applies in the domain formed by reduplication words such as "diminutive" nouns and sound-splitting words. Moreover, MTS is blocked in the domain formed by monomorphemic words, derived words, compounds, and reduplicated adjectives, while TS is valid with such situations. This difference supports the different domains of MTS and TS.

The Lexical Phonology Theory (cf. Kiparsky 1982, 1985, Mohanan 1982, among others) presents two classes of phonological rules: one is for lexical rules and the other is for post-lexical rules. The former are lexical phonological rules and morphological processes, or word formation rules (WFRs) that can be separated into a series of levels in the lexicon. In this theory, the English lexicon structure is organized as below:

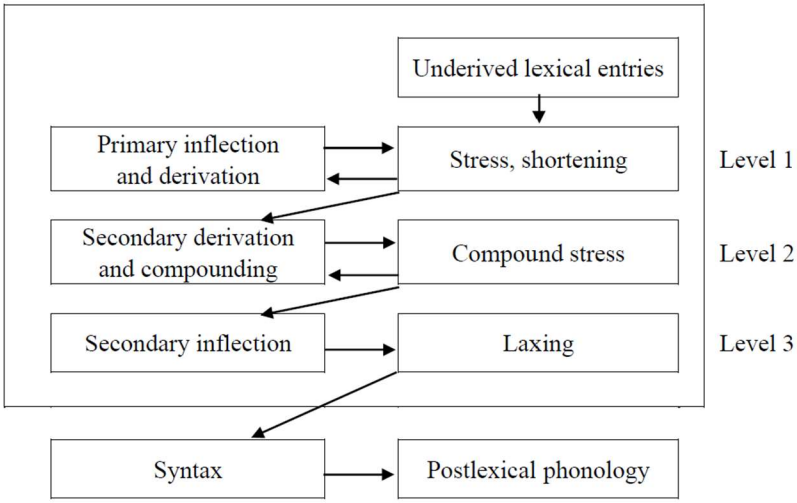


Figure 22

Zhang & Yu (2009) and Yu & Yin (2014) constructed the Mandarin Chinese lexicon organization with the framework above. In addition, they explained the third tone sandhi rule and the neutral tone rule to reduplication words. See below (Yu, Yin, 2014):

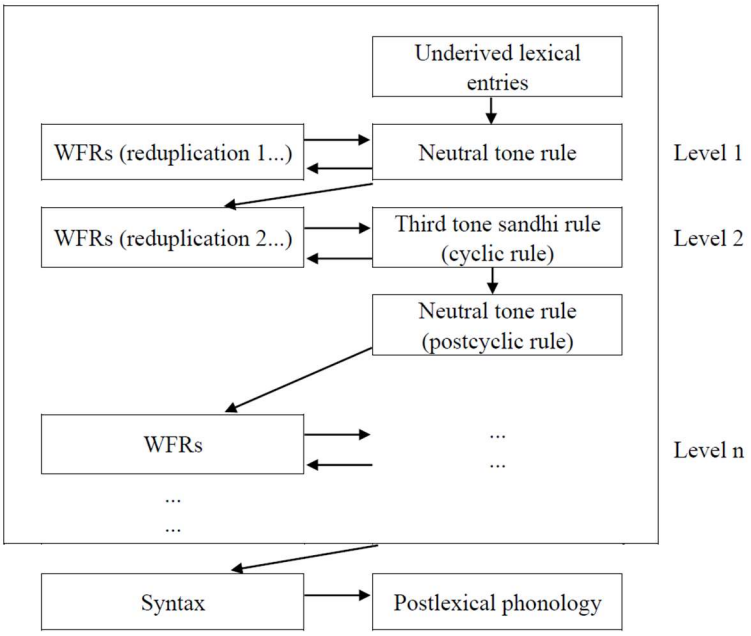


Figure 23

The Chengdu dialect is similar to Mandarin Chinese in various linguistic aspects. It falls into the assumption that MTS and TS rules are processed at different levels within the lexicon. Each

level has the lexical phonological standards particular to that level. For example, “diminutive” nouns and sound-splitting words are formed by reduplication 1 at Level 1 in the lexicon, where MTS applies. Other morpho-syntactic words such as derived words, compounds, and reduplicated adjectives are formed at Level 2, where TS applies. For example:

monosyllabic adjectives: AA

瓜瓜 kua^{45} kua^{45} → kua^{45} kua^{44} ‘cute stupid people’

乖乖 kuai^{45} kuai^{45}→ kuai^{45} kuai^{44} ‘good-looking kids’

Therefore, as seen above, MTS in the Chengdu dialect can only apply to certain morpho-syntactic words, namely, morpho-syntactic words formed by reduplication 1 at an earlier level in the figure. At the same time, TS applies to other morpho-syntactic words formed by affixation, compounding, or reduplication 2, at a later level.

4.4.3 Application of Voicing

The voicing rule in this dialect optionally voices a stop when a back vowel precedes it. See examples:

(1) Monomorphemic words

骆驼 n^{l}o^{31} to^{31} → n^{l}o^{43} t^{h}o^{31} ‘camel’

(2) Derived words

咋个 tsa^{31}ko^{213} →□ tsa^{43}k^{h}o^{32} ‘how’

(3) Compounds

a. 角度 ko^{31}tu^{213}→ ko^{43}t^{h}u^{32} ‘perspective’

b. 寡淡 kua^{51} tan^{213}→ kua^{55} t^{h}an^{32} ‘bland’

(4) Reduplication

旮旮角角 k^{h}a^{45} k^{h}a ^{45}ko^{31} ko^{31} → k^{h}a^{45} k^{h}a ^{45}k^{h}o^{31} ko^{31} ‘corner’

The Voicing rule is optional, thus the data above is not exhaustive. However, it can be seen that this rule applies to certain morpho-syntactic words.

4.4.4 Nasalization

This rule optionally nasalizes the segment after a nasal:

(1) Monomorphemic words

尴尬 kan^{45} ka^{213} → kan^{35} **ŋ**a^{32} ‘embarrassing’

(2) Compounds

应该 in^{45} kai^{45} → in^{45}**ŋ**ai^{44} ‘should’

人家 zən^{31}tɕia^{45} → zən^{45} **ɳ**ia^{44} ‘people’

4.4.5 Assimilation

Some sounds in the Chengdu dialect are optionally assimilating to the sound before them:

工人 konŋ^{45}zən^{31} → koŋ^{35}**ŋ**ən^{42} ‘worker’

笑人 ɕiau^{213}zən^{31} → ɕiau^{32}**u**ən^{41} ‘funny’

4.4.6 Deletion

This rule optionally deletes the final, a consonant, or both a final vowel and the initial after it together:

我们 ŋo^{51}mən^{45} → ŋom^{54} ‘we’

时候 si^{31}xəu^{213} → səu^{43} ‘time’

4.4.7 Summary

The application of Voicing, Nasalization, Assimilation, and Deletion is not mandatory. However, according to acoustic experiments, these rules are more often realized by older people than with young people. Therefore, it would be insufficient to conclude that these rules can be

applied to all major types of morpho-syntactic words, but it can be concluded that these rules are not blocked in the domain of certain words.

Table 53

Application Phenomena Words		TS	MTS	Voicing	Nasalization	Assimilation	Deletion
Monomorphemic words	monosyllabic	N/A	N/A	N/A	N/A	N/A	N/A
	disyllabic trisyllabic	√	×				
Derived words	prefix+stem stem+suffix(es) prefix+stem+suffix	√	×				
Compounds	coordination modifier-head verb-object verb-complement	√	×				
Reduplication: “diminutive” nouns		×	√				

Optional but not blocked

4.5 The prosodic word domain in the Chengdu dialect

Similar to Mandarin Chinese and other dialects, there are some facts about the domain formed by the major types of morpho-syntactic words in the Chengdu dialect:

a. TS obligatorily applies to polysyllabic monomorphemic words, derived words, compounds, and reduplicated adjectives, regardless of the internal structure of these words.

b. MTS obligatorily applies to “diminutive” nouns and sound-splitting words.

c. Voicing, Nasalization, Assimilation, and Deletion are optional but not blocked.

The above discussions demonstrated that the morpho-syntactic words in the Chengdu dialect form the domain for certain phonological rules (both segmental and suprasegmental) and phonotactic constraints. Also, the domain formed by morpho-syntactic words in the Chengdu

dialect is coextensive with the terminal node of the syntactic tree, and the correspondence is related to the numbers of syllables: the foot domain can generally contain no more than three syllables cross-linguistically, while in the Chengdu dialect, the domain can have unlimited syllables. Therefore, under the framework of prosodic phonology, the definition of the prosodic word domain in the Chengdu dialect can be presented as:

Prosodic Word (ω) domain in the Chengdu dialect

The domain of ω in the Chengdu dialect is the terminal node of the syntactic tree.

4.6 Summary

This chapter deals with the prosodic word. First, it reviewed primary research on the prosodic word in the world's languages and then presented major types of morpho-syntactic words in the Chengdu dialect and took phonological rules as the diagnostic to examine the phonological phenomena within the domain formed by morpho-syntactic words. Finally, by illustrating the role that the prosodic word domain plays in applying various phonological generalizations in the Chengdu dialect, it can be concluded that the phonological word is an independent constituent in the Chengdu dialect.

Furthermore, evidence and diagnostics above show that the prosodic word is the domain of TS rules in the dialect, and there are also some other phonological phenomena referring to the domain formed by prosodic words:

(1) ω-domain phonological phenomena in the Chengdu dialect

Table 54

a. TS:	$T_n\ T_n$' / [T_{n+1}]ω (n≥1)	
b. MTS:	T_1 21/31(44) / [T_2]ω	in reduplication 1

Chapter V Clitic Group in the Chengdu Dialect

Data presented in this chapter argues for the independent status of the clitic groups to be taken as a prosodic unit in the Chengdu dialect. Not only is the clitic group characterized by several specific rules different from that of words and phonological phrases, but also, a process of blocking rules is seen to have the clitic group as its domain (Horne, 1990). The basic structure of this chapter follows the previous pattern, starting with a definition of clitic groups across languages, the proceeding with a review of discussions concerning the clitic group as the domain of phonological rules in the Chengdu dialect and other languages and, and culminating in a chapter summary.

5.1 Definition

5.1.1 Definition of clitics

The organization of post lexical phonology from Nespor & Vogel (1986) is represented in the hierarchy below:

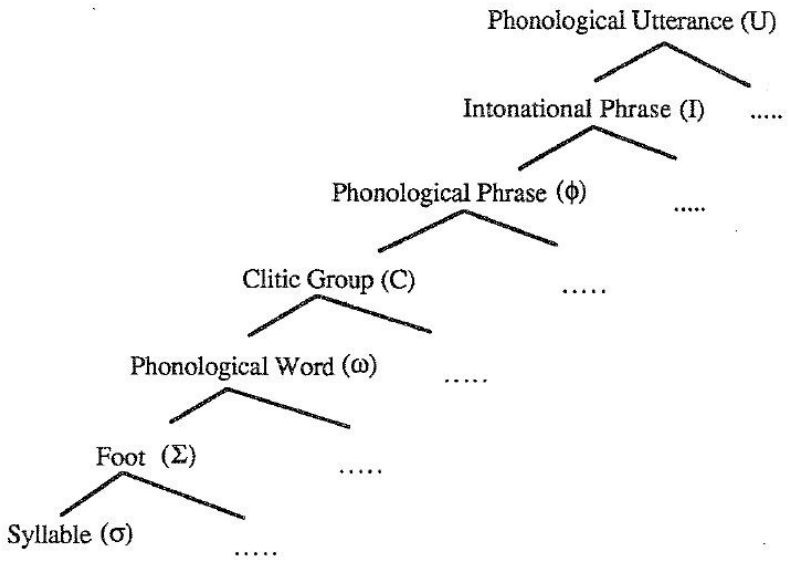


Figure 24

Here each prosodic constituent constitutes the domain of application of specific phonological rules and phonetic processes. Among these constituents, the clitic group (CG) is

controversial. However, unlike the constituent foot, which is controversial only in Chinese, the clitic group was discussed in multiple languages.

Previous studies (Selkirk 1980, Nespor &Vogel 1986) show that clitics are either treated as the phonological word analyzed as affixes or as phonological phrases that are classified as independent words (Booij 1983, Zwicky 1984). Thus, in the hierarchy above, the clitic group is placed between the phonological word, which group affixes with stems, and the phonological phrase, which groups words with other words.

A First Dictionary of Linguistics and Phonetics and SIL International (2003)[1] both define the clitics as a morpheme that has the syntactic characteristics of a word but phonologically depends on another word or phrase, reflecting the properties of a clitic: syntactically independent but phonologically dependent, permanently attached to a host. Clitics refer to intermediate linguistic units that grammatically behave like words and combine with other words or phrases to construct phrases. However, they are phonologically bound to an adjacent word traditionally referred to as the "host" (Russi 2008, also cf. Zwicky 1977, Klavans 1982, Matthews 1991, Halpern 1998, Riemsdijk 1999, among others). Accordingly, a clitic is pronounced like an affix but plays a syntactic role at the phrase level. In sum, a salient feature of clitics is that they have the form of affixes but the distribution of function words. In other words, the clitic is a term used in grammar to refer to a form that resembles a word but cannot stand on its own as a regular utterance, dependent in phonology upon a neighboring word, its host (Crystal 2008).

According to Nesor & Vegel (1986), it has been recognized that the problematic behavior of clitics comes from their hybrid nature: “Enclisis is neither true suffixation nor juxtaposition of

[1] Clitic - Wikipedia. https://en.wikipedia.org/wiki/Clitic

independent elements. It has the external characteristics of the former . . . the inner feeling of the latter" (Sapir, 1930).

There are two main reasons for comparing clitics to a phonological word or a phonological phrase. The first is the position of clitics in the phonological hierarchy. The other is that the most common approach in phonology considers clitics as belonging to the phonological word and being treated as something similar to affixes or as belonging to the phonological word and being treated as something similar to another phonological word.

Nespor and Vogel emphasize that clitics cannot always be forced into either of these categories because their phonological behavior is often different from that of both affixes and independent words. Nevertheless, it was made clear that clitics are phonological phenomena with characteristics only of the group consisting of a word plus clitic(s). Therefore, they conclude that a constituent of the prosodic structure must have precisely this extension. Furthermore, they proposed the domain of this constituent and provided evidence for the clitic group as the domain of application of several phonological rules in different languages.

5.1.2 Evidence for the clitic group domain across languages

Zwicky (1977) observed that some combinations of a word plus a clitic show "#" behavior, meaning they behave as if they were two independent words. Others show "+" behavior, which means they behave as if they were just one word. Generally speaking, some clitics behave like independent words, some like affixes, and some either like words or affixes depending on the specific rule. Considering the mixed behavior of sequences of word plus clitics, it is understandable that arguments abound whether or not the clitic is an independent unit in the phonological hierarchy. Evidence from Spanish illustrated the first type of clitics (Zwicky 1977). Here, the word's external status does not affect the location of stress on its host. For example:

a. dándo ‘giving’

b. dándonoslos ‘giving us them’

In this case, dándo maintains its initial stress when followed by two clitics (b), even though the new string has primary stress on the fourth-to-last syllable, which does not represent a possible word stress pattern in Spanish. Another example of Zwicky’s is from Turkish, where words usually have primary stress on the last syllable. When a clitic is present at the end of the word, the position of stress on the host word remains unchanged:

c. liyotlársa ‘if they had caught it’

sa is a clitic personal ending.

In both examples, clitics do not influence the word stress of their host. Zwicky summarized this as sufficient reason to consider clitics as word-external elements. By contrast, in classical Latin, clitics are considered as internal to words, with the evidence being that a stress rule is triggered by “cliticization” (Clitic Group Stress), meaning that when an enclitic joins a word, the primary stress is shifted from its original position in the structure to the syllable that immediately precedes it. For example:

“+ behavior” of Latin enclitics (cf. Zwicky 1977)

a. vírum ‘the man (acc.)’ virúmque ‘and the man (acc.)’

b. vídēs ‘you see’ vidḗsne? ‘do you see?’

c. cum vóbis ‘with you (pl.)’ vobíscum ‘with you (pl.)’

Another example from Demotic Greek also shows the word-internal behavior of clitics. A new stress pattern is produced by stress readjustment when an enclitic is attached to a word with primary stress on the antepenultimate. In 1984, Zwicky noted that the term clitic is used more precisely and restrictedly. Therefore, he suggested a series of syntactic and phonological tests to

distinguish clitics from independent words. According to the phonological test, an element is a clitic if, when joined together with a word, it is affected by internal sandhi rules. At the same time, it is an independent word if, still together with a word, it is affected by external sandhi rules. The step Zwicky took here is to restrict the term clitic. In short, according to Zwicky, if an element is word-internal, it is a clitic and if word external, it is an independent word.

Nespor and Vogel questioned this approach. They argued that clitics represent an independent category due to their morphosyntactic and phonological properties. In this manner, they should be distinguished from both words and affixes. This argument has two main directions.Clitics should differ from independent words since a clitic can never occur alone and must "lean" on a prosodic host adjacent to it. Moreover, due to the phonological dependency of clitics, it is impossible to (a) pause between a clitic and its host, (b) assign stress to clitics in stress languages, (c) assign contrastive stress to clitics, and (d) freely move clitics in an utterance (Haspelmath & Sims 2010, You 2018). The other property of clitics is that clitics commonly belong to some functional and considerably closed categories, for example, auxiliaries, pronouns, determiners, prepositions, postpositions, conjunctions, and functional particles like negatives and interrogative particles (cf. Zwicky 1977, Klavans 1982, 1985, among others). However, independent words typically come from open categories such as nouns, verbs (excluding auxiliaries), and adjectives. As for the difference between clitic and affixes, several criteria were proposed according to Zwicky & Pullum 1983, Haspelmath & Sims 2010, and others:

The first salient difference is the host selection. Clitics can attach to words of virtually any category, e.g., English auxiliary *'s*, which can attach to nouns, prepositions, verbs, adjectives, and adverbs, while affixes are pretty specific in their selections of stems, e.g., English plural suffix *-s*, which attaches only to noun stems.

Then there are the arbitrary gaps. Clitics do not present arbitrary gaps but affixes do; for example, the English plural suffix *-s* is not able to join "child." Also, the morpho-phonological idiosyncrasies indicate difference. Clitics do not exhibit morpho-phonological idiosyncrasies while irregular forms are quite common in groupings of stems and affixes as with irregular forms like *feet* for the plural affix, *went* for the past affix, and *best* for the superlative affix.

Moreover, there are semantic idiosyncrasies. The meaning of the string of the host plus the clitic(s) is under prediction from the meaning of the host and that of the clitic(s), while affix-stem combinations may have an idiosyncratic meaning. For example, the Dutch inflected form *ouder* is a comparative 'older' in its literal meaning but also can be extended to use as a noun, which means 'parent.' Furthermore, there are syntactic operations, such as when an affixed word is regularly treated as one unit, while a string of the host plus the clitic(s) are usually treated as separated units. Lastly, there is ordering. Clitics can attach to material already containing clitics or affixes, but affixes cannot attach to a host containing clitics.

Some other linguists found more evidence (e.g., Hayes 1984/1989, Nespor & Vogel 1986, among others) to support the idea that the phonological behavior of clitics is often different from that of both independent words and affixes. Some phonological phenomena only apply to a constituent consisting of a word host and the clitics (the clitic group) in a given language. In other words, the clitic group is the domain of application for various phonological generalizations, which differentiate clitics from both independent words and affixes.

5.1.3 Summary

According to Nespor & Vogel (1986), the clitic group is the first level of the prosodic hierarchy. This level represents the mapping between the syntactic and the phonological

components due to certain clitics choosing their direction of attachment according to the syntactic constituent structure.

Though it can be controversial to acknowledge the notion of the clitic group when arguments against the existence of this constituent (Zec 1988, 1993, Inkelas 1990, Inkelas & Zec 1995, Booij 1996, Kleinhenz 1996, Selkirk 1996, Peperkamp 1997, among others), some researchers still hold a position which supports the clitic group as an indispensable prosodic constituent in the hierarchy (e.g., Hayes 1989, Zhang 1992, 2014, 2017, Kabak & Vogel 2001, among others).

This paper will follow the categories of clitics established by Nespor and Vogel to analyze the clitic groups in the Chengdu dialect. Firstly, the prosodic constituent located immediately above the prosodic word in the prosodic hierarchy is referred to as the clitic group (cf. Hayes 1984/1989, Nespor & Vogel 1986, among others), which groups together a prosodic word plus adjacent clitics. In general, there are two types of clitic groups> The first, Type A clitic group, has morpho-syntactic functions with the phonological behavior of enclitics and is formed by "host+enclitic." The other is the Type B clitic group, the proclitics, formed by "proclitic+host." The definition of the clitic group domain presented in Nespor & Vogel (1986: 154) is:

Clitic group (CG) formation

The domain of the CG consists of a ω containing an independent (i.e., nonclitic) word plus any adjacent phonological words containing

a. a directional clitic, or

b. a plain clitic/nondirectional clitic such that there is no possible host with which it shares more category memberships.

5.2 Enclitics in the Chengdu dialect and their morpho-syntactic functions

5.2.1 Introduction

Several elements in the Chengdu dialect can be recognized as clitics. They have distinctive morpho-syntactic or phonological behaviors from phonological words and phonological phrases. However, strangely enough, there have hardly been any previous studies about this independent constituent, written in either English or Chinese. After another round of literature review, this gap can be explained. Most relevant studies take these elements in the Chengdu dialect as either affixes or words. However, some of the "affixes" and "words" share the common properties of clitics across languages. Also, some phonological phenomena in this dialect can refer to the domain formed by the host plus the clitics.

The clitics in the Chengdu dialect are mostly bound morphemes, which results in a mixture with affixes. These morphemes can not be independently used and have to stay with adjacent prosodic units as the host. Clitics in this dialect are usually functional parts, such as possessive markers, modification markers, nominalization markers, aspect markers, interrogative particles, auxiliaries, prepositions, and some other functional particles. In this section, I will analyze both enclitics and proclitics. In these analyses, the group of "host+enclitics" is labeled "CG" and the enclitics with a lowercase "C." Prosodic words areas before, labelled with a "ω".

5.2.2 嘞 $_1$ [n^{l}ei^{45}]

嘞 can be a possessive/modification/nominalization marker in this dialect and is very commonly used since it is a possessive marker. As mentioned before, the Chengdu dialect does not have a neutral tone, so the citation tone of 嘞 is marked as the first tone in this dialect. The counterpart of 嘞 in Mandarin Chinese would be 的. Similarly, 嘞 in Chengdu dialect also functions as (a) an attachment to the right of a noun/pronoun to indicate possession; (b) an

attachment to the modifier and connecting the modifier and the nominal expression modified by the modifier; and (c) a part of nouns that comes out of verbs/verb phrases, or adjectives (including reduplicated adjectives), nouns/noun phrases, or pronouns. 嘞 is presented as POSS (= possessive marker), MOD (= modification marker), or NOM (= nominalization marker) in examples below:

(1) Possessive marker

a. [[我]w 嘞 C]CG 书

[[ŋo] nˡei] su

I POSS book

'my book'

b. [[你]w 嘞 C]CG 笔

[[ny] nˡei] pi

You POSS pen

'Your pen'

c. [[你们妹儿]w 嘞 C]CG 炒饭

[[ny mən mɛɚ] nˡei] tsʰau fan

Your younger sister POSS fried rice

'your younger sister's stirred-rice'

(2) Modification marker

a. [[新]w 嘞 C]CG 书

[[ɕin] nˡei] su

new MOD book

'new book'

b. [[新咎咎]w 嘞 C]CG 书

[[ɕin tsan tsan] n^{l}ei] su

new-ish MOD book

'new book'

c. [[炒]W 嘞 C]CG 饭

[[ts^{h}au] n^{l}ei] fɛn

stir MOD rice

'stirred rice'

(3) Normalization marker

a. [[说]w 嘞 C]CG 比 [[唱]w 嘞 C]CG 好 听

[[so] n^{l}ei] pi [[ts^{h}aŋ] n^{l}ei] xau t^{h}in

speak NOM compare sing NOM good listen

'what is spoken sounds better than what is sung'

b. [[炒]W 嘞 C]CG 比 [[煮]W 嘞 C]CG 好 吃

[[ts^{h}au] n^{l}ei] pi [[ts^{h}u] n^{l}ei] xau ts^{h}i

stir NOM compare boil NOM good eat

'what is stirred tastes better than what is boiled'

c. [[耙]w 嘞 C]CG

[[p^{h}a] n^{l}ei]

soft NOM

'what is soft'

d. [[你]w 嘞 C]CG 还 是 [[我]W 嘞 C]CG?

[[ny] n^{l}ei] xai si [[ŋo] n^{l}ei]

you NOM or I NOM?

'yours or mine?'

e. [[妈妈]W 嘞 C]CG

[[ma ma] n^{l}ei]

Mom NOM

'mom's (stuff)'

5.2.3 嘞 2 (adjective reduplication markers)

When used as the predicate, reduplicated adjectives in Chengdu are usually bound on the right and need to take the enclitic 嘞. 嘞 is only used as an enclitic and thus is attached to reduplicated adjectives. 嘞 is presented as AdjR (=adjective reduplication marker) in examples below:

a. [[哈戳戳]w 嘞 C]CG

[[xa ts^{h}o ts^{h}o] n^{l}ei]

stupid poke poke AdjR

'quite stupid'

b. [[瓜兮兮]w 嘞 C]CG

[[kua ɕi ɕi] n^{l}ei]

fool like like AdjR

'quite foolish'

c. [[水垮垮]w 嘞 C]CG

[[suei k^{h}ua k^{h}ua] n^{l}ei]

water fall fall AdjR

'quite unreliable'

d. [[绵揪揪]w　　嘞 C]CG

[[mian tɕiəu tɕiəu] n^{l}ei]

silk pull pull　AdjR

‘quite continuous’

5.2.4 Aspect markers.

The aspect markers also go after the verb or verb phrases. These markers are enclitics since they are attached to the host on their left to indicate the aspect.

5.2.4.1 倒[tau^{51}]

倒 does not have an exact form and is a commonly seen enclitic in the Chengdu dialect. It serves as a duration aspect marker and sometimes as a perfective aspect marker along with 起咯. As a durative aspect marker, 倒 behaves like its counterpart 着 in Mandarin. The two of them remain post-verbal to indicate a continuing state or situation denoted by the verb or verbal phrase. These verbs preceding 倒 are generally activities or states that would keep going for a specific measure of time, as in the examples below:

a. 饭　[[炒]W　倒 C]CG 嘞

fɛn [[ts^{h}au] tau]　　n^{l}ei

rice sitr　DUR　final-particle

‘The rice is being stirred’

b. [[站]W　倒 C]CG 嘞

[[tsan]　tau]　n^{l}ei

stand　DUR　final-particle

‘(someone) is standing’

Likewise, like 着 in Mandarin, the duration marker 倒 can happen between two verbs: the "V1 倒 V2" structure. V1 demonstrates that the occasion denoted by the accompanying V2 occurs during the time spent "V1-ing". See examples:

a. [[吃]w 倒 C]CG 耍

[[ts^{h}i] tau] sua

eat DUR play

'Eating it for fun'

b. [[记]w 倒 C]CG 给 他

[[tɕi] tau] kei t^{h}a

remember DUR give he

'remember to give him'

c. 我[[站]w 倒 C]CG 说

ŋo[[tsan] tau] so

I stand DUR speak

'I am standing while speaking'

5.2.4.2 咯 $_{1}$ [n^{l}o^{31}] (perfective aspect marker)

咯 in this section is a perfective aspect marker. This writing form is based on the form that native speakers of the Chengdu dialect usually use. 咯 is often seen in daily messages sent by the young generation. The counterpart of 咯 in Mandarin would be 了, which is the perfective aspect marker. 咯 can be attached to a preceding verb or VP and indicates the completion of actions. It can occur after the verb and be followed by other elements such as an object or complement. For example:

(1) V1 咯(O1)V2(O2)

a. 他 [[吃]w 咯 C]CG 饭 就 [[写]w 咯 C]CG

tʰa [[tsʰi] nˡo] fan tɕiəu [[ɕiɛ] nˡo]

he eat PERF meal then write PERF

'He went to write after eating a meal.'

b. [[买]w 咯 c]CG 炒 饭 给 你

[[mai] nˡo] tsʰau fan kei ny

buy PERF stir rice give you

'I bought stirred-rice for you.'

c. 你 [[吃]w 咯 C]CG 还 要 想 吃

nʲy [[tsʰi] nˡo] xai iau ɕiaŋ tsʰi

you eat PERF still want think eat

'You would want to eat again after eating.'

(2) V+咯+ frequency Phrase/duration Phrase

a. [[说]w 咯 C]CG 好 多 遍

[[so] nˡo] xau to pʰian

speak PERF good many times

'already said many times'

b. [[吃]W 咯 W]CG 五 个 钟头

[[tsʰi] nˡo] v ko tsoŋ tʰəu

eat PERF five MEASURE hours

'be eating for five hours'

5.2.4.3 咯 $_2$ [n^{l}o^{31}] (sentence-final particle)

As seen in previous examples, many examples take a 咯 as endings. 咯 does not have a full correspondent form and this character is selected because of its frequent usage. 咯 $_2$ occurs at the end of a sentence or a clause, indicating a change in the state or situation. Therefore, I mark it as 咯 $_2$ since its counterpart in Mandarin would be 了 $_2$, which is a perfect aspect marker showing a change of state or a currently relevant state. 咯 $_2$ can be used as a single aspect marker in a sentence or clause and can be used along with other aspect markers as presented in previous examples.

a. 出 [[太 阳]W 咯 C]CG

ts^{h}u [[t^{h}ai iaŋ] n^{l}o]

Out sun CRS

'it's sunny'

b. 车 [[来]w 咯 C]CG

ts^{h}ei^{45}[[n^{l}ai^{31}] n^{l}o^{31}]

car come CRS

'The car is here.'

a. [[吃]W 咯 W]CG 五 个 [[钟头]w 咯 C]CG

[[ts^{h}i] n^{l}o] vu ko [[tsoŋ t^{h}əu]n^{l}o]

eat PERF five MEASURE hours CRS

'be eating for five hours'

b. [[看]w 咯 C]CG 嘞

[[k^{h}an] n^{l}o] n^{l}ei

see PERF CRS

‘already watched’

c. [[说]w 咯 C]CG 好 多 遍 咯

[[so] $n^{l}o$] xau to $p^{h}ian$ $n^{l}o$

speak PERF good many times CRS

‘already said many times’

5.2.4.5 三 [san^{45}]and 嘛[ma^{31}]

The sentence final particle 三 does not have a complete correspondent form in the Chengdu dialect. Some people write it as 三 while others write 噻. However, these two have different pronunciations and 噻 is more often used in the Chongqing dialect. Here we will take the form 三 as it is more often used in the Chengdu dialect.

三 is a final particle that emphasizes assurance or denotes an imperative sentence. It only occurs at the end of the sentence despite the morpho-syntactic structure preceding it. For example:

(1) Assurance 三

a. [[肯 定]w 三 C]CG

[[k^{h}en tin] san]

sure CRS

‘for sure’

b. [[对]w 嘞 C]CG 三

[[tuei n^{l}ei] san

correct NOM CRS

‘that’s indeed correct’

c. [[可以]w 三 C]CG

[[kʰe i] san]

permit CRS

'sure'

(2) Imperative sentences 三

a. [[走]W 三 C]CG

[[tsəu] san]

walk CRS

'go'

b. [[起来]w 三 C]CG

[[ɕi nˡai] san]

rise up CRS

'Get up'

嘛 is also a final particle that only occurs at the end of a sentence. When an imperative sentence ends, it expresses a request in a persuasive way. Though it also denotes actions and assurance, it is not as strong as 三. For example:

(3) Assurance 嘛

a. [[肯定]w 嘛 C]CG

[[kʰen tin] ma]

sure CRS

'of course'

b. [[对]w 嘞 C]CG 嘛

[[tuei nˡei] ma

correct NOM CRS

'that's true'

c. [[可以]w 嘛 C]CG

[[kʰe i] ma]

permit CRS

'okay'

(4) Imperative sentences 嘛

a. [[走]W 嘛 C]CG

[[tsəu] ma]

walk CRS

'Let's go'

b. [[起来]w 嘛 C]CG

[[ɕi nˡai] ma]

rise up CRS

'Get up, okay?'

5.2.4.6 哈儿[xaɚ^{45}]

The enclitic 哈儿 in the Chengdu dialect is a delimitative aspect marker indicating that a situation or event lasts only a short time. Also, the full form of this marker is not found, but most people use 哈儿. It occurs on the right of the verb. See examples:

a. [[坐]w 哈儿 C]CG

[[tso] xaɚ]

sit DLM

‘sit a while’

b. [[耍]w 哈儿 C]CG

[[sua] xaə˞]

play DLM

‘just play for a while’

c. [[看]w 哈儿 C]CG 书

[[k^{h}an] xaə˞] su

read DLM book

‘read for a while’

5.2.5 倒 $_{2}$ [tau^{51}]

As a post-verb particle, the enclitic 倒 can be placed after a verb or verb phrase to indicate a time, location of an action, or event. Its counterpart in Mandarin would be 在. See examples:

a. [[排]W 倒 C]CG 下 个 星 期

[[p^{h}ai] t^{h}au] ɕia ke ɕin tɕ^{h}i

arrange PVP next week

‘arranged to the next week’

b. [[放]w 倒 C]CG 卧室 头

[[faŋ] tau] ŋo si t^{h}au

put PVP bedroom LOC

‘put in the bedroom’

c. [[写]w 倒 C]CG 黑 板 上

[[ɕiɛ^{51}] tau] xɛ p^{h}an saŋ

write PVP blackboard LOC

'write on the blackboard'

5.2.6 头[tʰəu]

头 is a locative marker in Chengdu. The enclitic 头 itself means head in both Mandarin and Chengdu dialects. However, native speakers of the Chengdu dialect use 脑壳 to replace 头 when it means head. When it occurs after a noun, 头 indicates a location. Moreover, this location can be both specific and abstract. Its counterpart in Mandarin would be 里. See examples:

a. [[脑壳]w 头 C]CG

[[nau kʰo] tʰəu]

head LOC

'in the brain'

b. [[心]w 头 C]CG

[[ɕin] tʰəu]

heart LOC

'in (one's) heart'

c. [[嘴巴]w 头 C]CG

[[tsuei pa] tʰəu]

mouth LOC

'in (one's) mouth'

d. [[手]w 头 C]CG

[[səu] tʰəu]

hand LOC

‘in (one’s) hands’

e. 包 包 在[[车]W 头 C]CG 咯 C]CG

pau pau tsai [[tsʰei] tʰəu] nˡo]

bag at car LOC CRS

‘The bag is already in the car.’

5.2.7 Prosodic recursivity

In some cases, a recursive clitic group with enclitics is allowed. See examples:

a. 书 是[[我]w 嘞 C]CG 咯 C]CG

su si [[ŋo] nˡei] nˡo]

book be I NOM CRS

‘The book becomes mine.’

b. 包 包 在[[车]W 头 C]CG 咯 C]CG

pau pau tsai [[tsʰei] tʰəu] nˡo]

bag at car LOC CRS

‘The bag is already in the car.’

5.2.8 Summary

The above sections described the basic enclitics in the Chengdu dialect that linguistically display some morpho-syntactic properties of clitics. Enclitics in this dialect:

(a) are functional elements;

(b) are not the only element of an utterance and must attach to the adjacent prosodic unit on the left;

(c) consist of the meaning of the string. The host plus the enclitic is under prediction from the meaning of the host and that of the enclitic;

(d) is able to join materials that already contain the affix, as in, or the enclitic.

It is sensible to consider these components in Chengdu as clitics. Since all clitics append to one side of the host in the examples above, they are all considered enclitics. If referring back to the definition of the clitic group (CG) domain, it can be seen that the group of the host plus the enclitic can form the clitic group (Type A) in Chengdu. The following section goes through some phonological phenomena that only occur within the group of "host+enclitic,." the Type A clitic group, in the Chengdu dialect, giving additional proof to the presence of enclitics and the clitic group in this dialect.

5.3 Rule Application within Type A clitic group

In this section, the phonological behavior of the "host+enclitics" (or Type A clitic group) in the Chengdu dialect is discussed, with further investigation of the application of major Chengdu phonological rules. The results present different phonological behaviors among domains of Type A clitics, prosodic words, and phonological phrases.

5.3.1 Application of TS in phonological words and Type A clitic groups

It was discussed earlier that the phonological tone sandhi rule (TS) could apply within the domain formed by morpho-syntactic words/prosodic words. It was specially addressed in rules of disyllabic words, as restated below:

Table 55 Tone Sandhi Rules in Chengdu

Initial Position	Final Position	Tone Value Change
T1 (45)	T1/T3	45
	T2/T4	45→35
T2 (31)	T1/T2/T3/T4	31→43
T3 (51)	T1	51→54
	T2/T3/T4	51→55
T4 (213)	T1/T2/T3/T4	213→32

(1) Application of TS within the prosodic word domain

a. 工程 koŋ^{45} ts^{h} en^{31} → koŋ$^{\mathbf{35}}$ ts^{h} en^{31} ‘project’

b. 保安 pao^{51}an^{45} → pao$^{\mathbf{54}}$an^{45} ‘security’

c. 汽车 tɕ^{h} i^{213} ts^{h} ei^{45} → tɕ^{h} i$^{\mathbf{32}}$ ts^{h} ei^{45} ‘vehicle’

(2) Application of TS at the phrasal level

a. 修路 ɕiəu^{45}n^{l}u^{31} → ɕiəu$^{\mathbf{35}}$n^{l}u^{31} ‘construct a road’

b. 写书 ɕiɛ^{51}su^{45} → ɕiɛ$^{\mathbf{54}}$su^{45} ‘write books’

c. 配音 p^{h}ei^{213}in^{45} → p^{h}ei$^{\mathbf{32}}$in^{45} ‘voice acting’

However, it is found that some elements in the Chengdu dialect do not trigger TS rules. The blocking position is marked with “#,” see examples:

a.	配	音		b.	配	嘞	音
	p^{h}ei^{213}	in^{45}			p^{h}ei^{213}	n^{l}ei^{45}	in^{45}
→	p^{h}ei$^{\mathbf{32}}$	in^{45}		→	p^{h}ei^{213}	#n^{l}ei^{45}	in^{45}
	act	voice			act	MOD	voice
	‘act	voice’			‘acting		voice’

It can be seen that a and b have different phonological behaviors in triggering the TS rule. Therefore, TS that can be applied in (a) got blocked in (b) despite the similar morpho-syntactic structure, to be specific, the verb-object structure.

There are controversial arguments about the tone of the element in-between. For example, in the Fuzhou dialect, scholars suggest that the blocking of TS in some cases can be ascribed to

the neutral tone carried by elements in-between (cf. Chan 1985, Li 2002, among others). According to these scholars, TS has no suitable phonological environment if the non-first tone is a neutral tone. However, You (2018) argued that it had been noticed that even elements bearing a non-neutral tone might consistently cause the blocking of TS. The case in the Chengdu dialect is clearer since this dialect does not have a neutral tone. Namely, every enclitic has its tone. Therefore, excluding the confusion that might exist in other dialects, it can be assumed that the Type A clitic group composed of the host plus the enclitic in the Chengdu dialect cannot form the domain of application for TS. In other words, TS is blocked between the host and the enclitic that attaches to it. There are more examples of TS blocking in:

(1) host+possessive 嘞

a. [[你们妹儿]w 嘞 C]CG 炒饭。

[[ny^{51}mən^{45}mɛə^{213}] n^{l}ei^{45}] ts^{h} au^{51} fɛn^{213}

→[[ny^{51}mən^{45}mɛə^{213}]# n^{l}ei^{45}] ts^{h} au^{51} fɛn^{213}

Your younger sister POSS fried rice

'your younger sister's stirred-rice'

(2) Modificational marker 嘞

b. [[新]w 嘞 C]CG 书。

[[ɕin^{45}] n^{l}ei^{45}] su^{45}

→[[ɕin^{45}]# n^{l}ei^{45}] su^{45}

new MOD book

'new book'

(3) Normalization marker 嘞

c. [[说]w 嘞 C]CG 比 [[唱]w 嘞 C]CG 好听

[[so^{31}] n^{l}ei^{45}] pi^{51} [[ts^{h213}] n^{l}ei^{45}] xau^{51}t^{h}in^{45}

→[[so^{31}]# n^{l}ei^{45}] pi^{51} [[ts^{h213}]# n^{l}ei^{45}] xau^{51}t^{h}in^{45}

speak NOM compare sing NOM good listen

'what is spoken sounds better than what is sung'

(4) host + adjective reduplication marker 嘞

d. [[哈戳戳]w 嘞 C]CG

[[xa^{51}ts^{h}o^{31} ts^{h}o^{31}] n^{l}ei^{45}]

→[[xa^{51}ts^{h}o^{31} ts^{h}o^{31}]# n^{l}ei^{45}]

*[[xa^{51}ts^{h}o^{31} ts^{h}o$^{\mathbf{55}}$] n^{l}ei^{45}]

stupid AdjR

'quite stupid'

e. [[瓜兮兮]w 嘞 C]CG

[[kua^{45}ɕi^{45}ɕi^{45}] n^{l}ei^{45}]

→[[kua^{45}ɕi^{45}ɕi^{45}]# n^{l}ei^{45}]

?[[kua^{45}ɕi^{45}ɕi$^{\mathbf{45}}$] n^{l}ei^{45}]

fool AdjR

'quite foolish'

f. [[水垮垮]w 嘞 C]CG

[[suei^{51}k^{h}ua^{51}k^{h}ua^{51}] n^{l}ei$^{45]}$

→[[suei^{51}k^{h}ua^{51}k^{h}ua^{51}]# n^{l}ei$^{45]}$

*[[suei^{51}k^{h}ua^{51}k^{h}ua$^{\mathbf{21}}$] n^{l}ei$^{45]}$

watery AdjR

'quite unreliable'

(5) Host + aspect marker

I. Host + duration marker

g. 饭 [[炒]W 倒 C]CG 嘞

fɛn^{213}[[ts^{h}au^{51}] tau^{51}] n^{l}ei^{45}

→fɛn^{213}[[ts^{h}au^{51}]# tau^{51}] n^{l}ei^{45}

rice sitr DUR final-particle

'The rice is being stirred'

h. [[站]W 倒 C]CG 嘞

[[tsan^{213}] tau^{51}] n^{l}ei^{45}

→[[tsan^{213}]# tau^{51}] n^{l}ei^{45}

Stand DUR final-particle

'(someone) is standing'

i. 我 [[站]w 倒 C]CG 说

ŋo^{51}[[tsan^{213}] tau^{51}] so^{31}

→ŋo^{51}[[tsan^{213}]# tau^{51}] so^{31}

I stand DUR speak

'I am standing while speaking'

II. Host+ Perfective aspect marker 咯

j. 他 [[吃]w 咯 C]CG 饭 就 [[写]w 咯 C]CG

t^{h}a^{45}[[ts^{h}i^{31}] n^{l}o^{31}] fan^{213} tɕiəu^{213} [[ɕiɛ^{51}]# n^{l}o^{31}]

→t^{h}a^{45}[[ts^{h}i^{31}]# n^{l}o^{31}] fan^{213} tɕiəu^{213} [[ɕiɛ^{51}]# n^{l}o^{31}]

He eat PERF meal then write PERF

'He went to write after eating a meal.'

k.[[吃]W 咯 W]CG 五 个 钟头

[[tsʰi^{31}] nˡo^{31}] v^{51} ko^{213} tsoŋ^{45}tʰəu^{31}

→[[tsʰi^{31}]# nˡo^{31}] v^{51} ko^{213} tsoŋ^{45}tʰəu^{31}

eat PERF five MEASURE hours

'be eating for five hours'

(6) Host + Sentence final particle 咯 2

l. 车 [[来]w 咯 C]CG

tsʰei^{45}[[nˡai^{31}] nˡo^{31}]

→tsʰei^{45}[[nˡai^{31}]# nˡo^{31}]

*tsʰei^{45}[[nˡai$^{\mathbf{43}}$] nˡo^{31}]

car come CRS

'The car is here.'

m. 他 [[病]W 咯 C]CG

tʰa^{45} [[pin^{213}] nˡo^{31}]

→ tʰa^{45} [[pin^{213}]# nˡo^{31}]

*tʰa^{45} [[pin$^{\mathbf{32}}$] nˡo^{31}]

he sick CRS

'He is sick.'

(7) locative marker 头

n. [[屋]w 头 C]CG

[[vu^{31}] tʰəu^{31}]

→[[vu^{31}]# tʰəu^{31}]

house LOC

'in the house'

o. [[车]w 头 C]CG

[[tsʰei^{45}] tʰəu^{31}]

→[[tsʰei^{45}]# tʰəu^{31}]

car LOC

'in the car'

(8) Recursive clitic group with enclitics

a. 书 是 [[我]w 嘞 C]CG 咯 C]CG

su^{45} si^{45}[[[ŋo^{51}] nˡei^{45}] nˡo^{31}]

→su^{45} si^{45}[[[ŋo^{51}]# nˡei^{45}]# nˡo^{31}]

* su^{45}si^{45}[[[ŋo$^{\mathbf{54}}$]# nˡei$^{\mathbf{35}}$]# nˡo^{31}]

book be I NOM CRS

'The book becomes mine.'

b. 包包 在 [[车]W 头 C]CG 咯 C]CG

pau^{45}pau^{45}tsai^{213} [[tsʰei^{45}] tʰəu^{31}] nˡo^{31}]

→pau^{45}pau^{45}tsai^{213} [[tsʰei^{45}]# tʰəu^{31}]# nˡo^{31}]

*pau^{45}pau^{45}tsai^{213} [[tsʰei$^{\mathbf{35}}$]# tʰəu$^{\mathbf{43}}$]# nˡo^{31}]

bag at car LOC CRS

'The bag is already in the car.'

As indicated by the examples above, it is demonstrated that the TS rule is hindered in the domain formulated by the Type A clitic group (host + enclitic) in the Chengdu dialect. In this manner, it tends to be reasoned that the TS hindering is mandatory in CG enclitic in the Chengdu dialect.

5.3.2 Summary

Based on the discussion above, it tends to be seen that the application of group "host + enclitic" in the Chengdu dialect (Type A clitic group) is different from the prosodic word in terms of different applications of phonological phenomena. TS works within the domain of phonological words while consistently getting blocked in the domain of clitic groups. Therefore, evidence of phonological phenomena characteristic only of the clitic group is provided, proving that a clitic group is an independent unit of the prosodic hierarchy.

5.4 Discussion and conclusions

This chapter began with a definition of clitics and the clitic group with evidence to prove that they share common features across languages. Moreover, these features can distinguish clitics from affixes and independent words, often mistakenly confused in previous studies. Specifically, the structure of "host + enclitic" in Chengdu dialect show as much as some common morpho-syntactic and phonological properties in other languages as below. In other words, enclitics and Type A clitic group in the Chengdu dialect:

(a) are functional elements;

(b) are not the only element of an utterance and must attach to the adjacent prosodic unit on the left;

(c) are a part of the meaning of the string. The host plus the enclitic is under prediction from the meaning of the host and that of the enclitic;

(d) can attach to an element already containing the affix, or the enclitic.

Examples by far demonstrated the phonological phenomena between the host and the enclitics. However, if the host is a prosodic word, then the Type A clitic group domain would not be responsible for any phonological behavior within the prosodic word host. For instance, TS is blocked between the host and enclitic in Chengdu while still working within the prosodic word, namely, the host itself. See examples:

a. [[脑壳]w 头 C]CG

[[nau^{51}k^{h}o^{31}] t^{h}əu^{31}]

→ [[nau$^{\mathbf{55}}$=k^{h}o^{31}]# t^{h}əu^{31}]

head LOC

'in the brain'

b. [[盆盆]w 头 C]CG

[[p^{h}en^{31}p^{h}en^{31}] t^{h}əu^{31}]

→ [[p^{h}en^{31}=p^{h}en$^{\mathbf{55}}$]# t^{h}əu^{31}]

container LOC

'in the container'

"#" indicates blocking, and "=" indicates application.

The application of TS in (a) triggers the change of the first syllable from [nau^{51} → nau$^{\mathbf{55}}$] and the second syllable in (b) from [p^{h}en^{31} →p^{h}en$^{\mathbf{55}}$], while the blocking of TS also occurs in both Type A clitic groups. However, instead of a disyllabic, if the host is monosyllabic, then the whole structure is free from the application or blocking of TS. Therefore, it can be summarized that in the domain of a Type A clitic group, any phonological rules that refer to the Type A clitic group

would not be triggered if the constituent is or from a prosodic word. In contrast, these rules would only be triggered when they refer to the prosodic word domain.

5.5 Proclitics and Type B Clitic Group

Due to the different positions of the host, there are also proclitic-like elements in the Chengdu dialect. This section first investigates the morpho-syntactic functions of proclitics with the typical structure "proclitic + host," namely the Type B clitic group, to show that proclitics in Chengdu resemble properties of both clitics in other languages and enclitics in Chengdu. The phonological performance of the "proclitic + the host" component is then further examined in this dialect. In fact, like the Type A clitic group, the Type B clitic group in the Chengdu dialect has different phonological performance compared to the prosodic word and the phonological phrase, further evidence for the existence of the clitic group as a whole in this dialect.

5.5.1 Some proclitics in Chengdu

As in earlier discussions, the group of "proclitic+host" in the following section is also labeled as "CG," the prosodic word host "ω," the phonological phrase host "φ," and the proclitics with a lowercase "C."

5.5.1.1 得[tɛ^{31}] and 是[si^{213}]

In the Chengdu dialect, 得 is an auxiliary verb, meaning possibility, willingness, and permission. The equivalent of 得 in Mandarin are auxiliary verbs like 能, 能够, 会, etc. 得 in Chengdu can be placed either before or after the main verb and is analyzed as a proclitic since it belongs to the functional category and does not have a semantic meaning. "得 + host" has a similar phonological performance with other "proclitic + host" components in the Chengdu dialect. See examples:

a. [得 C [行]ω]CG

[tɛ [ɕin]]

be work

'Yes, it will work.'

b. 太 阳 大, 衣服 才[得 C[干] ω]CG

t^hai iaŋ ta i fu tsai[tɛ [kan]]

sun big clothes be dry

'Strong sunshine can dry the clothes.'

c. 不[得 C[下雨]φ]

pu [tɛ [ɕia]y]

not be rain

'It won't rain.'

是 is another commonly-used auxiliary verb in Chengdu. This proclitic is not quite the same as the one that can be used alone when addressing questions. It is also a proclitic since it belongs to the functional category and does not have a semantic meaning. See examples:

a. 我[是 C[要 切]φ]

ŋo [si [iau tɕ^{h}iɛ]

I be want go

'I am going.'

b. 他[是 C[好 看]ω]

t^ha[si [xau k^han]]

He be good look

'He is good-looking.'

5.5.1.2 等[ten^{51}] and 走[ts^{h}əu^{51}]

等[ten^{51}] functions as a clitic since it cannot be used alone (and meanings are entirely different) and it has to attach to the host on the right. 等 by itself means to wait, which is the same in Mandarin. However, in the Chengdu dialect, 等 can also be a preposition, meaning "permission" or "let something be it." The closest equivalent in Mandarin would be *rang* 让. The basic structure of 等 in Chengdu would be "等+N+VP," see examples:

a. [等 C[她]ω]CG 弄

[ten [t^{h}a]] n^{l}oŋ

let she make

'Let her do it herself.'

b. [等 C[雨]ω]CG 淋

[ten [y]] n^{l}in

let rain pour

'Let the rain pour.'

走[ts^{h}əu^{51}] in Chengdu is mostly used in speaking, introducing routes or places. However, 走 by itself can be a verb in this dialect and Mandarin Chinese, meaning "to walk." As a preposition, it cannot be used alone and thus has a "less concrete" meaning of "from" but with less frequency than its equivalent in Mandarin *cong* 从. See examples:

a. [走 C[街 上]ω]CG 回来

[ts^{h}əu[kai saŋ]] xuei n^{l}ai

from street back

'Come back from the street.'

b. [走 C[上 海]ω]CG 切

[tsʰəu[saŋ xai]] tɕʰiɛ

from LOC go

'Go from Shanghai.'

5.5.1.3 Recursive forms

Violations of Nonrecursivity are found in some examples:

a. 他[是 C[得 C[行][]CG]CG

tʰa[si [tɛ [ɕin]]]

he be work

'He is excellent.'

b. 他[是 C[走 C[上 海]ω]CG 切

tʰa[si [tsʰəu[saŋ xai]] tɕʰiɛ

he be from LOC go

'He is going from Shanghai.'

From the examples above, it can be seen that proclitics in Chengdu resemble properties of both clitics in other languages and enclitics in Chengdu, specifically in that they are functional elements that attach to the adjacent host on the right. The meaning of "prosodic +host" can be predicted by combining the meanings of the host (concrete) and the proclitic (less concrete). Moreover, these elements can attach to components that contain affixes or the proclitic. Therefore, it can be summarized that the "proclitic +host" structure also forms the clitic group (Type B clitic group) in the Chengdu dialect.

The following section will investigate the phonological performance of the Type B clitic group to collect more evidence to prove the existence of this particular prosodic unit and illustrate the domain of some phonological phenomena.

5.5.2 Application of TS in phonological words and Type B clitic groups

As summarized earlier in previous chapters, the application of TS is valid in most morpho-syntactic words besides "diminutive words," while MTS rules can be applied in "diminutive words" but not other major morpho-syntactic words in Chengdu. Examples are shown as below:

a. [瓶瓶]ω　　[pʰin^{31}pʰin^{31}] → * pʰin$^{\mathbf{43}}$pʰin^{31} (*TS) 'bag'

　[瓶瓶]ω　　[pʰin^{31}pʰin^{31}] → pʰin^{31}pʰin$^{\mathbf{55}}$ (MTS) 'bag'

b. [棍棍]ω　　[kuən^{213}kuən^{213}] → *[kuən$^{\mathbf{32}}$kuən^{55}] (*TS) 'stick'

　[棍棍]ω　　[kuən^{213}kuən^{213}] → *[kuən^{213}kuən$^{\mathbf{55}}$] (MTS) 'stick'

The TS application is blocked between the host and the enclitics in the Type A clitic group. Below is a quick review:

a. [[新]ω　嘞 C]CG　书。

　[[ɕin^{45}]　nˡei^{45}]　su^{45}

→　[[ɕin^{45}]#　nˡei^{45}]　su^{45}

　new　MOD　book

　'new book'

b. [[你们妹儿]ω　嘞 C]CG 炒饭。

　[[ny^{51}mən^{45}mɛɚ^{213}]　nˡei^{45}]　tsʰau^{51} fan^{213}

→　[[ny^{51}mən^{45}mɛɚ^{213}]#　nˡei^{45}]　tsʰ au^{51} fan^{213}

　Your younger sister　POSS　fried rice

‘Your younger sister’s fried rice.’

While at the phrasal level, TS takes the phonological phrase as its application domain. See examples:

a. [写 书]φ

[ɕiɛ^{51} su^{45}]

→ [ɕiɛ$^{\mathbf{54}}$=su^{45}]

write book

‘write a book’

b. [吃 饭]φ

[ts^{h}i^{31} fan^{213}]

→ [ts^{h}i$^{\mathbf{43}}$=fan^{213}]

eat rice

‘Have a meal.’

In comparison to the obligated block in enclitics (Type A clitic group), TS consistently works within proclitics (Type B clitic group):

(1) 得[tɛ^{31}] and 是[si^{213}]

a. [得 C [行]ω]CG

[tɛ^{31} [ɕin^{31}]]

→ [tɛ$^{\mathbf{43}}$ [ɕin^{31}]]

be work

‘Yes, it’ll work.’

b. 太 阳 大, 衣服 才 [得 C[干] ω]CG

$t^{h}ai^{213}ia\eta^{31}ta^{213}$ $i^{45}fu^{31}tsai^{31}[t\varepsilon^{31}[kan^{45}]]$

→ $t^{h}ai^{213}ia\eta^{31}ta^{213}$ $i^{45}fu^{31}tsai^{31}[t\varepsilon^{\mathbf{43}}[kan^{45}]]$

sun big clothes be dry

'Strong sunshine is able to dry the clothes.'

c. 不 [得 C[下 雨]φ]

$pu^{31}[t\varepsilon^{31}[\text{ɕ}ia^{213}y^{51}]]$

→ $pu^{31}[t\varepsilon^{\mathbf{43}}[\text{ɕ}ia^{213}y^{51}]]$

not be rain

'It won't rain.'

d. 我 [是 C[要 切]φ]

$\eta o^{51}[si^{213}[iau^{213}t\text{ɕ}^{h}i\varepsilon^{213}]$

→ $\eta o^{51}[si^{\mathbf{32}}[iau^{213}t\text{ɕ}^{h}i\varepsilon^{213}]$

I be want go

'I am going.'

e. 他 [是 C[好 看]ω]

$t^{h}a^{45}[si^{213}[xau^{51}k^{h}an^{213}]]$

→ $t^{h}a^{45}[si^{\mathbf{32}}[xau^{51}k^{h}an^{213}]]$

He be good look

'He is good-looking.'

(2) 等[ten^{51}] and 走[$ts^{h}\text{ə}u^{51}$]

a. [等 C[她]ω]CG 弄

[ten^{51}[t^{h}a^{45}]] n^{l}oŋ^{45}

→ [ten$^{\mathbf{54}}$[t^{h}a^{45}]] n^{l}oŋ^{45}

let she make

'Let her do it herself.'

b. [等 C[雨]ω]CG 淋

[ten^{51}[y^{51}]] n^{l}in^{31}

→ [ten$^{\mathbf{55}}$[y^{51}]] n^{l}in^{31}

let rain pour

'Let the rain pour.'

c. [走 C[街 上]ω]CG 回 来

[ts^{h}əu^{51}[kai^{45}saŋ^{213}]] xuei^{31} nlai^{31}

→ [ts^{h}əu$^{\mathbf{54}}$[kai^{45}saŋ^{213}]] xuei^{31} nlai^{31}

from street back

'Come back from the street.'

d. [走 C [上 海]ω]CG 切

[ts^{h}əu^{51}[saŋ^{213}xai^{51}]] tɕ^{h}iɛ^{213}

→ [ts^{h}əu$^{\mathbf{55}}$[saŋ^{213}xai^{51}]] tɕ^{h}iɛ^{213}

from LOC go

'Go from Shanghai.'

Based on the examples above, it can be seen that TS is applicable in the domain that consists of "proclitic + host" (Type B clitic group) in Chengdu, which differentiates the Type B clitic group

from the prosodic words and the Type A clitic group by showing distinguishing phonological properties. Therefore, the sandhi tones of proclitics are decided by the tones of the hosts in the clitic group, clearly indicating the phonological dependence of proclitics in this dialect.

5.5.3 Summary of Type B clitic group

Unlike with Type A clitic group, TS can be applied within the domain of Type B clitic groups, including auxiliary verbs, prepositions and recursive clitic group with proclitics. TS can also be applied within the domain of the prosodic word except for "diminutive nouns" (where MTS applies), while it applies in the domain of Type B clitic group without any exception. In other words, the phonological behavior of the Type B clitic group is not only different from the Type A clitic group but also from prosodic words. Moreover, referring back to examples (c) and (d) above, the Type B clitic group shows a different phonological performance from the phonological phrase, which indicates that the Type B clitic group is different from the φ-structuring domain and thus forms an independent phonological domain.

Though the application of TS shows different phonological performance in the Type A and B clitic groups, respectively, these two can still be distinguished from the prosodic word domain and the phonological phrase domain as a whole. Compared to prosodic words and phonological phrases, some phonological phenomena are only characteristic of the clitic group in the Chengdu dialect, which provides strong evidence to establish the clitic group as an indispensable prosodic constituent in Chengdu and maintain its place in the prosodic hierarchy of this particular dialect.

5.6 Violation of SLH in Chengdu

As discussed in Chapter 2, since the Strict Layer Hypothesis was established, there has been evidence across languages to challenge the theory, including examples of the violation of Exhaustivity, Nonrecursivity, and Layeredness (Ladd 1986, Odden 1987, Hyman 1987, Inkelas

1989, Kanerva 1989, Itô & Mester 1992/2003, Zhang 1992, 2014, 2017, Prince & Smolensky 1993, Mester 1994, Hayes 1995, Truckenbrodt 1995, 1999, Vogel 2009, You 2018, among others). To deal with the violation of the Strict Layer Hypothesis in Chinese, Zhang (1992, 2017) proposes a supplementary principle to the Strict Layer Hypothesis, as replicated below:

Stipulation of prosodic recursivity

Prosodic recursivity is prohibited between the units of different hierarchies (language-universal), but optionally in the units of the same hierarchy (language-specific).

The supplementary principle has been illustrated to explain the violation of Exhaustivity, Nonrecursivity, and Layeredness found in some Chinese dialects (like Chongming and Pingyao). This principle is additionally very much upheld by the proof from the Chengdu dialect. From one perspective, we have seen numerous instances of the violation of Exhaustivity in previous chapters: a phonological phrase in Chengdu can rule a prosodic word straightforwardly. Then again, other examples of Nonrecursivity and Layeredness are also permitted in Chengdu, including examples of clitic groups that present the violation of the two constraints. See some examples of Nonrecursivity are below:

a. 书 是 [[我]w 嘞 C]CG 咯 C]CG

su^{45} si^{45}[[[ŋo^{51}] n^{l}ei^{45}] n^{l}o^{31}]

→su^{45} si^{45}[[[ŋo^{51}]# n^{l}ei^{45}]# n^{l}o^{31}]

book be I NOM CRS

'The book becomes mine.'

b. 包包 在 [[车]W 头 C]CG 咯 C]CG

pau^{45}pau^{45}tsai^{213} [[ts^{h}ei^{45}] t^{h}əu^{31}] n^{l}o^{31}]

→pau^{45}pau^{45}tsai^{213} [[ts^{h}ei^{45}]# t^{h}əu^{31}]# n^{l}o^{31}]

bag at car LOC CRS

'The bag is already in the car.'

c. 他 [是 C[得 C [行]ω]CG]CG

$t^ha^{45}[si^{213}$ $[t\varepsilon^{31}$ $[\mathfrak{e}in^{31}]]]$

→ $t^ha^{45}[si^{213}\#[t\varepsilon^{31}$ $\#[\mathfrak{e}in^{31}]]]$

he be work

'He is excellent.'

d. 他 [是 C [走 C [上 海]ω]CG 切

$t^ha^{45}[si^{213}$ $[ts^h\mathfrak{e}u^{51}$ $[sa\eta^{213}xai^{51}]]$ $t\mathfrak{e}^hi\varepsilon^{213}$

→ $t^ha^{45}[si^{213}$ $\#[ts^h\mathfrak{e}u^{51}\#[sa\eta^{213}xai^{\mathbf{32}}]]$ $t\mathfrak{e}^hi\varepsilon^{213}$

he be from LOC go

'He is going from Shanghai.'

A clitic group in Chengdu can rule another clitic group from the same kind based on the examples above. For instance, in (a), in the Type A clitic group, the enclitic 嘞 $[n^lei^{45}]$ joins to the prosodic word 我 'I' as the host, while in the outer Type A clitic group, the enclitic 咯 $[n^lo^{31}]$ appends to the inside Type A clitic group [我嘞]CG as the host. Also, in (d), the proclitic 走 $[ts^h\mathfrak{e}u^{51}]$ connects to the prosodic word 上海 'Shanghai' as the host inside the interior Type B clitic group, while the proclitic 是 $[si^{213}]$ joins to the inward Type B clitic group [走上海]CG, which is the host in the outside Type B clitic group. Additionally, there are examples of the domination from Type B clitic group to Type A clitic group in the Chengdu dialect:

a. 书 [是 C[[我]ω 嘞 C]CG]CG

su^{45} si^{32} $[[\eta o^{51}]$ $n^lei^{45}]]$

→ su^{45} si^{213} $[[\eta o^{51}]$ $n^lei^{45}]]$

book be I POSS

'The book is mine.'

b. 不 [得 C[[下 雨]φ 咯 C]CG]CG

pu^{31}[tɛ^{31} [[ɕia^{213}y^{51}] n^{l}o^{31}]]

→ pu^{31}[tɛ^{43} [[ɕia^{213}y^{51}] n^{l}o^{31}]]

not be rain PERF

'It won't rain any more.'

The enclitic 嘞 [n^{l}ei^{45}] appends to the prosodic word 我 'I' as the host and afterward the gathering of 我 + 嘞 structures a Type A clitic group. Then, at that point, the proclitic 是 [si^{213}] appends to the Type A clitic bunch [我嘞]CG as the host and the gathering of 是+[我嘞]CG structures a Type B clitic group. The arrangement of the prosodic domain in (b) works in the same way with example (a). In some cases, Layeredness is also found in the Type B clitic group:

a. 不[得 C [下 雨]φ]CG

pu^{31} [tɛ^{31}[ɕia^{213}y^{51}]]

→ pu^{31} [tɛ^{43}[ɕia$^{\mathbf{32}}$ y^{51}]]

not be rain

'It won't rain.'

b. 我 [是 C[要 切]φ]CG

ŋo^{51} [si^{213} [iau^{213} tɕ^{h}iɛ^{213}]

→ ŋo^{51} [si^{32} [iau^{32} tɕ^{h}iɛ^{213}]

I be want go

'I am going.'

It can be seen that a Type B clitic group in Chengdu can govern a phonological phrase, which is situated at the following more elevated level in the prosodic hierarchy. This is upheld by the application of TS in the Type B clitic group: the proclitic in a Type B clitic group joins to the whole phonological phrase as the host, and the gathering of "proclitic + phonological phrase host" structures the domain for TS application, which can be illustrated in both example (a) and (b). In short, the violation of Nonrecursivity and Layeredness in the instances of the clitic group in Chengdu occurs among the prosodic word, the clitic group, and the phonological expression, all situated in the hierarchy. Consequently, Zhang's (1992, 2017) supplementary principle can explain the violation of these two constraints displayed by the clitic group in Chengdu, which further proves the possibility that a debilitated SLH is needed in the hypothesis of prosodic phonology. However, as introduced in the first two chapters, the Type B clitic group is not necessarily isomorphic to any morpho-syntactic structures even if the violation of Nonrecursivity and Layeredness are allowed. None maps to any syntactic constituent for all the examples of the clitic group discussed in this chapter since the head is prohibited from each clitic group.

5.7 Restriction on Rule Application

As discussed previously, TS compulsorily applies inside the domain of the gathering of "proclitic + host," in particular the Type B clitic group. To be explicit, TS applies between the proclitic and the host, and the host in a Type B clitic group can be a prosodic word, a clitic group, or a phonological phrase. As per the Restriction on Rule Application in the prosodic phonology of the Chengdu dialect figured, one can expect that the TS application between the proclitic and the host ought not to influence the inward prosodic word, clitic group, or phonological phrase. If provided, the application or blocking of a similar kind of rule can be set off inside the embedded

prosodic domain. This presumption can be all around upheld by important linguistic information in Chengdu as in examples below:

(1) Proclitic + prosodic word

a. 他 [是 C[好 看]ω]CG

$t^ha^{45}[si^{213}$ $[xau^{51}$ $k^han^{213}]]$

→ $t^ha^{45}[si^{213}$ $[xau^{\mathbf{55}}k^han^{213}]]$

He be good look

'He is good-looking.'

a. [走 C [上 海]ω]CG 切

$[ts^h əu^{51}[saŋ^{213}xai^{51}]]$ $tɕ^hiɛ^{213}$

→ $[ts^h əu^{\mathbf{55}}[saŋ^{\mathbf{32}}xai^{51}]]$ $tɕ^hiɛ^{213}$

from LOC go

'Go from Shanghai.'

(2) Proclitic + clitic group

a. 书 [是 C [新 嘞]CG]CG

su^{45} $[si^{213}$ $[$ $ɕin^{45}$ $n^lei^{45}]]$

→ su^{45} $[si^{\mathbf{32}}$ $[$ $ɕin^{\mathbf{45}}$ $n^lei^{45}]]$

book be new NOM

'The book is mine.'

b. 他 [是 C[得 行]CG]CG

$t^ha^{45}[si^{213}$ $[tɛ^{31}$ $ɕin^{31}]]$

→ $t^ha^{45}[si^{213}$ $[tɛ^{\mathbf{43}}$ $ɕin^{31}]]$

he be work

'He is excellent.'

(3) Proclitic + phonological phrase

a. 不[得 C [下 雨]φ]CG

pu^{31} [tɛ^{31}[ɕia^{213}y^{51}]]

→ pu^{31} [tɛ^{43}[ɕia$^{\mathbf{32}}$ y^{51}]]

not be rain

'It won't rain.'

b. 我 [是 C[要 切]φ]CG

ŋo^{51} [si^{213} [iau^{213} tɕ^{h}iɛ^{213}]

→ ŋo^{51} [si^{32} [iau$^{\mathbf{32}}$ tɕ^{h}iɛ^{213}]

I be want go

'I am going.'

Although TS applies to the proclitic within the external Type B clitic group, the application does not affect the internal Type A clitic group. TS is blocked between the prosodic word host and the enclitic within the Type A clitic group. Therefore, the Restriction on Rule Application can be verified by the data of the Type B clitic group in Chengdu.

5.8 Conclusions

The Type B clitic group is composed of the proclitic + host, and this section investigates the proclitic along with its phonological properties in Chengdu. Similar to enclitics, proclitics in this dialect also belong to functional categories, and they must attach to the adjacent constituent to the right. The meaning of the "proclitic + host" structure combines two components. First, based on

the examples above, Chengdu proclitics can join structures containing the affix or the proclitic. The following syllables determine the tones of the proclitics.

As for properties of the Type B clitic group, TS applies between the proclitic and the host, namely within the Type B clitic group domain. From one perspective, Chengdu proclitics share various morpho-syntactic and phonological properties with clitics in other languages and dialects, including Chengdu enclitics. Along these lines, they ought not to be treated as prefixes or prosodic words. On the other hand, the Type B clitic group in Chengdu shows a distinctive phonological performance when contrasted with the Type A clitic group in terms of the application of TS. Although the clitic groups in this dialect (Type A and Type B) can be differentiated from prosodic words or phonological phrases, data in this chapter also provides evidence and motivation for the existence of the clitic group in the hierarchy. Therefore, the clitic group ought to be kept as an indispensable prosodic constituent in the prosodic phonology of this dialect.

Furthermore, a clitic group in Chengdu can rule a prosodic word, yet another clitic group, or a phonological phrase. This demonstrates that the violation of Nonrecursivity and Layeredness are permitted, which illustrates a challenge to the Strict Layer Hypothesis. Rather than barring the clitic group from the prosodic progressive system, the solution to this challenge is to accept a debilitated Strict Layer Hypothesis and embrace Zhang's (1992, 2017) supplementary principle. With such reference, the domain formation of the clitic group in Chengdu accordingly can be officially introduced as:

Clitic group (CG) formation in the Chengdu dialect

The domain of the CG in the Chengdu dialect consists of one independent (i.e., nonclitic) prosodic constituent (ω, CG, or φ), plus any adjacent

a. directional clitic(s), or

b. plain clitic(s)/nondirectional clitic(s) such that there is no possible host with which they share more category memberships.

In this way, the issue brought about by the connection of clitics to constituents higher than the prosodic word in Chengdu can be fixed since the issue does not come from the clitic group itself, yet simply because of the constraints forced by the Strict Layer Hypothesis, as proposed by Vogel (2009). Therefore, it is very well settled by falling back on a debilitated Strict Layer Hypothesis involving Zhang's (1992, 2017) specification without any bothersome hypothetical outcomes.

Lastly, by analyzing the information pertinent to Type B clitic group, the Restriction on Rule Application in the prosodic phonology of Chengdu is defined and along these lines exhibited that this restriction forestalls the application of rules explicit to Type B clitic group (the obligatory application of TS) from influencing the embedded prosodic domain. Furthermore, since the same restriction conditions Type A and Type B clitic groups as other constituents discussed in earlier chapters, this restriction has been additionally demonstrated and thus conversely supports the idea that the clitic group should generally be kept as an indispensable prosodic constituent in Chengdu.

Chapter VI The Phonological Phrase in the Chengdu Dialect

6.1 Introduction

This chapter seeks to provide a deeper understanding of the phonological phrase in the Chengdu dialect, beginning with an extensiveexamination of past studies that have looked at the topic and summarization of the domain of phonological phrases in Chengdu. According to Wu (2017), a phonological phrase is described as a minor phrase and a constituent in the prosodic hierarchy. Moreover, it combines prosodic words and clitic groups into a single prosodic unit (Wu, 2017). Therefore, this chapter also investigates some of the phonological phenomena that occur within the domain of phonological phrases.

Various authors have addressed the definition of the phonological phrase, some in detail and others more superficially. According to Nespor and Vogel, the constituent in the phonological hierarchy above the clitic group is the phonological phrase, which enables the grouping of one or more clitic groups. A single utterance can be subdivided into various prosodic groupings. While some utterances are grouped into one prosodic grouping, others are divided into several prosodic groupings. As they noted, these groupings are heavily dependent on the syntactic structures of the utterance even though they are not isomorphic to syntactic groupings (Selkirk, 1986; Nespor & Vogel, 1986; Hayes, 1989; Truckenbrodt, 1999). This is an affirmation that language differs in the mapping between a syntactic structure and a prosodic structure.

Mainly, there are three major approaches to defining a phonological phrase. These approaches are end-based theory, relation-based theory, and alignment theory. The end-based theory utilizes three main principles of phonological phrase formation: the phrase domain for phonological phrase construction, the relative prominence, and the phonological trace.

The relation-based theory is mainly a set of phrase formation rules that may include phonological phrase prominence, phonological phrase construction, and the phrase domain (C=Clitic group, between the phonological phrase and the phonological word).

(1) ϕ domain

The domain of a phrase is made of several parts, theprimary ones being a C which contains a lexical head (X) and all Cs on its nonrecursive side up to the C that contains another head outside the maximal projection of X.

(2) ϕ construction

Join into an n-ary branching ϕ all Cs included in a string delimited by the definition of the domain of ϕ.

(3) ϕ relative prominence

In languages whose syntactic trees are right branching, the rightmost node of ϕ is labeled s; in languages whose syntactic trees are left branching, the leftmost node of ϕ is labeled s. All sister nodes are labeled *w*.

As the above shows, a sentence or phrase can be expressed as either right dominant or left dominant. If the structure of a phrase or even of a sentence is right dominant, then it is necessary to see how far on the left the phonological phrase needs to go. Such information is necessary when defining a phonological phrase.

There is also the idea of phonological phrase restructuring. In many instances, the phonological phrase or phrase that is regarded as a phonological phrase may lose its status. For instance, if two phonological phrases are adjacent to each other, they influence each other such that one of them loses the status of being a phonological phrase. Let the following serve as examples:

(C) ϕ (C) ϕ → (CC) ϕ

(C= a Clitic group)

When two related phonological phrases influence each other to incorporate one into the other, the process is known as "restructuring." For example, a nonbranching phonological phrase that is the first complement of X on its recursive side is joined into the phonological phrase that contains X.

Peschera granchi

(he)-will-fish crabs

[[ ]NP]VP

(C) ϕ(C) ϕ

(C C) ϕ

The above example from Italian shows that the phonological phrase construction contains the general syntactic concepts such as the head of a phrase and the direction of embedding. While this example is obtained from the Italian language, the observation would still be the same with other languages such as Chinese, Mandarin, and the Chengdu dialect (Hsiao, 1995). When two phonological phrases adjacent to each other interact, they are restructured such that the two combine into one, resulting in one of them losing its phonological phrase status.

In short, under the framework of prosodic phonology, two main approaches account for the phonological phrasing across languages: the Relation-Based Approach (RBA; cf. Nepsor & Vogel 1986, among others) and the Edge/End-Based Approach (EBA; cf. Selkirk 1986, among others). To differentiate, both of these approaches can account for several phonological phenomena at the phrasal level. However, as mentioned before, languages differ in defining a particular prosodic

constituent. Therefore, the definition of the phonological phrase in the Chengdu dialect should be established on the basis of the investigation of relevant Chengdu phonological phenomena.

In the case of this dissertation, it is important to test which of the two methodologies deals with the phonological phrase in Chengdu. This section will first audit the application/obstructing of phonological tone sandhi (TS) at the phrasal level, then revisit some previous arguments of this issue along with a detailed examination of the TS application at the phrasal level. Based on past investigations, an idea including both the EBA and the RBA is proposed to characterize the phonological phrase domain in Chengdu, which represents the process of TS application at the phrasal level. This indicates the phonological phrase formation, yet its inner prosodic structure also assumes a significant part in utilizing the TS rule at the phrasal level.

6.2 The Tone Sandhi Follows Language-Specific Phonological Principles at the Phrasal Level

As investigated in previous chapters, the phonological tone sandhi rule (TS) in Chengdu compulsorily applies in the domain of all the major morpho-syntactic prosodic words but reduplications that work with MTS. In addition, TS is systematically obstructed between the host and the enclitic in the Type A clitic group domain. See a brief review below:

(1) TS application in the domain of the prosodic word

a. 骆驼 $n^{l}o^{31}to^{31}$ → $n^{l}o^{\mathbf{43}}to^{31}$ ‘camel’

b. 玻璃 $po^{45}li^{31}$ → $po^{\mathbf{35}}li^{31}$ ‘glass’

c. 蜈蚣 $v^{31}koŋ^{45}$ → $v^{\mathbf{43}}koŋ^{45}$ ‘centipede’

d. 巴适 $pa^{45}si^{31}$ → $pa^{\mathbf{35}}$ si^{31} ‘good’

e. 尴尬 $kan^{45}ka^{213}$ → $kan^{\mathbf{35}}ka^{213}$ ‘embarrassing’

f 美国 $mei^{51}kuɛ^{31}$ → $mei^{\mathbf{55}}$ $kuɛ^{31}$ ‘the United States’

(2) TS blocking in the domain of Type A clitic group

a.	[[你们妹儿]w	嘞 C]CG	炒饭
	[[ny^{51}mən^{45}mɛə^{213}]	n^{l}ei^{45}]	ts^{h}au^{51}fɛn^{213}
→	[[ny^{51}mən^{45}mɛə^{213}]#	n^{l}ei^{45}]	ts^{h}au^{51}fɛn^{213}
	Your younger sister	POSS	fried rice
	‘your younger sister’s stirred-rice’		

b.	车	[[来]w	咯 C]CG
	ts^{h}ei^{45}	[[n^{l}ai^{31}]	n^{l}o^{31}]
→	ts^{h}ei^{45}	[[n^{l}ai^{31}]#	n^{l}o^{31}]
	car	come	CRS
	‘The car is here.’		

c.	[[车]w	头 C]CG
	[[ts^{h}ei^{45}]	t^{h}əu^{31}]
→	[[ts^{h}ei^{45}]#	t^{h}əu^{31}]
	car	LOC
	‘in the car’	

However, it has been observed that TS application is valid in some cases at the phrasal-level, while invalid in some cases at the same level. See examples below:

(3) TS application

a.	配	音	b.	配	嘞	音
	p^hei^{213}	in^{45}		p^hei^{213}	n^lei^{45}	in^{45}
→	$p^hei^{\mathbf{32}}$	in^{45}	→	p^hei^{213}	$\#n^lei^{45}$	in^{45}
				$*p^hei^{\mathbf{32}}$	$\#n^lei^{45}$	in^{45}
	act	voice		act	MOD	voice
	‘acting	voice’		‘acting		voice’

(4)

a.	好	朋 友	b.	买	炒 饭
	xau^{51}	$p^hoŋ^{31}iəu^{51}$		mai^{51}	ts^hau^{51} fan^{213}
→	$xau^{\mathbf{55}}$	$p^hoŋ^{31}iəu^{51}$	→	mai^{51}	$\#ts^hau^{51}fan^{213}$
				$*mai^{\mathbf{55}}$	$\#ts^hau^{51}fan^{213}$
	good	friend		buy	stir rice
	‘good	friends’		‘buy	fried rice’

The examples above show that the TS rule does not apply in all phrasal-level constructions. Though there are few scholars discussing the phenomena in Chengdu, similar observations were found in other languages and dialects. Chen and Norman first raised this asymmetrical TS application at the phrasal level in 1965, followed by a number related studies. The following section revisits and discusses these works that address the issue of asymmetry application in phrasal-level constructions.

6.3 Early primary studies on Chengdu Phonological Phenomena at the Phrasal Level

While there are presently some well-studied dialects in research of phonological phrases in Chinese, such as Xiamen, Shanghai, and Fuzhou, etc., there are few studies on the tone sandhi of Chengdu dialect at the phrasal level (Chang 1958, Lin 2005, Qin 2009, Wu 2010, Yan 2012 and

Qin 2015). Chang and Qin emphasized descriptive studies on TS, while Lin and Yan applied OT and OT-CC to analyze TS rules, and specifically directionality in Chengdu. Therefore, this section reviews both previous critical analyses on phonological phrases in other dialects and languages, as well as language-specific phonological phenomena.

6.3.1 Lin (2015)

Various scholars have attempted to explain the tri-syllabic continuous TS rules in Chengdu. Some argued that the tri-syllabic tone sandhi rules are all based on the two-syllabic tone sandhi. Lin argued that there is an intriguing correlation between the directions of rule application and normal vs. underapplications. Specifically, achieving identity is the motivation behind the right-to-left directionality in direction-sensitive tonal patterns. Moreover, Lin argues that morphosyntactic structures do not play any role in predicting tri-tonal sandhi in Chengdu but do function in quadri-tonal strings. According to Lin, this is because of the upper limit on the size of the tone sandhi domain. To not generate oversized domains, tonal strings are divided into smaller parts. The division of tonal strings into different tonal domains is not *ad hoc* but is based on morphosyntactic structure.

Theoretically, Lin's work thoroughly analyzed the phonological TS rules, tone value changes, and directionality in Chengdu, differentiating oneself from all previous studies about phonological phrases in this dialect. However, the fundamental starting point of this work is based on the theory that the Chengdu dialect is a left-dominate language. As analyzed by both experiments in Chapter 3, the Chengdu dialect is not a left prominent language. Lin's analysis accounts for many cases where the TS application is valid or invalid from a typological perspective and comparison. Without solid linguistic data, "size of string" is insufficient to explain why, at the phrase level, TS application works in some cases while it gets blocked in other certain cases.

Moreover, Lin observes that in the Chengdu dialect, a) the first tone remains while the second tone changes; b) there is no rising tone at the third syllable position; and c) verbs maintain their tones. While in other research that is also analyzed with OT, Yan (2016) listed all the ten different patterns of TS in Chengdu, covering 62.5% of total tone combinations in this dialect, and both positions undergo TS application.

6.3.2 Yan (2016)

Yan argued that the tri-syllabic tone sandhi rules are based on the two-syllabic tone sandhi. For the 64 kinds of three-character combinations (that is, 43), among the tone combinations involving tone sandhi, there are seven kinds of tone sandhi patterns whose results have changed due to different application directions of tone sandhi. Theoretically, the seven types of tone sandhi can be either left or right, but only a specific tone direction can produce the correct result. Some can only adopt leftward tone sandhi, and some can only adopt rightward tone sandhi. The direction of the tone sandhi is not related to the grammatical structure. The left branch structure and the right branch structure of the same tone combination adopt the same direction of tone sandhi. Examples are reorganized as below:

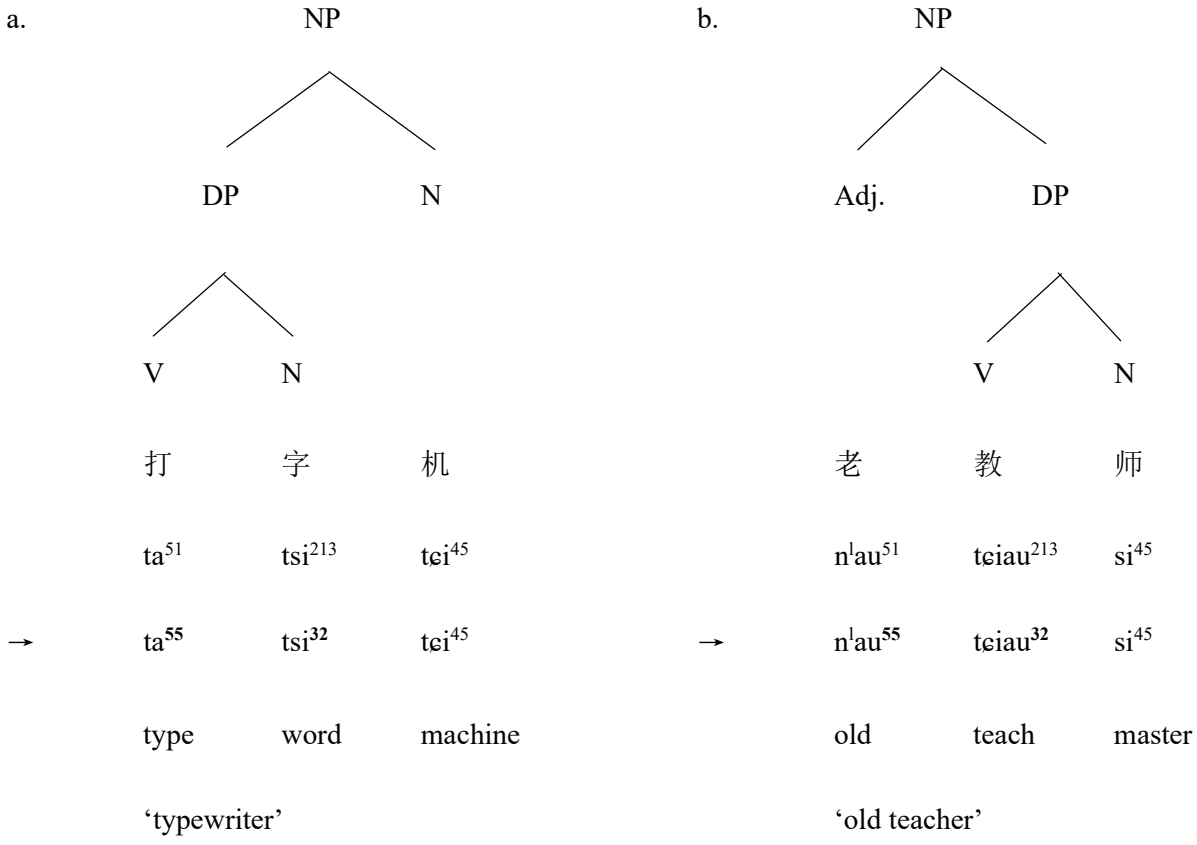


Figure 25

According to Yan, (a) and (b) apply TS rightward regardless of their branching, and TS applies leftward regardless of branching:

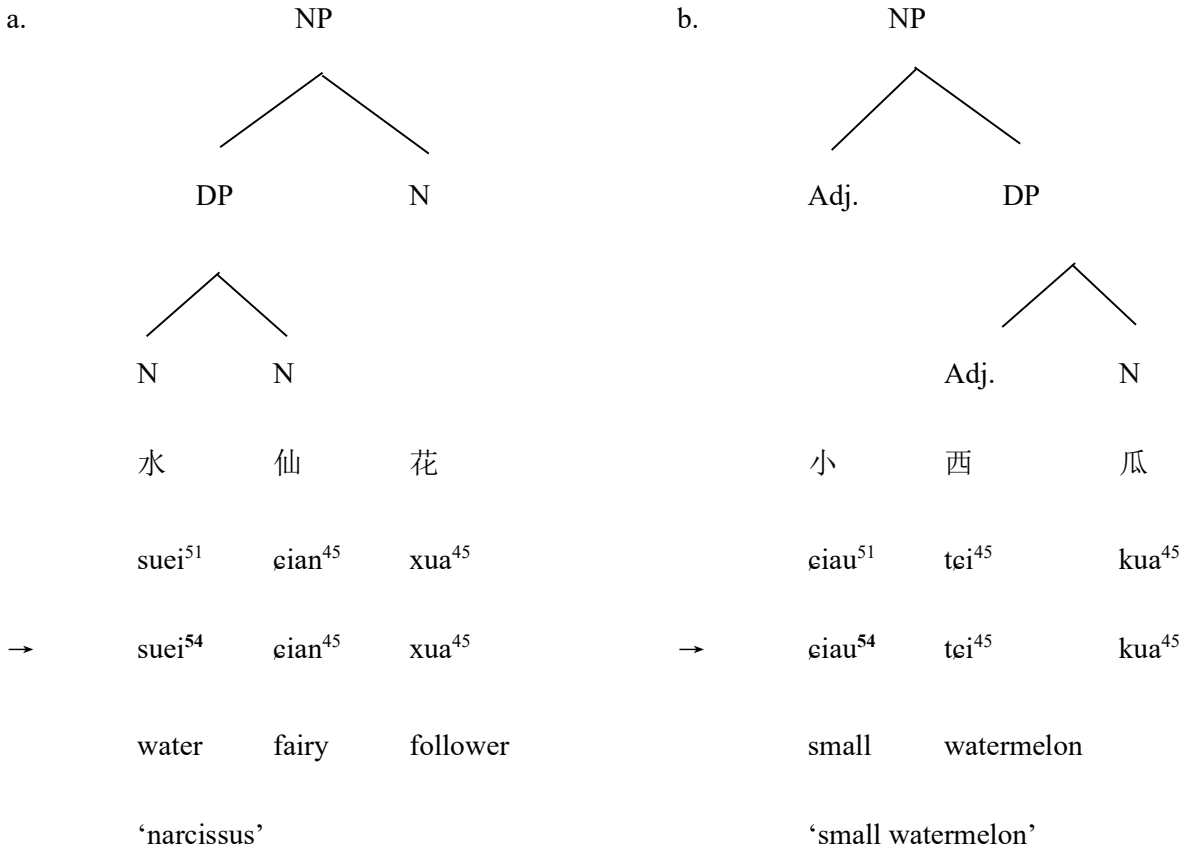


Figure 26

Moreover, Yan presents the list of disyllabic TS applications in Chengdu as below:

Table 56 Tone sandhi in Chengdu dialect

类型序号	本调	变调	例词
1	MH. MH	MH. M	今天
2	ML. MH	ML. M	阳光
3	HM. MH	H. M	晚间
4	LM. MH	LM. H	面包
5	MH. LM	MH. L	宗教
6	ML. LM	ML. L	习惯
7	HM. LM	H. L	早饭
8	LM. LM	LM. L	路边
9	HM. ML	H. ML	彩虹
10	HM. HM	H. HM	雨伞

In the table above, patterns 3, 7, 9, and 10 have their first syllable H.M changed to H, which contradicts Lin's argument about syllable positions that go through TS rules. Yan pointed out that, first of all, from the perspective of the role played by the tones of adjacent positions of the tone sandhi, the two-character tone sandhi involves both independent and mutual tone sandhi. Taking tone sandhi patterns 5 to 8 as an example, the tone "LM" becomes "L" uniformly, an independent tone sandhi. The preceding "MH," "ML," "HM," and "LM" only play a role in promoting the tone sandhi, thus they do not affect the modulation value. Unlike independent pitch shifts, the tone that triggers the pitch shift in mutual pitch shifts will affect the pitch value of the pitch shift. Taking tone sandhi patterns 2 and 4 as examples, the tone "MH" will be affected by the previous tones "ML" and "LM" and become "M" and "H," respectively. Secondly, from the perspective of the position of the tone sandhi, patterns 3, 7, 9, and 10 involve the left-syllable tone sandhi. The other patterns are all right-syllable tone sandhi. Among them, 3 and 7 involve both the left and right tone sandhi. Based on previous observation, Yan confirmed that the Chengdu dialect has a left-preminate prosodic structure. Also, it was argued that ML maintains original tones all the time.

In contrast, three other tones go through TS under different circumstances (which contradicts Duanmu's conclusion that only objects maintain tones in VO structures while verbs go through TS rules). In addition, Yan went deeper into tone values. From the perspective of the tone value after TS, all positions that go through TS have a flat tone value. Among them, "HM" and "LM" become "H" and "L," respectively, and their tone values are the same as the head position syllable. The tone value of MH varies since it depends on the pitch value of the preceding tone. When the tail of the preceding tone of "MH" is a middle tone, "MH" becomes "H"; when the tail of the preceding tone is "H" or "L," MH becomes "M." Yan explained that the particular case of MH is that

Chengdu does not allow the existence of surface pattern M.M, which is the application of the mandatory non-equal value principle. With the same rule, it is not allowed to have surface patterns like MH.MH, LM.LM and HM.HM (as in examples 1, 8, and 10)

Therefore, Yan concluded that morphological and syntactic factors do not restrict the TS rules of tri-syllabic structures in Chengdu. The application direction of the tonal sandhi rule involves both the left and right directions, which is a typical directional sandhi. Among the seven groups of directional tone sandhi, there are four groups of right tone sandhi and three groups of left tone sandhi. See below:

Table 57

No.	Underlying Form	Surface Form	TS direction	Appliacation	Examples
1	MH.LM.MH	MH.L.M	right	Yes	三字经
2	ML.LM.MH	ML.L.M	right	Yes	织布机
3	HM.LM.MH	H.L.M	right	Yes	打字机
4	LM.LM.MH	LM.L.M	right	Yes	会计师
5	MH.MH.MH	MH.M.M	left	No	深呼吸
6	ML.MH.MH	ML.M.M	left	No	除湿机
7	HM.MH.MH	H.M.M	left	No	水仙花

Lastly, Yan argues that classical OT theory can explain the transparent form of non-marked directional sandhi. However, it cannot describe and explain the phonological opacity involved in marked directional sandhi. In contrast, the Optimality Theory with Candidate Chains (OT-CC) replaces a single language form with a gradual chain sequence, reflecting the derivation process between the bottom form and the surface form of the phonology and explaining the alternated phenomenon of continuous tone sandhi of the Chengdu dialect. After applying OT-CC rules, Yan summarized that two factors mainly cause the tone sandhi in different directions in the Chengdu

dialect. On the one hand, the tone change follows the principle of economy, and the unchanging tone is retained to the maximum extent, and the "ML" tone remains unchanged, which is similar to Lin's study. However, tones that must be transposed tend to be less marked when selecting the surface form. Yan's work was the only one that used OT-CC to analyze TS in Chengdu. However, just like Lin's work, the basis of this research also considers Chengdu as a left-prominent language.

6.3.3 Qin (2015)

Qin (2015) analyzed continuous TS in Chengdu from the perspective of prosodic structure. He concluded that the prosodic structure emphasizing the beginning syllable in the Chengdu dialect is the fundamental triggering mechanism of continuous tone sandhi. Whether the tone changes or preserves, the target always fulfills a particular prosodic structure. Qin's analysis shows that from the perspective of prosodic structure, the continuous tone sandhi of the Chengdu dialect can be explained uniformly. Unlike previous research, Qin distinguished reduplicated structures and non-reduplicated structures. For TS of reduplicated structures/words:

Table 58

本调	变调
MH.MH	MH.H
ML.ML	ML.M
HM.HM	HM.ML
LM.LM	LM.H（reduplication nouns）
	LM.L（other reduplication words）

It can be seen that Lin and Yan's conclusion that "ML" always maintains its tone is not supported by Qin's argument (since Qin used phonetic experiments to achieve the form, it can also be noted that Lin and Yan's OT analysis was not supported by phonetic evidence). Furthermore, in describing the TS phenomenon Qin noted that "TS sandhi all occur on the right side of the

bicylinder unless the left syllable is the third tone," therefore, once again, Qin defined Chengdu as a Left Prominent Language[1].

There have been different approaches to summarize Chengdu TS rules, especially serious OT attempts. However, by comparing the results of different works, it can be seen that even with the same OT application, conclusions can be vastly different.

6.3.4 Detailed analyses of critical studies

6.3.4.1 Tri-tonal domain in Chengdu

One of the essential things to consider when dealing with tone sandhi is the domain within which tone sandhi operates, which applies whether it is in constraint-based analysis or a rule-based analysis. Upon the determination of the domain, the next thing that follows is to account for tone sandhi (Lin, 2003). According to research, two approaches explain how the tone sandhi domain can be defined. One shows that the tone sandhi mainly operates on the morphosyntactic structures. The second approach posits that tone sandhi need not operate directly on the morphosyntactic structures. Therefore, the tone sandhi domain is a form of prosodic structure that collaborates between phonology and syntax.

Xu (2002) opined that the operation of tone sandhi in tri-tonal strings in dialects such as Chengdu is not sensitive to morphosyntactic structures. As a result, it is impossible to determine tone sandhi by considering the morphosyntactic structures. Additionally, in the tri-tonal strings of Chengdu dialect, there is the need to decide whether the domain is (σ(σσ)) or ((σσ)σ). This paper proposes that the tone sandhi domain of the Chengdu dialect is the right-branching (σ(σσ)) foot.

[1] Original text: "如果按照 Chen （2000）的做法，将倾向于保留字组左侧、右侧声调的语言，分别叫做左重语言和右重语言，那么成都话当属一门左重语言。"

Wang et al. (2012) noted that the claim for the tri-tonal domain to be (σ(σσ)) might appear somehow *ad hoc*. However, even with this, for the domains proposed for various dialects and languages that entail a directional tone sandhi, known as morphosyntactically insensitive languages, a correlation between the position of prominence and prosodic domain can be observed.

As evident in the table below, while the domain of a left prominent language is right-aligned, the one for a right prominent language is left aligned. Based on this observation, it is possible to conclude that in languages whose tone sandhi is not considerate of morphosyntactic structures, the prosodic domains may be independently defined based on the location of prominence (Lombardi, 2001).

It is also essential to note that the proposal of tonal domains may lead to another interesting observation. Operating tone sandhi in a right-aligned domain (σ(σσ)) mainly indicates a right-to-left tonal operation directionality. In the same aspect, an operating tone sandhi in a left-aligned domain ((σσ)σ) is indicative of a left-to-right operation directionality. It is also essential to note that reference to contextual tone refers to the type of tone sandhi where the form of the sandhi is mainly conditioned by the value of the adjacent tone irrespective of the pitch value of the sandhi tone (Lombardi, 2001). For instance, Shanghai tone sandhi is a form of contextual tone sandhi. Essential also to note is that Shanghainese is a left -prominent Chinese dialect.

Different languages and dialects may comprise different types of tone sandhi. For instance, one language may have an independent tone sandhi while another may have a contextual tone sandhi. Lombardi (2001) gives an example of a situation where Shanghai has a contextual tone sandhi while Taiwanese has an independent tone sandhi. To illustrate the independent tone sandhi in Taiwanese, examples are provided as below:

a. H.M ➞ **M**.M (e.g., tang po ‘eastern’)

b. H.LM ➞ **M**.LM (e.g., tang ping ‘east side’)

In the same manner, examples to illustrate Shanghai as a contextual tone sandhi are also provided as follows:

a. LH.LH ➞ L.H (e.g., ze’ pe ‘Japan’)

b. HL.LH ➞ H.L (e.g., fe ga ‘tomato’)

Table 59

Edge of Prominence	Prosodic Domain	Languages
a. left prominent T.T→$T_{.TRI}$. T_{TAR}	(σ(σσ))	Chengdu H akha-Lai (Lin2005a)
b.right prominent T.T→T_{TAR}. T_{TRI}	((σσ)σ)	Tianjin (Lin 2003, 2005b) , Bosh an (Lin2004b) Six ian-Hakka (Lin2005b)

It is also worth noting that for both independent tone sandhi and contextual tone sandhi, the non-prominent position's tonal values may co-occur since neighboring tones' tonal values do not matter. Therefore, the question of rule application directionalities may not exist. A good example is Taiwanese, where a base tone changes to a sandhi tone when in front of any tone. Therefore, the tone sandhi rule tends to take place and change all the non-final tones simultaneously.

Xiao and Wong (2014) opined that the Shanghai tone sandhi entails the tonal deletion of old features in the non-prominent position and the reassignment of new tonal features. Therefore, the tonal deletion may co-occur as the deletion of the tonal features of the tones, especially those in non-prominent positions. After this, the reassignment process follows, the primary intention of which is to fill the toneless syllables with the feature of prominent syllables simultaneously. The process is represented in the figure below.

Table 60

Underlying representation	$HL_1.T_2.T_3$
Tonal deletion	$\varphi_2.\varphi_3$
Tonal filling	$L_2.L_3$
Surface presentation	$H_1.L_2.L_3$

One of the significant things to note is that both the contextual and independent tone sandhi may be classified as positional types of tone sandhi, which means that the tone changes are mainly a result of positional factors. However, Yip (1995) was opposed to tonal changes resulting from specific tonal environments such as dissimilation and assimilation. Some of the languages would entail various types of tone sandhi. For instance, the Chengdu dialect entails both independent tone sandhi and mutual tone sandhi. The latter is expressed through the changes of "MH," while the former refers to the tonal changes of "LM" and "HM." Chen (2004) stated that as long as mutual tone sandhi is involved, tone sandhi operation directionality has to be understood.

The author further noted that the Chengdu dialect tone sandhi (σ(σσ))'s tri-tonal domain could be clearly understood by following various constraints. As shown in the figure below, the prosodic constraints have been used to predict the foot domain (σ(σσ)) for the tri-tonal examples concerning the input's morphosyntactic structure.

{σ{σσ}}	PARSESYLL	ALLFTR	BINBRAN
a. ((σσ)σ)		*!	
☞ b. (σ(σσ))			
c. (σσ)(σ)		*!	*
d. σ(σσ)	*!		
e. (σσσ)			*!

Figure 27 Morphosyntactic structure (Chen, 2004)

Considered together, in the tri-tonal strings of Chengdu, the information contained in morphosyntactic structures is not respected. At all times, the prosodic domain is considered a right-branching foot (σ(σσ)) irrespective of whether the string is right or left-branching morphosyntactically. Another essential factor to note is that the prediction of the domain for tri-tonality depends mainly on the ALLFTR constraint, which favors every foot to stand at the right edge of an utterance ((Lin, 2003).

6.3.4.2 Tri-tonal strings, regular application, and underapplication

The rule application for directionality that facilitates the derivation of outputs, as previously stated, is neither governed by morphosyntactic structures nor the various discussed principles such as wellformedness, transparency, derivational economy, temporal sequence, and simplicity (Lin, 2004). The question thus arises whether rule application directionality is indeed predictable. With a deeper analysis of the outputs derived from different perspectives, an interesting finding may be discovered,

There exists a significant relationship between rule application directionality and whether the output is transparent or opaque. A transparent output denotes one that shows normal applications, while an opaque one refers to one that shows either overapplication or underapplication. In the same vein, the regular application refers to output forms that are neither non-surface-apparent nor non-surface-true. On the other hand, underappplication and overapplication refer to the forms that are non-surface-true and non-surface-apparent, respectively (Lin, 2004).

6.3.4.2.1 Underapplication

The right-to-left direction derives the seven tonal patterns and they entail the underapplication of tone sandhi because the outputs are non-surface-true (Lin, 2004). Under

normal circumstances, the normal application of tone sandhi would have given MH.**M.H**, ML.**M.H**, and **H.M.H** for (P1)-(P3) respectively based on the table below. Therefore, they are supposed to be better candidates than their underapplication counterparts in regard to the current constraint ranking, since none violate OCP.

	Input	Attested Output (underapplication) ⇦	*Unattested Output (normal application)* ⇨
P1	MH.MH.MH	MH.**M.M**	*MH.**M.H***
P2	ML.MH.MH	ML.**M.M**	*ML.**M.H***
P3	HM.MH.MH	**H.M.M**	***H.M.H***

Figure 28

Based on the above observation, the question that arises is what causes tone sandhi to underapply, especially in (P1)-(P). As shown earlier, the evidence from Hakha-Lai, Boshan, Sixian-Hakka, and Beijing Mandarin showed the importance of identity preservation between prosodically related outputs in tone sandhi (Lin, 2003). Even with this, it is to be noted that satisfaction can lead to the emergence of forms that are not very transparent. This observation is the same as what happens in the Chengdu dialect.

It is to be noted that underapplication in Chengdu arises as a result of the need to maximize identity between tri-tonal outputs coupled with their prosodically related base tones. As discussed in this paper, the tri-tonal sandhi domain of Chengdu is (σ(σσ)) and the outputs of underapplication are motivated by the need to satisfy IDENT-BOT (Hyman et al., 2004). According to the latter, the corresponding tones in the bases and outputs that are prosodically related must be identical. Since underapplication involves impermissible tonal sequences, it is observed that the IDENT-BOT needs to be ranked above OCP to allow underapplication candidates to surface.

In a left prominent language such as Hakha-Lai, various impermissible sequences occur at various times at the non-prominent edge and not at the left or prominent edge. The marked sequences in the various attested underapplication outputs do not occur at the recognized prominent positions. Hyman et al. (2004) noted that the markedness constraint needs to be divided into two constraints: one penalizes marked sequences in general and the other penalizes marked sequences at the prominent position. When MC-POS outranks IDENT-BOT, which in turn outranks MC-FREE (i.e., MC-POS >> IDENT-BOT >> MC-FREE), impermissible tonal sequences at the non-prominent position that are caused by identity preservation would be allowed.

Following this, it is proposed that the underapplication of the Chengdu dialect requires the division of the markedness constraints into MC-FREE and MC-POS (Chen, 2004). For the main reason that Chengdu is a left prominent language, it is possible to conclude that the MC-POS constraint may penalize impermissible sequences at the left edge (Duanmu, 1992). By and large, identity preservation is essential in tone sandhi. Thus, it has the capacity to force a tonal output to deviate from the canonical surface patterns of the language to enable it to become more like a tonal base with which it relates prosodically. The maximizing identity between prosodically related outputs is essential in Chengdu tone sandhi (Duanmu, 1992). It influences tone sandhi, making it apply from right to left in (P1)-(P3), and this results in a directionality that belongs to that of underapplication.

6.3.4.2.2 Normal Application

The figure below shows seven patterns from P4 to P7. These patterns are derived from the left-to-right rule application directionality and entail a normal application. As shown, maximizing identity between the prosodically related outputs is essential to Chengdu tone sandhi (Lin, 2003). As a result, it makes the toned sandhi apply right to left in (P1)-(P3). In addition, the resultant

outputs arising from the directionality belong to such underapplication. Even with this, there arise questions from various quarters as to what prevents toned sandhi from applying right-to-left in (P4)-(P7) if preserving identity is that essential in tone sandhi (Gerken, 1996). However, as evident in the figure, the outputs obtained by using a right-to-left directionality would be similar to their corresponding bases compared to the normal application outputs obtained by a left-to-right directionality.

	Input	Base	Attested Output (normal application) Less similar ⇨	*Unattested Output (underapplication) More similar* ⇦
P4	(MH.(LM.MH))	(LM.**H**)	(MH.(**L.M**))	**(MH.(**L.H**))*
P5	(ML.(LM.MH))	(LM.**H**)	(ML.(**L.M**))	**(ML.(**L.H**))*
P6	(HM.(LM.MH))	(LM.**H**)	(**H**.(**L.M**))	**(**H**.(**L.H**))*
P7	(LM.(LM.MH))	(LM.**H**)	(LM.(**L.M**))	**(LM.(**L.H**))*

Figure 29 Outputs (Gerken, 1996)

Hsiao (1995) opined that it is somehow clear why tone sandhi fails to apply from right-to-left in order to increase identity in (P4)-(P7). The reason for this is to prevent instances of highly marked forms from occurring. * POLAR >> IDENT-BOT explains such an expression. For example, in (P4), if one assumed that tone sandhi operated right-to-left, the resulting output would have the **L.H** sequence, which does not obey the *POLAR. As evident below, the normal application patterns are explained further by the same set of constraints that are proposed for the underapplication patterns.

(ML.(LM.MH))	FALL]u	IDENT-IO-T-L	*RISE	*POLAR	u[OCP	IDENT-BOT	OCP
☞a. (ML.(**L.M**)) (normal application) ⇨	*					**	
b. (ML.(**L.H**)) (underapplication) ⇦	*			*!		*	

Figure 30 Application patterns (Gerken, 1996)

In figure 9 above, the base is **(P5)** from figure 8, which gives rise to the following; (P5) ML.LM.MH → (ML(L.M)) and Base: LM.H (← LM.MH). By and large, it is evident that identity preservation is vital in Chengdu tone sandhi. It makes the tone sandhi apply right-to-left in some instances, such as (P1)-(P3) above (Hsiao, 1995). Even with this, tone sandhi will apply in the reverse direction if such a pattern is presented. However, even application direction may lead to marked forms. Therefore, the various tone sandhi operation directions in Chengdu tri-tonal sandhi are mainly captured by the interaction of the markedness constraint, which is *POLAR, as well as IDENT-BOT, which is the faithfulness constraint.

6.3.4.2.3 Problem of the rule-based analyses

Various aspects are considered in determining the domain within which tone sandhi ought to apply. The first entails the determination of the domain. After the determination of the domain, tone sandhi may be accounted for (Hsiao, 2000). For instance, in accounting for a language such as Beijing Mandarin, some scholars realized that Beijing Mandarin is a prosodic foot. Based on the FFR rule, the domains for morphosyntactically distinct tri-tonal examples are different. As a result of this, various tonal outputs are predicted correctly.

Foot Formation Rule (FFR) (Shih 1986)

Foot (f) Construction

a. IC: Link immediate constituents into disyllabic feet.

b. DM: Scanning from left to right, string together unpaired syllables into binary feet unless they branch to the opposite direction.

Super-foot (f') Construction (Hsiao, 2000).

The next aspect to consider is if the monosyllables that are left and neighboring the binary foot are analyzed as per the direction of syntactic branching, which is evident in the figure below;

	mai hao jiu 'buy good wine'	*mai hao jiu* 'have bought wine'
Immediate Constituency	{σ{σσ}}	{{σσ}σ}
Prosodic Foot Structure	(σ(σσ))	((σσ)σ)
Derivation:		
Input: Cycle 1 Cycle 2 Output:	**(L.(L.L))** LH n/a **L.LH.L**	**((L.L).L)** LH LH **LH.LH.L**

Figure 31 Prosodic Foot Structure (Hsiao, 2000)

Rule-based analysis functions when used to deal with Beijing Mandarin tone sandhi. However, even with this, when the directional tone sandhi is considered, such as Chengdu tone sandhi, then a rule-based analysis cannot work, since in these cases, the morphosyntactic structures do not play any critical role (Hsiao, 2000). The major challenge is that in Chengdu, tone sandhi appears to operate right-to-left while in other languages and dialects, it seems to operate left-to-right, irrespective of the information in morphosyntactic structures.

The left-to-right application directionality shows that tone sandhi mainly functions cyclically in the domain ((σσ)σ). Similarly, the right-to-left application directionality reveals that tone sandhi applies cyclically in the domain (σ(σσ)). However, Lin (2002) also explained that there is no objective way to determine the tone sandhi domain within which tone sandhi may be considered to operate. Therefore, stipulations of the directions where the tone sandhi rule should apply are necessary.

There have been proposals that the tonal domain for Chengdu tri-tonal sandhi is (σ(σσ)). Despite this, it is noteworthy that the OT framework may not be directly added to the rule-based analysis. The reason for this is that tone sandhi may not at all times apply right-to-left in Chengdu

even when the domain is (σ(σσ)). What the domain (σ(σσ)) simply reflects is the essence that the right-to-left rule application directionality is typical in Chengdu tone sandhi (Lin, 2002). As previously observed, tone sandhi rules can operate from left to right. Considering the proposed domain for Chengdu tone sandhi using the OT framework, the constraints are easily violable.

The differing directions result from the interaction of the constraints, mainly the markedness constraint *POLAR, and the constraint that requires output-to-output correspondence, which is IDENT-BOT. Where the markedness constraint dominates IDENT-BOT, it is an assurance that tone sandhi applies right-to-left to achieve identity between prosodically related outputs. The only exception is when such directionality produces highly marked forms. When this happens, the tone sandhi applies left-to-right.

The various directions may not be accounted for with the rule-based analysis if only a single tone sandhi domain is used. For example, if one assumes that the tone sandhi domain for Chengdu is (σ(σσ)), the only tonal patterns which may be obtained by right-to-left directionality can be easily accounted for (Chen, 1997). However, the tonal patterns obtained by the left-to-right directionality may not be accounted for if a similar domain is used. As a result, the conflicting directions can only give rise to stipulations such as the ones in the examples below:

a. For inputs /MH.MH.MH/, /ML.MH.MH/ and /HM.MH.MH/, tone sandhi should apply from right to left.

b. For inputs /MH.LM.MH/, /ML.LM.MH/, /HM.LM.MH/ and /LM.LM.MH/, tone sandhi should apply from left to right (Chen, 1997).

6.3.4.2.4 Problems of the principles

As this work has shown earlier, neither the principle of temporal sequence nor the principle of structure affinity can predict tone sandhi operation directionality in dialects such as Chengdu

(Chen, 2004). Similarly, the other four principles, which are simplicity, wellformedness, transparency, and derivational economy, can be adequately tested. When considering the derivational economy, it is essential to note that this prefers tonal changes which are obtained by the shortest derivational path (Chen, 2004). Although, as the figure below shows, the attested outputs may not be derived by the most economical derivation path, as the attested outputs coupled with the unattested outputs are derived by similar steps of derivation in the seven patterns.

	Attested Outputs		Unattested Outputs	
(P1)	a.	MH.MH.MH→ MH.MH.**M** → MH.**M.M**	a'.	MH.MH.MH→ MH.**M**.MH →*MH.**M.H**
(P2)	⇦	ML.MH.MH→ ML.MH.**M** → ML.**M.M**	⇨	ML.MH.MH→ ML.**M**.MH → *ML.**M.H**
(P3)		HM.MH.MH→ HM.MH.**M** → **H.M.M**		HM.MH.MH→ **H**.**M**.MH → ***H.M.H**
(P4)	b.	MH.LM.MH→ MH.**L**.MH → MH.**L.M**	b'.	MH.LM.MH→ MH.LM.**H** → *MH.**L.H**
(P5)	⇨	ML.LM.MH→ ML.**L**.MH →ML.**L.M**	⇦	ML.LM.MH→ ML.LM.**H** → *ML.**L.H**
(P6)		HM.LM.MH→ **H**.**L**.MH →**H.L.M**		HM.LM.MH→ HM.LM.**H** → ***H.L.H**
(P7)		LM.LM.MH→ LM.**L**.MH →LM.**L.M**		LM.LM.MH→ LM.LM.**H** → *LM.**L.H**

Figure 32 Outputs in the seven patterns (Chen, 2004)

The other principle that can be tested is the principle of transparency. This principle favors transparent outputs as opposed to opaque outputs, which are either non-surface-true or non-surface apparent. In addition, transparency does not account for Chengdu tri-tonal sandhi since the outputs in consideration are mainly transparent, meaning that they show normal applications (Chen, 2004). The principle of well-formedness favors a derivation that gives rise to unmarked tonal combinations and does not govern the tonal changes.

Lastly is the principle of simplicity. This principle favors the use of level tones as opposed to contour tones. It is essential to note that the principle of simplicity fails since the attested outputs coupled with the unattested outputs carry a similar number of level tones. These realizations are clearly shown in figure 11 below.

	Attested Output		*Unattested Outputs*	
	Input	*Output*	*Input*	*Output*
P1	MH.MH.MH	MH.**M.M**	*MH.MH.MH*	**MH.M.H*
P2	ML.MH.MH	ML.**M.M**	*ML.MH.MH*	**ML.M.H*
P4	MH.LM.MH	MH.**L.M**	*MH.LM.MH*	**MH.L.H*
P5	ML.LM.MH	ML.**L.M**	*ML.LM.MH*	**ML.L.H*

Figure 33 Outputs (Chen, 2004)

6.4 Quadri-tonal Sandhi

6.4.1 Morphosyntactic sensitivity

This study has shown that the operation of tone sandhi in tri-tonal strings is mainly insensitive to the morphosyntactic structures. Chen et al. (2003) opined that the tone sandhi mainly operates from right to left to maximize the identity between various prosodically related outputs. The only deviation is when the directionality can lead to highly marked forms. The right-branching tonal domain (σ(σσ)) mainly reflects the norm directionality. Duanmu (2017) noted that the domain is mainly a result of the ALLFTR constraint, which demands that every foot stands at the right edge of an utterance.

There are questions raised about tone sandhi in longer strings like quadri-tonal strings. There are also questions about the sensitivity of tone sandhi to morphosyntactic structures. If the answer to these questions is in the affirmative, then it would imply that the behavior of tone sandhi operation directionality maintains the right to left direction irrespective of the morphosyntactic structures. In the same manner, the ALLFTR still holds a primary role. As a result, the tonal domain for quadri-tonal strings would be (σ(σ(σσ))) (Duanmu, 2017).

However, if, for instance, the tone sandhi in quadritonal strings starts to obey the morphosyntactic structures, then it would imply that some alignment constraints occur at the edge

of the prosodic structures, so morphosyntactic structures begin to play various roles. The tone sandhi domain may then start to vary accordingly. A study by Lin (2004) assessed the quadri-tonal strings in languages such as Tianjin and Sixian-Hakka. The study showed that the tone sandhi operation directionality in tri-tonal and quadri-tonal strings of languages that are considered morphosyntactically insensitive could be quite different. Just like Chengdu, both Tianjin and Sixian-Hakka are morphosyntactically insensitive languages. This is because the operations of tone sandhi in various tri-tonal strings are insensitive to morphosyntactic structures, as can be illustrated below;

Sixian-Hakka Tri-tonal strings

{{tsu kon}thong}'pig liver soup'; {mai {tsu kon}} 'buy pig liver'

((LH.LH).LH) → ((L.LH).LH) → ((L.L).LH) (Hsiao, 2000).

The Sixian-Hakka quadri-tonal strings are illustrated as follows;

2+2: {sam pi}{ka pi} 'three cups of coffee'

(LH.LH)(.LH.LH) → (L.LH.)(L.LH);

Compare with: (((LH.LH).LH).LH) → (((L.LH).LH).LH) → (((L.L).LH).LH)*(((L.L).L).LH)

The second way to illustrate this is as follows;

1+3: {mai {seu {sien tshau}}} 'buy hot-sien tshau'

(((LH.LH).LH).ML → (((L.LH).LH).ML → (((L.L).LH).ML → (n/a) ((L.L.)LH).ML)

Compare with: (LH.(LH.(LH.ML))) → (n/a) (LH.(LH.(LH.ML))) → *(LH.(L.(LH.ML))) (Hsiao, 2000).

Despite the above observations, in quadri-tonal strings, the tone sandhi in Tinjian and Sixian-Hakka becomes insensitive to the morphosyntactic structure. As evident, in the above examples, the correct tonal outputs need to be derived through the application of tone sandhi in

the domain (σσ)(σσ). In this case, the domain is said to be isomorphic to the morphosyntactic structures of the strings.

Additionally, if the tone sandhi applied from left to right in the domain (((σσ)σ)σ), then the resulting norm of directionality in tri-tonal strings of the Tianjin and related languages such as Sixian-Hakka the resultant outputs would be unattested (Hsiao, 2000). While this is true, there arise questions as to why tone sandhi begins to pay great respect to the morphosyntactic, especially in quadri-tonal strings in languages such as Tianjin and Sixian-Hakka. Various scholars have tried to answer this question utiliizing different methodologies or proposing various theoretical arguments. For instance, Lin (2004) argued that both Sixian-Hakka and Tianjin comprise an upper limit on the size of the tone sandhi domain, which consists of three syllables.

When word strings are greater than the upper limit of the domain size so as to generate domains that are bigger than the upper limit, what happens is that they are divided into independent domains. Some examples of such domains that are independent include the following, either (σ(σ(σσ))) or (((σσ)σ)σ). The separation of the strings into various domains is sensitive to morphosyntactic structure and, therefore, not *ad hoc* (Lin, 2003). It is essential to note that tone sandhi in quadri-tonal strings in languages such as Tianjin and Sixian-Hakka starts to obey the morphosyntactic structure.

A study by Huang (2018) looked at the behavior of quadri-tonal strings in the Chengdu dialect. The study found out that they behave in the same manner as those in Tianjin and Sixian-Hakka languages, meaning that tone sandhi starts to pay some respect to morphosyntactic structures in quadri-tonal strings. The tonal output is obtained by operating tone sandhi on the domain of (σσ)(σσ), which can be realized as being isomorphic to the morphosyntactic structure of the strings (Huang, 2018). Thus, the operation of tone sandhi from right to left adhering to the

norm of directionality in tri-tonal strings on the tonal domain may result in unattested output, which is expressed as *(MH.(M.(M.M))).

Table 61 Input and Output

Input	Output	Example	
a. MH.MH.MH.MH	(MH.M)(MH.M)	{xiang gu}{ji tang}	'mushroom chicken soup'
b. MH.MH.MH.HM	(MH.M)(MH.HM)	{hua sheng}{chun juan}	'peanut spring roll'
c. ML.HM.MH.MH	(ML.H)(MH.M)	{yin er}{ji tang}	'white fungus chicken soup'

From the above figure 12, all strings with the structure {σσ}{σσ} is "2+2." What this means is that the expression for the development of the table is 2+2: {σσ}{σσ}: (σσ)(σσ) (Lombardi, 2001). The figure shows that the tone sandhi domain respects the morphosyntactic structure. This is different from the figure below, which shows that the tone sandhi domain does not adequately respect the morphosyntactic structure. In figure 13 below, a structure of "1+3" is functional, but the morphosyntactic structure of the internal "3" is mainly different. The structure employed is 1+3 (Type I): σ{{σσ}σ}: σ(σσσ).

Table 62 Output and Input ((Lombardi, 2001)

Input	Output	Example	
a. MH.MH.MH.MH	MH.(MH.**M.M**)	{xin{{san xian}tang}}	'new soup of three delicacies'
b. MH.ML.MH.MH	MH.(ML.**M.M**)	{xiang{{nan gua}tang}}	'savory pumpkin soup'
c. MH.ML.LM.MH	MH.(ML.**L.M**)	{xiang{{niu rou}tang}}	'savory beef soup'

The domain *LH.L.LH.ML is generally larger than three syllables. However, tone sandhi domains do not split into two domains viz (σσ)(σσ) to avoid an instance of having to split a lexical

word into two domains. In linguistics, the terminology used to refer to such a situation is lexical integrity.

The "3+1" strings may be divided into two types based on the morphosyntactic bracketing of the "3." A further elaboration shows that the tone sandhi phenomenon witnessed in the "3+1" strings further affirms that tone sandhi fails to totally respect morphosyntactic structures in quadri-tonal strings (Lombardi, 2001). In this case, if tone sandhi had paid full respect to the morphosyntactic structures in the "3+1" strings, then it should have functioned in the tonal domain of (σσσ)σ, which can be expressed more clearly as ((σσ)σ)σ in Type I and (σ(σσ))σ in Type II. However, this cannot be attested to in the two types of the "3+1" strings. As shown in the figure below, while the tonal outputs of Type I must be derived by operating tone sandhi on the domain (σσ)(σσ), those of Type II must be derived by operating tone sandhi on the domain σ(σσσ) [more specifically, σ(σ(σσ)), since tone sandhi in the "3" is also based on tri-tonal sandhi, and as mentioned, the domain of tri-tonal sandhi is (σ(σσ))].

Table 63 3+1 (Type I) (Neergaard and Huang, 2016)

Input	Output	Example	
a. MH.MH.MH.MH	(MH.M)(MH.M)	{{{huasheng}tang}xiang}	'peanut soup smells good'
b. MH.LM.MH.MH	(MH.L)(MH.M)	{{{ji dan}tang}xiang}	'egg soup smells good'
c. ML.MH.MH.LM	(ML.M)(MH.L)	{{{nan gua}tang}gui}	'pumpkin soup expensive'

The above figure 14 applies 3+1 (Type I): {{σσ}σ}σ: (σσ)(σσ).

A study by Neergaard and Huang (2016) showed that the Chengdu quadri-tonal sandhi behaves similar to the observations made in Tianjin and Sixian-Hakka, as it becomes sensitive to the morphosyntactic structure although not fully respectful to it.

6.4.2 Quadri-tonal domain of Chengdu

It is possible to realize how prosodic constraints determine tonal domains. In tri-tonal strings in the Chengdu dialect, it is difficult to respect information in morphosyntactic structures. Therefore, the existing prosodic domain is usually right-branching (σ(σσ)) irrespective of whether the string is right or left-branching morphosyntactically. Hsiao (1995) noted that the prediction of the domain of tri-tonal sequences depends mostly on ALLFTR, which relies on every foot to stand at the right edge of an utterance. Since ALLFTR does this, observations about things like groupings of the syllables of an utterance into independent feet may violate the expectations of ALLFTR.

One can argue that the need to subdivide an utterance into two independent feet instead of being wrapped into a four-syllabic foot is a result of the need to satisfy ALLFTR since Chengdu resembles Tianjin and Sixian-Hakka. Besides, it has an upper limit on the size of the foot and an upper limit, which is also three syllables. This is further expounded by realizing that a foot must have less than or equal to 3 syllables. This realization is expressed by the constraint FT ≦ 3σ (Hsiao, 1995). However, for one to determine to choose (σσ)(σσ) instead of (σ(σ(σσ))) when dealing with the "2+2" strings, then ALLFTR must be dominated by FT ≦ 3σ. As a result, the current constraint that is used in the ranking for Chendu is FT ≦ 3σ >> {ALLFTR, PARSESYLL, BINBRAN}. Even with this, it is essential to note that the current constraint ranking may not avoid the choice of the unattested foot σ(σ(σσ)). The same case applies to the possible domain candidate for the "2+2" structure as evident in the figure below.

Table 64

{σσ}{σσ}	FT ≦ 3σ	ALLFTR	PARSESYLL
a. (σσ)(σσ)		*	
b. σ(σ(σσ))			*

Thus, to eliminate the domain σ(σ(σσ)) for {σσ}{σσ}, there is a need for realignment constraints that align the edges of morphosyntactic structures as well as foot structures. In some cases, the ALIGNFT/MS constraint is proposed, which becomes effective when FT ≦ 3σ (Hsiao, 2000). That explains the reason it is ranked lower than FT ≦ 3σ.

6.4.3 Metrical System Interaction in Chinese Dialects

Other the Chengdu, this study will also consider Taiwanese and Shanghai from among the many other Chinese dialects. This study argues that a tonal domain is a metrical domain. With this understanding, it is possible to address several challenges, such as the correct prediction of tonal domains as well as the tonal asymmetry between Taiwanese and Shanghai with respect to contrastive stress and word-length sensitivity.

Based on this study, the formation of tonal domains may help realize the metrical head through aspects such as stress reduction, stress clash, location of the head, and the avoidance of a degenerate foot. Lin (2000) showed that Chinese suggests that metrical systems may exist in other languages in which phonetic stress is not obvious. Additionally, both Taiwanese and Shanghai have a metric system. This is a deviation from the common view among many people that Chinese does not have stress. The other essential thing to mention regarding Taiwanese and Shanghai is that compound stress is not universal.

However, it can change from one language to another. For instance, compound stress is left-headed in Shanghai but right-headed in Taiwanese even though both languages contain similar morphological structures (Hsiao, 1995). The present study also shows that metrical and tonal systems may exist in the same language and that it is essential to understand how a tonal domain does not simply refer to a “prosodic constituent” in which a head is not a necessary element but a metrical domain in which it is.

As with some other dialects of Chinese, Chengdu also has two types of TS rules: lexical tone sandhi (LTS) and phrasal tone sandhi (PTS). The domain of LTS is phonological words, while the domain of PTS is the phonological phrase (Hsiao, 1995). Other chapters also discussed that the phonological tone sandhi rule (TS) in the Chengdu dialect obligatorily applies within the domain of the prosodic word formed by most types of morpho-syntactic words but is consistently blocked between the host and the enclitic in the domain of Type A clitic group.

The super-foot construction rule may be used to predict the blocking of TS between the head and the post-head adjunct. However, You pointed out that since the right edge of the determiner or quantifier is marked as a TS domain boundary, Shih's analysis wrongly predicts the TS blocking between the determiner/quantifier and the classifier. However, Shih proposed that there was an expansion rule used to expand the domain of the tone group to include verbs and its object, which was recognized as self-contradictory in terms of the explanation of TS within VP constructions Tone Group Expansion.

$$V \# O \rightarrow V = O \tag{3}$$

6.4.4 Metrical Phonology

One of the common factors binding metrical phonology is that a metrical constituent does not have boundaries. The boundaries need to be created over a multisyllabic morpheme, as it happens when one constructs trochaic or iambic feet (Hsiao, 1995). One of the examples that can be used to demonstrate this is shown here below, where metrical boundaries are represented by parentheses and S is the syllable.

$$S\text{-}S\text{-}S\text{-}S\text{-}S\text{-}... \dashrightarrow (S\text{-}S)(\text{-}S\text{-}S)(\text{-}S\text{-}.. \tag{4}$$

It is also possible to project metrical boundaries from morphosyntactic boundaries so that phrase boundaries, word, and morphemes become metrical boundaries. To demonstrate, it is possible to consider a two-word compound as shown below, where W refers to a word.

Compound: ( )

Word: ( ) ( )

[[W] [W]]

From the above example, the syntactic boundaries are shown by brackets, and as can be seen, they project three pairs of metrical boundaries. Parentheses show the metrical boundaries. One is from the compound, while the other is from each word. It is also imperative to note that every metrical domain contains one and only one head or stress. Stress may either be on the right or the left. Anytime new stress is added, it leads to creating a new domain. Similarly, when stress is deleted, the domain that it heads may also be eliminated. This is demonstrated in the examples below where X = stress[2].

a. x

(S S)

b. x

(S S)

c. *(S S)

d. x x

*(S S S S) -->

e. x x

(S S)(S S)

The (a) above is left-headed while (b) is right-headed. An observation of (c) reveals that it is ill-formed since there is no head. It is noted that in (d) the domain has two heads and is therefore ill-formed. Despite this, it is possible to convert (d) into €, which is well-formed.

The expression x x

(S S)(S S)

shows that there is a constant constraint against stress clash. When the clash occurs, various things can happen. One such things is that one of the stresses gets deleted. Similarly, an extra mora may be introduced between the two stresses through various means, such as the lengthening of the vowel so that the stress is no longer adjacent (Huang, 2018).

The other major thing to note is that a monosyllabic domain or what is referred to as a 'degenerate foot' is not preferred but is not necessarily forbidden. This is expressed in the example below;

x x

(S S)(S S)

or

x

(S S S).

The above structure can form one or two metrical domains. However, this will be determined by whether one decides to keep the monosyllabic foot. Therefore, one may decide not to build a monosyllabic foot unless there is a reason to do so, such as when it carries contrastive stress or when one is speaking very carefully, especially with a lengthening of the monosyllabic foot.

Lastly, reducing the number of stress contrasts in a structure through conflation or deleting a stress line is possible. The example below obtained from Halle and Vergnaud (1987) clearly demonstrates this.

Line 2: a. x b. x c.

Line 1: (x x) ( ) x

Line 0: (S S)(S S) ----> S S S S -- --> (S S S S)

In (a) above, the first and third syllables contain stress. Once the stresses on Line 1 are deleted, their corresponding domains on Line 0 are lost, as evident in (b). As shown in Line 2, stress is now the only stress and its domain the only domain.

6.4.5 Analysis of Shanghai Dialect

Although many people consider Shanghai as an independent language, it is a Wu dialect of Chinese. While there are several varieties of Shanghai dialect, the one that will be considered for this study is the New Shanghai dialect, also known as the Mainstream Shanghai, mainly spoken in Shanghai City and its immediate outskirts. Huang (2018) opined that phonetic stress is rarely contrastive lexically in Chinese. There only exists a few exceptions that can be ignored for the purpose of this study. Gao and Shi (1963) opine that Chinese does not have the word stress, a widespread belief among many people. However, this study argues that most of the tonal domains in Shanghai are stress domains andsimilarly, that compound stress in Shanghai is uniformly left-headed.

Works by authors such as Yip (1980) and Daunmu (1992) have studied and recorded Shanghai tone. Their studies show that every syllable has a tone pattern. As a result, more than one syllable expression may split into two or more domains. Once this happens, the tonal pattern of every domain is determined by the initial syllable as well as the underlying tones from non-

initial syllables, which are all deleted. Following the study by Wu (2017), it is therefore possible to assume that the underlying tones of a Shanghai syllable could be either HL or LH. Studies by Duanmu (1993) showed that all Shanghai syllables contain an underlying light, especially when a syllable forms a domain by itself, mainly when it is lengthened to bimoraic and can carry both of its tones.

There are three patterns in a domain, such as the polysyllabic domain. If the initial syllable is underlying HL, then the first syllable is H, and L is the second one, while the rest may be toneless. Similarly, when the initial syllable is underlying LH that has either a non-glottal vowel or voiceless onset, the first syllable is mainly L while the second is H and the rest is L, which might be toneless.

The three patterns are shown below, together with the monosyllabic cases in Shanghai:

HL LH LH	LH LH LH	LH LH LH
H L L	L H L	L L H
ko vã- tsz	wã vã- tsz	lo’ vã- tsz
tall house	yellow house	green house
‘tall house’	‘yellow house’	‘green house’

It is also possible to demonstrate that Shanghai has a syllabic C, such as [z] IN [tsz]. The [V’] represents a glottal vowel as shown in the example below:

HL	LH
koo ‘tall’	wãã ‘yellow’

There is a general agreement on tonal behavior within a domain. However, there are some disagreements on the manner of determining a domain. For instance, Selkrirk and Shen (1990) propose that the tonal domain in Shanghai is mainly the prosodic word (PWD). Therefore, it starts

from the left edge of every lexical compound or word. Zhang's (1992) study showed that thematic relations and syntactic c-command influence tonal domains. In the same way, Duanmu (1992) stated that tonal domains are mainly metrical constituents. These arguments gave rise to three aspects of metrical analysis, namely, the effect of contrastive stress, multisyllabic morphemes, and the phenomenon of word-length sensitivity.

It is essential to note that Shanghai is a monosyllabic language, and most of its multisyllabic morphemes are mainly borrowed names. Thus, the underlying tones of a foreign name are derived from the Chinese syllables where the translator finds it fit to represent the foreign word. The examples below clearly illustrate this;

HL LH	LH LH
H L	L H
(pa-li)	(zã- he)
'Paris'	'Shanghai'

6.4.6 Fuzhou Dialect

The first systematic study on the phrasal-level TS of Chinese dialects is Chen & Norman (1965a). They distinguished four types of "junctures" in the Fuzhou dialect: terminal juncture, plus juncture, intermediate juncture, and close juncture. Chen & Norman claimed that in Fuzhou, tone sandhi is blocked before terminal juncture and plus juncture, while applied before intermediate juncture and close juncture:

TS and Chen & Norman's junctures

I. Terminal Juncture (Blocking of TS)

End of sentence/clause

II. Plus Juncture (Blocking of TS)

a. Subject # Predicate

b. Determiner-Classifier # Noun

c. Verb # Resultative complement

d. Reduplicated Adjective # adjective reduplication marker

e. Some marked words (e.g., [koyŋ242] ‘and, with’; [khøyʔ23] ‘to give’; [tuoʔ5] ‘to be in or at’) #

III. Intermediate Juncture (Application of TS)

a. Verb = Object (both monosyllabic)

b. [ʔa242] (‘can’) = Verb

c. [lɛ31] (progressive action) = Verb

d. Adj. = Adj.

IV. Close Juncture (Application of TS)

a. Determiner = Classifier

b. Adj. = Noun (both monosyllabic)

c. Adverb = Verb (both monosyllabic)

d. [ma242] (‘cannot’) = Verb

Chen and Norman’s work established the basic scale of TS application rules in the Fuzhou dialect, inspiring later studies. However, You (2018) pointed out that these junctures may share some common characteristics, and an adequate linguistic account should be able to capture the shared nature of these lexically marked contexts rather than supply a list of them. You (2018) also found that Chen and Norman mix up contexts at different levels and involve some contexts that should not be considered at the phrasal level. Moreover, according to You, Chen & Norman’s

analysis fails to cover some other syntactic contexts. Chan (1980) proposes the Head Dominance Condition to account for the phrasal tone sandhi in the Fuzhou dialect, as presented below:

Head Dominance Condition (Chan, 1980)

Let y be a monosyllabic word immediately dominated by a preterminal category symbol Y, and Y be the head of X. Daughters of Z are within the tone sandhi domain of y if and only if Z is the first node to the left of Y, and the daughters of Z are monosyllabic words.

The HDC can account for the application of TS between a monosyllabic pre-head modifier and its head and the blocking of TS between a monosyllabic head and its post-head complements, but incorrectly bars the chance of the application of TS in the verb object construction (You 2018). Wright (1983) divides a Fuzhou sentence into four levels of the prosodic domain as below:

Phonological Phrase

Super-foot

Foot

Syllable

In Wright's analysis, the prosodic structure is heavily relied on, while the syntactic information is only a minor factor. She argues that a phonological phrase must be constructed with a weak-strong binary foot, and the foot must be built above syllables strings from right to left at the lexical level, then phrase level. The unfooted syllable will be marked "w" and form a super-foot with the binary foot, and the unfooted syllable to the right of a binary structure is able to form an independent foot on its own. However, You argued that the simplicity of using syntactic information makes her analysis difficult when dealing with constructions other than subject-predicate constructions and verb-object constructions.

6.4.7 Syntactic Contexts

A study by Suzuki (2012) examined how syntactic contexts are realized in various dialects. They found out that there is a wide range of syntactic contexts in which the TS is either blocked or triggered, which has been the basis for most analyses. The following examples can be used to discuss syntactic contexts and also help to highlight some of the problems that exist. Some of the lexically marked contexts include 共[koyi^{242}] 2yined how sy 乞[k^{h}Øy?^{23}]

When properly applied, they give ‘to be in or at.’ These junctures can share various common characteristics. Therefore, there arises the need to have enough linguistic account in order to be able to capture the common nature of these contexts that are lexically marked instead of just supplying a list of them. Although Suzuki (2010) provides an analysis that makes it possible for such a lexical idiosyncrasy to function, it cannot be adequate to spearhead a linguistic analysis of the Chengdu or Fuzhou TS at the phrasal level.

The second shortcoming for the study by Chen and Norman (1965) is that it mixes up contexts at various levels and includes some contexts that need not be considered at the phrasal level. One example is that the terminal juncture is mainly associated with intonation and should therefore be treated as a notion related to the intonational phrase domain.

What is more, a string that comprises a reduplicated adjective with the latter reduplication marker and the juncture in between should be understood as a Type A clitic group domain. Therefore, the blocking of TS at such a particular juncture needs to be properly accounted for. The TS may also be applied at an intermediate juncture between the members of the reduplicated adjective, and it can therefore be a reduplicated adjective since it forms a prosodic word domain.

It is essential to note that all studies are not the same, and some fail to cover all the essential syntactic aspects. For example, in some studies such as that by Chen and Norman (1965), the

application of TS is bound to occur only between two monosyllabic components such as “Verb + Object” and “Adverb + Noun.” Even with this, it is helpful to remember that there exist various instances where the verb-object construction is disyllabic. In such cases, the TS may be blocked, which Chen and Norman's study (1965) fails to address. As a result, to account for the Fuzhou TS at the phrasal level, there is the need for several other syntactic constructions to be considered.

Chan (1980) tried to examine the relationship between the Fuzhou tone sandhi at the phrasal level to syntactic structure. Following this observation, the author proposed the Head Dominance Condition to account for the phrasal tone sandhi in the Fuzhou dialect.

Wright (1983) showed that the Fuzhou phrasal-level TS appears to be blocked between a disyllabic verb and the following object. However, this appears to be triggered between the object and a monosyllabic verb. This explanation cannot be accommodated by Chan’s (1980) Head Dominance Condition. Cognizant of this, Wright (1983) developed a prosodic analysis where the prosodic structure is what is mainly relied on, while syntactic information is a minor factor. The study claims that the asymmetry shown by monosyllabic verbs and disyllabic verbs may be understood in conjunction with the different prosodic structures involved in forming a tone sandhi domain. Thus, the author divided the Fuzhou sentence into four major prosodic domains: the phonological phrase, super-foot, foot, and syllable.

According to the analysis by Wright, a phonological phrase is considered in such a way that the end of the provided phonological phrase coincides with the end of a noun phrase abbreviated as NP or a clause abbreviated as (S). Based on this, Wright argued that a weak-strong binary foot needs to be constructed within a phonological phrase and it should be built above the syllable strings from right to left at the lexical level first and then the phrasal level. After this, there exists a remaining unfooted syllable to the left of a binary foot, usually marked “w,” and a form of super-

foot with the binary foot (Wang et al., 2012). On the right of a binary foot is an unfooted syllable that can form an independent foot by itself.

Shih (1986) took a different route upon realizing that neither prosodic nor syntactic properties are sufficient to solve the Fuzhou phrasal tone sandhi domain. The author also took an approach to combine both prosodic and syntactic information. While Chan (1980) proposed Head Dominance Condition but realized that this was not adequate enough, Shih proposed a revised version of Head Dominance Condition, which defines where TS is blocked instead of being applied.

6.4.8 Phrasal TS Domain Formation (Zhang 1992)

The phrasal tone sandhi rule is applied iteratively right-to-left to the syllable, either the adjunct or the head of an argument, when the syllable c-commands the following syllable. Zhang's analysis captures most facts with only one simpler rule, but You (2018) argued that this is not perfect since Zhang's (1992) analysis also has difficulty dealing with complex verb-object constructions. Based on this, it is evident that the idea of complex verb-object constructions should be looked at from a keener perspective to ensure that the correct results are obtained.

6.4.9 Summary

This section has revealed the basic tone sandhi phenomena of quadri-tonal and tri-tonal strings in Chengdu. It has been observed that different rules are applied differently in this dialect. The most complicated part of Chengdu tone sandhi is mainly the unpredictable rule application directions that are evident in the tri-tonal strings. Even with this, based on OT, it has been possible to unravel the factors governing the conflicting rule application directions as well as whatever causes them to behave so. As this study has indicated, there exists a correlation between the directions of rule application and normal versus underapplications.

In the direction-sensitive tonal patterns, the right-to-left directionality may give rise to underapplications, while the left-to-right directionality may give rise to normal applications. In reference to Chengdu tone sandhi, the underapplications that have been observed are motivated by the need for a tonal output to be more like a prosodically related base. Therefore the need to achieve identity is the primary factor that gives rise to the right-to-left directionality. This study has also found that maximizing identity between prosodically related tonal outputs is essential in Chengdu tone sandhi. Even with this, it has been noted that the maximization identity is not fulfilled at all times. To be able to achieve an identity that would give rise to highly marked tonal outputs as explained by the *POLAR markedness constraint, there is always the need to sacrifice identity preservation. In such an instance, tone sandhi functions reversely from right to left, and the output produced would reveal the characteristics of normal application. Therefore, the motivation of the left-to-right directionality is to limit the chances of highly marked sequences. The interaction between the markedness constraint *POLAR and IDENT-BOT enables the different directions to fall naturally.

The study also discovered that the markedness constraint over IDENT-BOT reveals that the IDENT-BOT is always satisfied. The only exception is when that satisfaction generates forms that violate the markedness constraint. These phenomena that have been discussed are unique to Chengdu tone sandhi. Similar experiences and realizations are also evident in other languages and dialects, such as Sixian-Hakka and Beijing Mandarin, as well as Hakka-Lai, Boshan, and Tianjin.

In the languages mentioned above, realizing identity between prosodically related forms plays a fundamental role unless the marked forms are generated. In such an instance, the identity that exists between the prosodically related forms is sacrificed. Thus, the phenomenon that is observed in the Chengdu dialect is part of a universal tendencies that require some form of

attention. The study has shown that the discussion of quadri-tonal sandhi reveals that morphosyntactic structures which do not play a significant role in predicting tri-tonal sandhi are observed in quadri-tonal strings. As explained, tone sandhi starts to respect the morphosyntactic structures mainly in quadri-tonal strings because of the upper limit on the size of the tone sandhi domain.

To be able to realize oversized domains, there is always the need for the tonal strings to be divided into different tonal domains based on morphosyntactic structure. This study has further found out that the non-uniqueness theory profoundly influenced phonemic analysis. The best solution in the phonemic analysis does not exist based on theory. Instead, competing solutions of the same language may co-exist, with each of the solutions having its own merit and all being valid.

The phonemic analysis does not seem very useful due to the lack of a clear solution, and this may explain why the Chinese tradition of phonological descriptions does not offer a phonemic inventory. Instead, inventories of tones, rimes, and onsets are mainly offered and, in some cases, an inventory of evident syllables since inventories are mainly unambiguous. Despite its ambiguity, phonemic analysis is still used in the Western tradition of phonological descriptions. The reason why is because the Western tradition is influenced by the realization that most of these languages are spelled alphabetically and both vowels and consonants are considered as basic units. The other plausible reason for this is that Western languages contain most polysyllabic words, which makes the syllable boundaries very unclear. As a result, it is challenging to develop an inventory of rimes, onsets, or an inventory of a syllable. Therefore, phonemic analysis remains the only plausible option. Despite this, the lack of rigor in phonemic analysis has resulted in various scholars doubting its validity.

A significant shortcoming in the uniqueness theory found in its assumption is that no common set of criteria can be used for all solutions. The present study has proposed a set of criteria to be established, including phonetic facts, constraints on syllable gaps, rime structure, riming properties, feature theory, and syllable complexity. The proposal has been applied by a detailed examination of the Chengdu dialect, whose phonemic analysis has not been offered before. Comparing various proposals based on "CGV" segmentation, "CVX" segmentation, "CV" segmentation, the CVX analysis came to be regarded as the best and most viable solution. Thus, the present study solves a problem that has existed in phonology for a very long time and gives an example of how to determine phonemes in other languages.

Also uncovered by this study was the fact that the various directions are a result of the interaction of the constraints, mainly the markedness constraint *POLAR, and the constraint that requires output-to-output correspondence, which is IDENT-BOT. Where the markedness constraint dominates IDENT-BOT, it is an assurance that tone sandhi applies right-to-left to achieve identity between prosodically related outputs. The only exception is when such directionality produces highly marked forms. When this happens, the tone sandhi applies left-to-right.

The various directions may not be accounted for with the rule-based analysis if only a single tone sandhi domain is used. For example, if one assumes that the tone sandhi domain for Chengdu is (σ(σσ)), the only tonal patterns which may be obtained by right-to-left directionality can be easily accounted for (Chen, 1997). However, the tonal patterns that are obtained by the left-to-right directionality may not be accounted for if a similar domain is used. Especially in Chengdu-specific analyses, the problem of TS application at the phrasal level is presented but not well

explained. In order to manage this issue, linguistic data from Chengdu will be investigated in the following section.

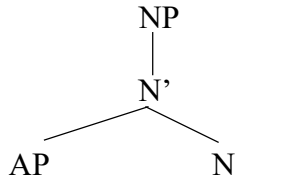
6.5 A New approach to the investigation and analysis of the TS application of the phonological phrase in Chengdu

As mentioned before, one of the essential things to consider when dealing with tone sandhi is the domain in which it operates and two main approaches explain how the this domain can be defined. One of these approaches shows that the tone sandhi mainly operates on morphosyntactic structures. The second approach posits that tone sandhi need not operate directly on morphosyntactic structures. Therefore, the tone sandhi domain is a form of prosodic structure that collaborates between phonology and syntax. Also, with linguistic data from Chengdu, it can be seen that neither RBA nor EBA provides a solid definition for the domain of the phonological phrase in Chengdu and the reason why different TS application performance in different strings has different performance at the phrasal level remains unexplained in this dialect. According to You (2018), when using the Edge/End-Based approach to analyze the issue of Fuzhou TS application, it mainly runs into three fundamental problems. Firstly, in an incorrect way, EBA excludes the possibility of the TS application within the VO construction since the right edge of the head V is marked with a TS domain boundary (Chan, 1980). Secondly, it fails to explain the TS application between the head D of DP and the following classifier. Finally, it does not provide a solid illustration for the contrast presented by monosyllabic verbs and disyllabic verbs. Problems in Fuzhou are also issues in Chengdu when applying EBA to analyze the same situation. While compared to EBA, RBA makes reference to the recursive and the non-recursive side of a head instead of the ends of heads or maximal projections since the non-recursive side is defined as the side where specifiers are located, and only V, N, and A are considered lexical heads according to

Nespor & Vogel (1986). With the impact of branching, Nespor and Vogel proposed the optional restructuring of φ in the RBA approach. However, the investigation dependent on RBA is flawed. Since just V, N, and A are considered lexical heads, nothing in the RBA-based examination can illustrate the TS application between the determiner/quantifier and the classifier. Also, the RBA-based approach cannot manage the obstructing of TS between the verb and the object of a disyllabic structure. Moreover, the obstructing of TS appears to fail to fill in the RBA-based investigation, as well. See examples:

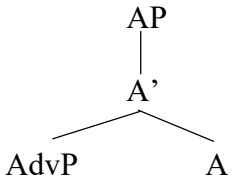
(1) Modifier-head (attributive-noun and adverbial-adjective/verb)

a.



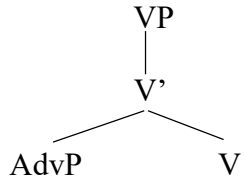
[炒 饭]φ
[ts^{h}au^{51} fɛn^{213}]
→ [ts^{h}au^{55} = fɛn^{213}]
stir rice
‘fried rice’

b.



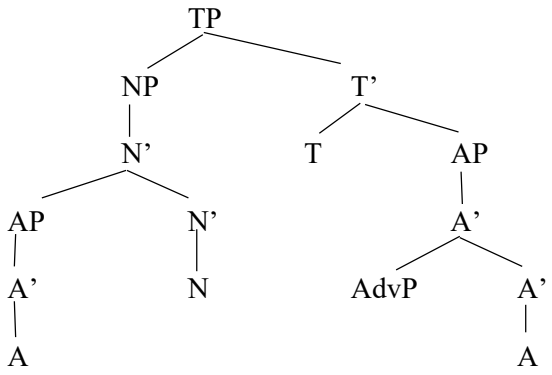
[好 臭]φ
[xau^{51} ts^{h}əu^{213}]
→ [xau^{55} = ts^{h}əu^{213}]
good smelly
‘very smelly

c.



[自 助]φ
[tsi^{213} tsu^{213}]
→ [tsi^{32} = tsu^{213}]
self help
‘self-service’

(2) Subject-predicate



[炒 饭]φ [好 臭]φ

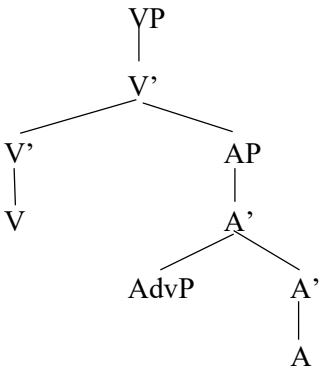
[ts^{h}au^{51} fɛn^{213}] [xau^{51} ts^{h}əu^{213}]

→ [ts^{h}au^{55} = fɛn^{213}] # [xau^{55} = ts^{h}əu^{213}]

stir rice good smelly

'The fried rice is very smelly.'

(3) Verb-resultative complement



[跑]φ [飞 快]φ

[pau^{51}] [fei^{45} k^{h}uai^{213}]

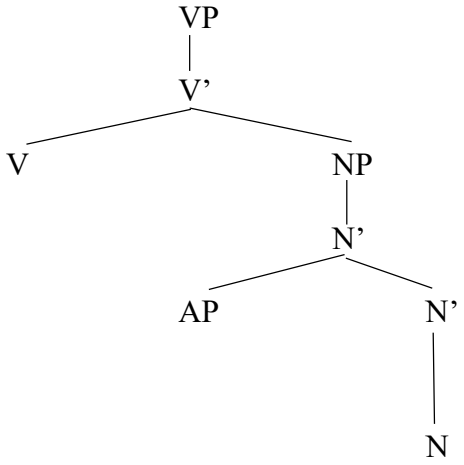
→ [pau^{51}]# [fei^{35} = k^{h}uai^{213}]

run very fast

'Someone runs very fast.'

(4) Verb-object

a.



[骑]φ [小 骆驼]φ

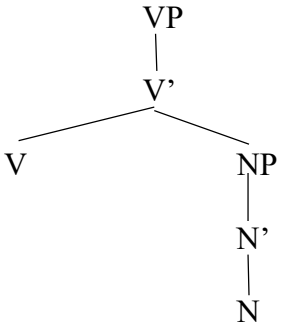
[tɕ^{h}i^{31}] [ɕiau^{51} n^{l}o^{31}to^{31}]

→ [ts^{h}i^{31}]# [ɕiau^{55} = n^{l}o^{43}to^{31}]

ride small camel

'to ride a small camel'

b.



[骑]φ [骆驼] φ

[tɕ^{h}i^{31} n^{l}o^{31}to^{31}]

→ [tɕ^{h}i^{43} = n^{l}o^{43}to^{31}]

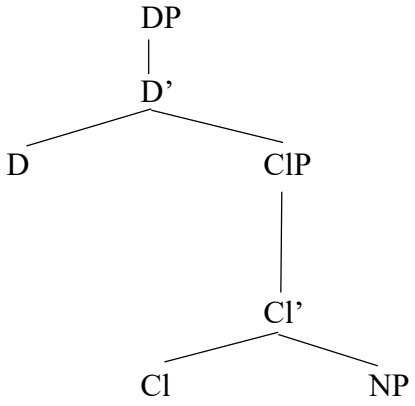
ride camel

'to ride a camel'

Examples of the RBA-based approach fail to illustrate the TS application between the determiner/quantifier and the classifier.

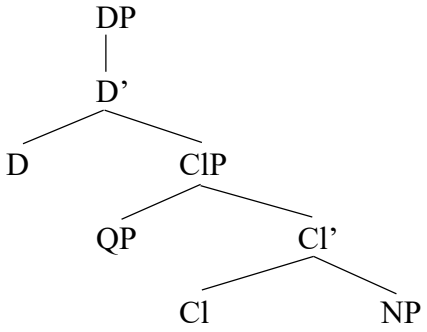
(5) Determiner/quantifier-classifier-noun

a.



	这	头		骆驼	
	tsɛ^{213}	t^{h}əu^{31}		n^{l}o^{31}to^{31}	
→	tsɛ^{32} =	t^{h}əu^{31}	#	n^{l}o^{43}to^{31}	
	this	Cl		camel	
	'this camel'				

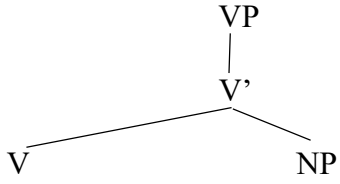
b.



	一		头		骆驼	
	i^{31}		t^{h}əu^{31}		n^{l}o^{31}to^{31}	
→	i^{43}	=	t^{h}əu^{31}	#	n^{l}o^{43}to^{31}	
	one		Cl		camel	
	'one camel'					

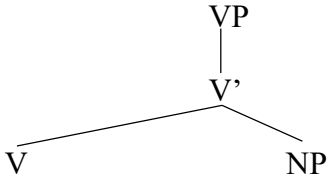
(6) Disyllabic verb-object

a.



	[维修]φ		[玻璃]φ	
φ restructuring	[维修		玻璃] φ	
	[uei^{31}ɕiəu^{45}		po^{45}n^{l}i^{31}]	
→	[uei^{43}ɕiəu^{45}]	#	[po^{35}n^{l}i^{31}]	
Prediction→	*[uei^{43}ɕiəu^{45}	=	po^{35}n^{l}i^{31}]	
	fix		glass	
	'to fix glass'			

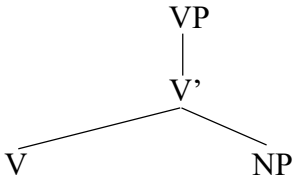
b.



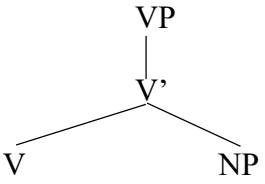
	[喜欢]φ		[钱]φ	
	[喜欢		钱]φ	
	[ɕi^{51}xuan^{45}		tɕ^{h}ian^{31}]	
→	[ɕi^{54}xuan^{45}]	#	[tɕ^{h}ian^{31}]	
→	*[ɕi^{54}xuan^{35}	=	tɕ^{h}ian^{31}]	
	like		money	
	'to like money'			

(7) Verb-[theme] argument

a.



b.



	[切]φ		[上海]φ		[飞]φ		[上海] φ
φ restructuring	[切		上海]φ		[飞		上海] φ
	[tɕʰiɛ^{213}		saŋ^{213}xai^{51}]		[fei^{45}		saŋ^{213}xai^{51}]
→	[tɕʰiɛ^{213}]	#	[saŋ^{32}xai^{51}]	→	[fei^{45}]	#	[saŋ^{32}xai^{51}]
Prediction →	*[tɕʰiɛ^{32}	=	saŋ^{32}xai^{51}]	→	*[fei^{35}	=	saŋ^{32}xai^{51}]
	go		Shanghai		fly		Shanghai
	'to go to Shanghai'				'to fly to Shanghai'		

As shown by the examples above, neither the EBA nor the RBA approach is able to deal with the TS application in all cases as discussed earlier. Specifically, they may produce wrong predictions in some phrasal-level constructions. Therefore, a new approach to dealing with TS application based on the definition of the phonological phrase and the optional restructuring is needed.

The same issue was discussed by You in 2018. To account for weaknesses of earlier approaches, You proposed a new definition of the phonological phrase in the Fuzhou dialect:

(8) Phonological Phrase (φ) domain in the Fuzhou dialect

a. Mark the right edge of every lexical head X, except where XP is an adjunct;

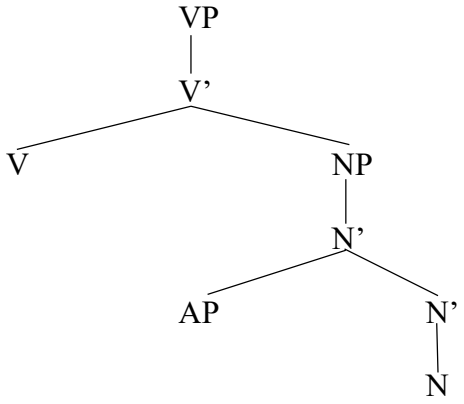
b. On the non-recursive side of the lexical head X, mark the right edge of the first phonetically overt head Y (if any; either lexical or functional) outside of XP; ωs/CGs that are separated by the right edge of X or Y belong to different φs;

c. φ restructuring: a non-branching φ, which is the first complement of X on its recursive side, is joined into the φ that contains X.

The definition above both accounts for the TS application in Fuzhou between the determiner/quantifier and the classifier and also successfully deals with the blocking of TS between a disyllabic verb and its object NP. Moreover, the blocking of TS between a verb and a [-theme] argument can be addressed here as well. Therefore, in the following section, a new approach is adopted to account for the TS application issue at the phrasal level in Chengdu. Examples below show whether the same definition can deal with the Chengdu dialect or not:

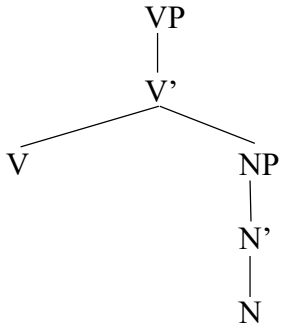
(8) Verb-object

a.



	骑]	小		骆驼]	
	[骑]φ	[小		骆驼]φ	
	[tɕʰi^{31}]	[ɕiau^{51}		n^{l}o^{31}to^{31}]	
→	[tsʰi^{31}]#	[ɕiau^{55}	=	n^{l}o^{43}to^{31}]	
	ride	small		camel	
	‘to ride a small camel’				

b.



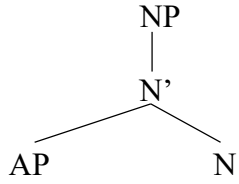
	骑]		骆驼]	
	[骑]φ		[骆驼] φ	
	[骑		骆驼] φ	
	[tɕʰi^{31}		n^{l}o^{31}to^{31}]	
→	[tɕʰi^{43}	=	n^{l}o^{43}to^{31}]	
	ride		camel	
	‘to ride a camel’			

In the examples above, (a) first denotes the right edge of the lexical head V 骑 ‘to ride’ and the lexical head N 骆驼 ‘camel.’ The fact that the right edge of the head A 小 ‘small’ is not stamped results from the maximal projection AP capacities as the adjunct of the head N. Then, at that point (b) again denotes the right edge of the head V 骑 ‘to ride’ for being the main head on the non-

recursive side of the lexical head N and outside of NP. Therefore, prosodic words 小 ‘small’ and 骆驼 ‘camel’ are assembled into one phonological phrase, and the other prosodic word 骑 ‘to ride’ structures one more phonological phrase all alone. Subsequently, the utilization of TS between 小 ‘small’ and 骆驼 ‘camel’ and the hindering of TS between the head V 骑 ‘to ride’ and its supplement are both represented. Conversely, after the setting-up of (a) and (b) as two phonological phrases in (b), the φ restructuring bunches these two phonological expressions into one single φ, and thus the NP 骆驼 ‘camel’ shapes a non-spreading φ, which is the complement of the head V 骑 ‘to ride’ in (b). By rebuilding (b) into a solitary phonological phrase, the TS application between 骑 ‘to ride’ and 骆驼 ‘camel’ gets clarification. Other than the examples above, this new proposal of the phonological phrase domain can likewise be very much upheld by the vast majority of different linguistic data talked about in earlier discussions, as shown below:

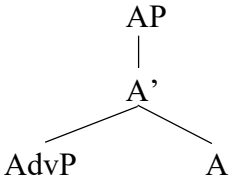
(9) Modifier-head (attributive-noun and adverbial-adjective/verb)

a.



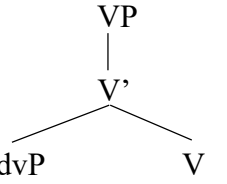
炒 饭]φ
[炒 饭]φ
[tsʰau^{51} fan^{213}]
→ [tsʰau^{55} = fan^{213}]
stir rice
‘fried rice’

b.



好 臭]φ
[好 臭]φ
[xau^{51} tsʰəu^{213}]
→ [xau^{55} = tsʰəu^{213}]
good smelly
‘very smelly

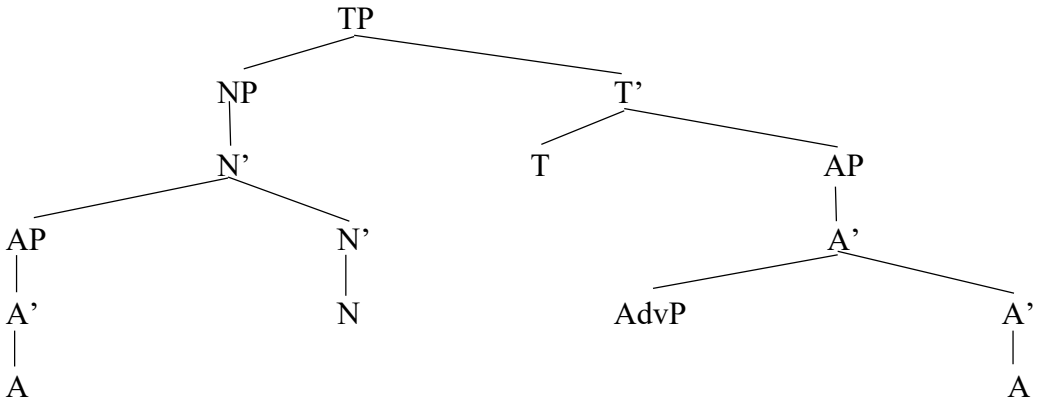
c.



自 助]φ
[自 助]φ
[tsi^{213} tsu^{213}]
→ [tsi^{32} = tsu^{213}]
self help
‘self-service’

(10) Subject-predicate

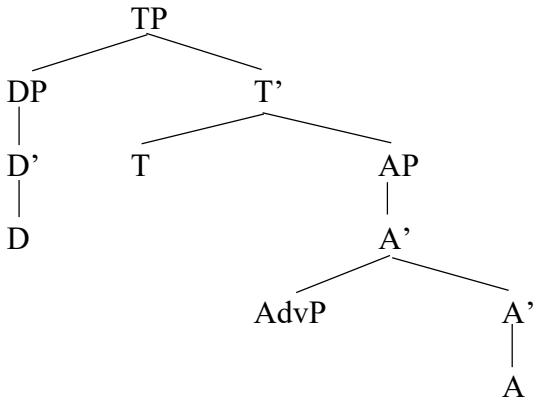
a.



	炒		饭]φ		好		臭]φ
	[炒		饭]φ		[好		臭]φ
	[ts^{h}au^{51}		fan^{213}]		[xau^{51}		ts^{h}əu^{213}]
→	[ts^{h}au^{55}	=	fan^{213}]	#	[xau^{55}	=	ts^{h}əu^{213}]
	stir		rice		good		smelly

‘The fried rice is very smelly.’

b.

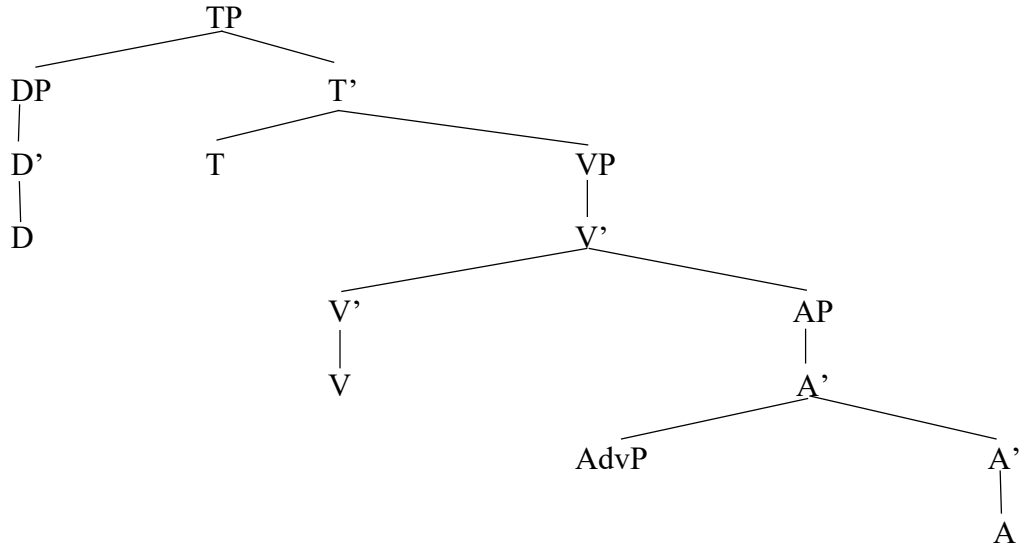


	她		只		乖]
	[她]φ		[只		乖]φ
	[t^{h}a^{45}]		[tsi^{51}		kuai^{45}]
→	[t^{h}a^{45}]	#	[tsi^{54}	=	kuai^{45}]
	she		very		obedient

‘She is very obedient.’

(11) Verb-resultative complement

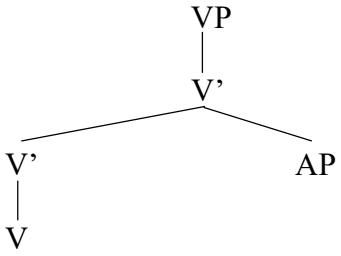
a.



	他		跑]	飞		快	
	[他]φ		[跑]φ	[飞		快]φ	
	[t^ha^{45}]		[pau^{51}]	[fei^{45}		k^huai^{213}]	
→	[t^ha^{45}]	#	[pau^{51}]#	[fei^{35}	=	k^huai^{213}]	
	he		run	very		fast	

‘He runs very fast.’

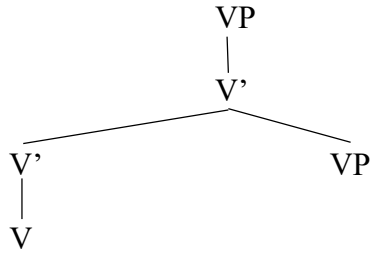
b.



	弄]		好
	[弄]φ		[好]φ
→	[$n^loŋ^{45}$]		[xau^{51}]
	[$n^loŋ^{45}$]	#	[xau^{51}]
	do		well

‘do something well’

c.

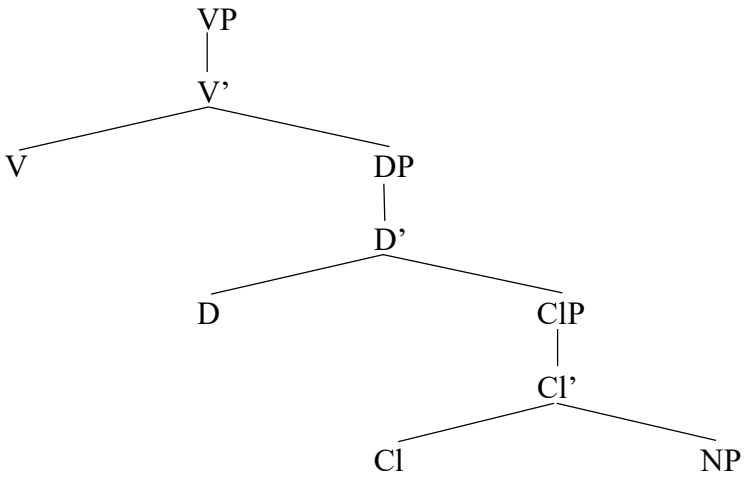


	弄]		完
	[弄]φ		[完]φ
→	[$n^loŋ^{45}$]		[uan^{31}]
	[$n^loŋ^{45}$]	#	[uan^{31}]
	do		finish

‘finish doing something’

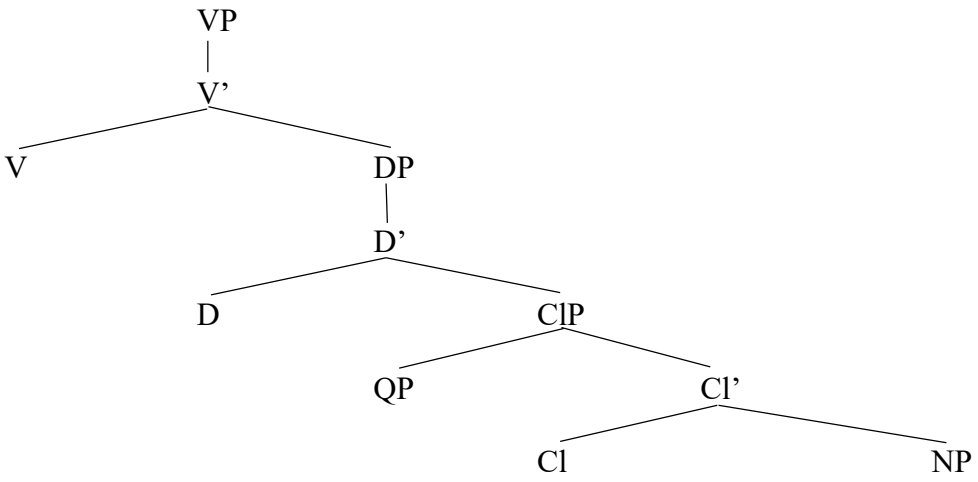
(12) Determiner/quantifier-classifier-noun

a.



	骑]	这	头		骆驼]
	[骑]φ	[这	头]φ		[骆驼]φ
→	[tɕʰi^{31}]	[tsɛ^{213}	tʰəu^{31}]		[nˡo^{31}to^{31}]
	[tɕʰi^{31}]#	[tsɛ^{32}=	tʰəu^{31}]	#	[nˡo^{43}to^{31}]
	ride	this	Cl		camel
		‘to ride this camel’			

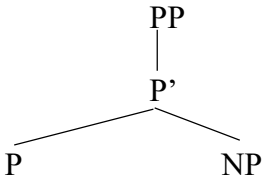
b.



	骑]	一		头		骆驼]
	[骑]φ	[一		头]φ		[骆驼]φ
	[tɕʰi^{31}]	[i^{31}		tʰəu^{31}]		[nˡo^{31}to^{31}]
→	[tɕʰi^{31}]#	[i^{43}	=	tʰəu^{31}]	#	[nˡo^{43}to^{31}]
	ride	one		Cl		camel
	‘to ride one camel’					

(13) Prepositional phrases

a.



往] 左]

[往]φ [左]φ

[往 左]φ

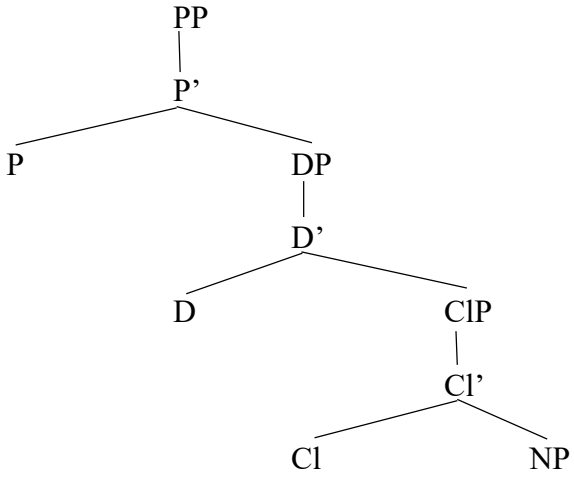
[uaŋ^{51} tso^{51}]

→ [uaŋ^{55} = tso^{51}]

towards left

‘towards the left’

b.



朝] 这 条 巷巷]

[朝]φ [这 条]φ [巷巷]φ

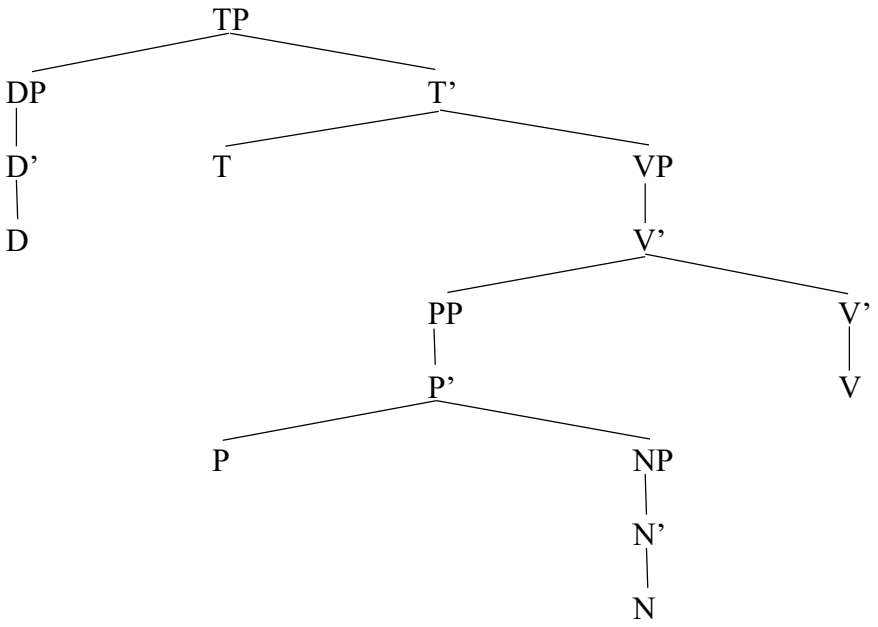
[ts^{h}au^{31}] [tsɛ^{213} t^{h}iau^{31}] [xaŋ^{213}xaŋ^{213}]

→ [ts^{h}au^{31}]# [tsɛ^{32} =t^{h}iau^{31}] # [xaŋ^{213}xaŋ^{55}]

toward this Cl alley

‘towards this alley’

c.

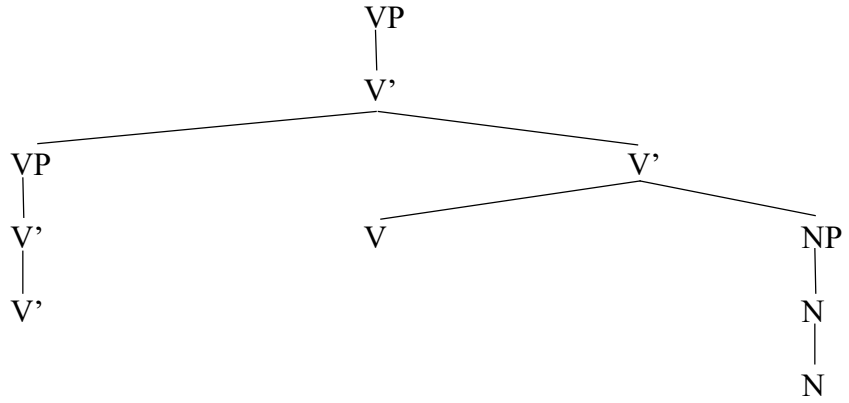


	你	往		左]	拐]
	[你]φ	[往]φ		[左]φ	[拐]φ
	[你]φ	[往		左]φ	[拐]φ
	[ny^{51}]	[uaŋ^{51}		tso^{51}]	[kuai^{51}]
→	[ny^{51}]#	[uaŋ^{55}	=	tso^{51}]	[kuai^{51}]
	you	towards		left	turn

‘You turn to the left.’

(14) Serial verb construction

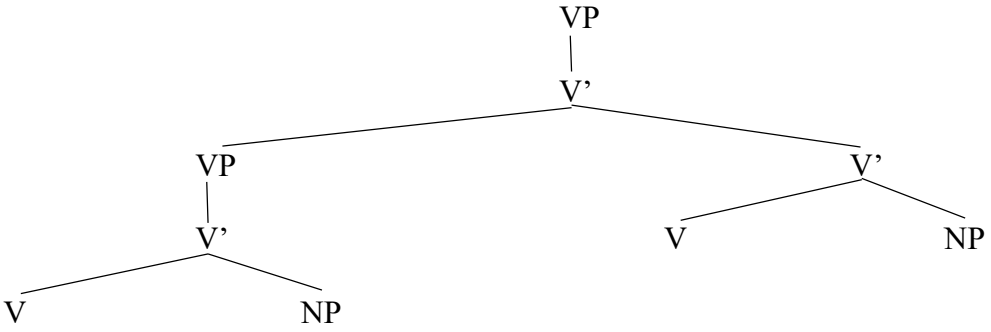
a.



	切	洗]		手]
	[切	洗]φ		[手]φ
	[切	洗		手]φ
	[tɕʰiɛ^{213}	ɕi^{51}		səu^{51}]
→	[tɕʰiɛ^{32}	=ɕi^{55}	=	səu^{51}]
	go	wash		hand

‘to go wash one’s hands’

b.

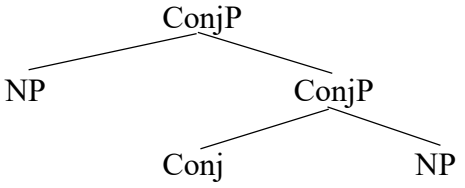


	切		厨房]		炒]		饭]
	[切]φ		[厨房]φ		[炒]φ		[饭]φ
	[切		厨房]φ		[炒		饭]φ
	[tɕʰiɛ^{213}		ts^{h}u^{31}faŋ^{31}]		ts^{h}au^{51}		fan^{213}]
→	[tɕʰiɛ^{32}	=	ts^{h}u^{43}faŋ^{31}]	#	[ts^{h}au^{55}	=	fan^{213}]
	go		kitchen		stir		rice

‘to go to the kitchen to stir the rice’

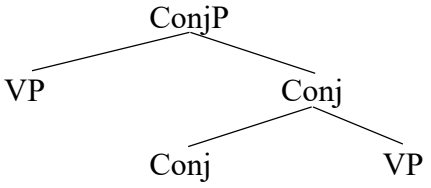
(15) Coordination construction

a.



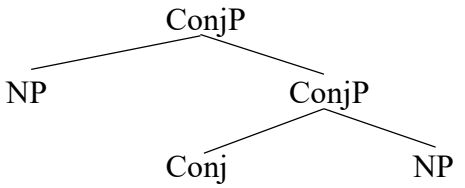
	婆]	跟		孃]
	[婆]φ	[跟]φ		[孃]φ
	[p^ho^{31}]	[kən^{45}]		[nʲiaŋ^{45}]
→	[p^ho^{31}]#	[kən^{45}]	#	[nʲiaŋ^{45}]
	grandma	and		aunt
	‘grandma and aunt’			

b.



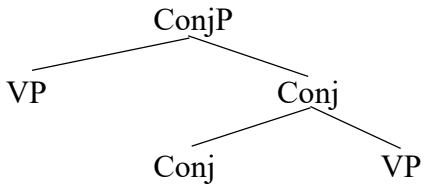
	烧]	跟		烤]
	[烧]φ	[跟]φ		[烤]φ
	[sau^{45}]	[kən^{45}]		[k^hau^{51}]
→	[sau^{45}]#	[kən^{45}]	#	[k^hau^{51}]
	burn	and		bake
	‘to burn and bake’			

c.



	婆]	ø		孃]
	[婆]φ	ø		[孃]φ
	[p^ho^{31}]	ø		[nʲiaŋ^{45}]
→	[p^ho^{31}]#	ø	#	[nʲiaŋ^{45}]
	grandma			aunt
	‘grandma and aunt’			

d.



	烧]	ø		烤]
	[烧]φ	ø		[烤]φ
	[sau^{45}]	ø		[k^hau^{51}]
→	[sau^{45}]#	ø	#	[k^hau^{51}]
	burn			bake
	‘to burn and bake’			

Therefore, as shown in the examples above, when applying You’s definition to the domain of the phonological phrase, some phenomena can be presented, and contrastive tones are reorganized as below:

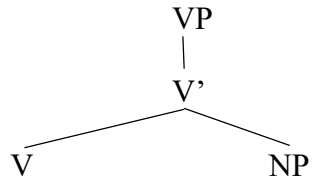
a.	婆孃	p^ho^{31}	nʲiaŋ^{45}	→	p^ho**^{31}**	nʲiaŋ^{45}	‘grandma and aunt’
	婆孃	p^ho^{31}	nʲiaŋ^{45}	→	p^ho**^{43}**	nʲiaŋ^{45}	‘wife’
b.	烧烤	sau^{45}	k^hau^{51}	→	sau**^{45}**	k^hau^{51}	‘to burn and bake’
	烧烤	sau^{45}	k^hau^{51}	→	?sau**^{45}**	k^hau^{51}	‘barbecue’

c.	炒饭	ts^hau^{51}	fan^{213}	→	$ts^hau^{\mathbf{51}}$	fan^{213}	‘to stir the rice’
	炒饭	ts^hau^{51}	fan^{213}	→	$ts^hau^{\mathbf{55}}$	fan^{213}	‘fried rice’

Generally speaking, the first line in each pair does not go through TS while the second line does, except for (b) since the tone value does not change in the sandhi pattern. According to You’s definition, (a) and (b) are both coordination structures, and in this manner, two phonological phrases are displayed. Example (c), on the other hand, is a verb-resultative complement structure, and in this manner, there are also two phonological phrases. Supposedly, in this case, TS at the phrasal level applies inside yet not across the phonological phrase domain and indeed it gets blocked in the first line of each pair. Contrary the first line, the second line in each pair is a prosodic word and henceforth shapes the domain for TS application.

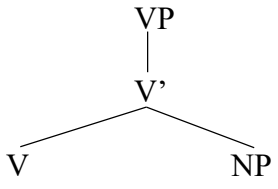
In sum, by adopting You’s alternative approach proposed for Fuzhou phonological phrases, various linguistic data regarding Chengdu TS at the phrasal level can be uncovered and explained. That said, a few experimental issues remain as yet unaddressed. Like the Fuzhou dialect, in Chengdu, there are also cases where not every verb undergoes the TS rule with a followed non-branching complement. See examples:

(16) a.



	切		上海
	$tɕ^hiɛ^{213}$		$saŋ^{213}xai^{51}$
→	$tɕ^hiɛ^{213}$	#	$saŋ^{32}xai^{51}$
	go		Shanghai
	‘to go to Shanghai’		

b.



	骑		骆驼
	$tɕ^hi^{31}$		$n^lo^{31}to^{31}$
→	$tɕ^hi^{43}$	=	$n^lo^{43}to^{31}$
	ride		camel
	‘to ride a camel’		

To account for the distinct performance in the examples above, and based on previous studies, You concluded that the result is the difference between transitive and intransitive verbs. For example, a transitive verb like 骑 ‘to ride’ can directly take its object, while an intransitive verb like 切 ‘to go’ does not take a direct object. Instead, it assigns the theta-role to the bounded syntactic argument at the subject position, and the argument after this intransitive verb does not get the theta-role from the verb. Therefore, You suggests that a constituent assigns theta-role to the post-verb argument to form a construction that shares the same semantic meaning and TS performance with ‘intransitive V +location’ structure. In other words, problems in the example above can be handled by distinguishing transitive verbs and intransitive verbs along with their syntactic structures.

Another problem is the different TS performance between the monosyllabic and disyllabic verbs, both in Fuzhou and Chengdu. The monosyllabic verb undergoes TS with a first non-branching complement as the object, but the second syllable of the disyllabic verb does not undergo TS rule. See examples:

(17) a.	吃		饭	b.	骑		骆驼	
	ts^hi^{31}		fan^{213}		$tɕ^hi^{31}$		$n^lo^{31}to^{31}$	
→	ts^hi^{43}	=	fan^{213}	→	$tɕ^hi^{43}$	=	$n^lo^{43}to^{31}$	
	eat		rice		ride		camel	
	‘to have a meal’				‘to ride a camel’			

(18)a.	喜欢		饭	b.	喜欢		骆驼	
	$ɕi^{51}xuan^{45}$		fan^{213}		$ɕi^{51}xuan^{45}$		$n^lo^{31}to^{31}$	
→	$ɕi^{54}xuan^{45}$	#	fan^{213}	→	$ɕi^{54}xuan^{45}$	#	$n^lo^{43}to^{31}$	
	like		rice		like		camel	
	‘to like rice’				‘to like camel’			

The abovementioned examples have the same syntactic structure: “a verb head + non-branching complement.” Therefore, the domain of the phonological phrase is constructed on the basis of syntactic notions as all approaches have agreed. In this manner, Zhang (1992) suggests that only the syllable that is either the adjunct or the head of an argument can undergo phrasal-level TS. Specifically, when there is more than one syllable in one constituent, no single syllable contained in the constituent can serve as the adjunct or the head of an argument on its own. Instead, it should be the overall polysyllabic constituent that has this function. In other words, Zhang’s findings indicate that only a monosyllabic adjunct or head in the Fuzhou dialect may undergo phrasal-level TS. As shown above, linguistic data from Chengdu also supports this analysis. Therefore, based on Zhang’s analysis, and with the consideration on restriction rules, You finalized an alternative approach to phonological phrasing in the Fuzhou dialect that combines RBA and EBA, as stated below:

(19) Phonological Phrase (φ) domain in the Fuzhou dialect

a. Mark the right edge of every lexical head X, except where XP is an adjunct;

b. On the non-recursive side of the lexical head X, mark the right edge of the first phonetically overt head Y (if any; either lexical or functional) outside of XP; ωs/CGs that are separated by the right edge of X or Y belong to different φs;

c. φ restructuring: a non-branching φ, which is the first complement of X on its recursive side, is joined into the φ that contains X.

The newly finalized approach above can deal with issues at the phrasal level in Fuzhou and account for the related problems in the Chengdu dialect. Issues such as the contrast performance between monosyllabic verbs and disyllabic verbs and the blocking of TS within certain constructions, coordination constructions, and double-object constructions are well handled.

6.6 Summary

This chapter investigates the TS application in Chengdu at the phrasal level. Neither the traditional RBA nor EBA approach can fully account for all the prosodic phenomena in this dialect. Therefore, there are still some cases that remain unclear. Based on previous approaches, You finalized an alternative approach for the phonological phrase domain in the Fuzhou dialect, which Chengdu can also adopt to deal with TS application at the phrasal level. With the new approach and related restriction rule, the TS rule that applies in the domain of phonological phrases is well handled. The next chapter will continue the topic with the investigation of intonational phrases in the Chengdu dialect.

Chapter VII The Intonational Phrase in the Chengdu Dialect

The intonational phrase in the Chengdu dialect will be explained in this chapter. It also serves as the dissertation's last prosodic component in the hierarchy. The intonation phrase is first defined and reorganized in terms of the domain's core definition and occurrences across languages. Based on the definition and restructuring of the intonational phrase, intonational phrases in Chengdu are then analyzed, followed by appraisals of phonological phenomena, rule application, and constraints.

7.1 Introduction and Preliminary Study Analysis

The final chapter begins with a discussion of Nespor and Vogel's (1976) notion of the intonation phrase domain in the context of prosodic phonology, specifically within the framework of prosodic phonology. First, the most important guidelines in forming an intonational phrase are discussed. Next, the restructuring of an intonational phrase and any restrictions that may apply to the restructuring is examined. This is followed by a look at the most frequent phonological rules within the domain of intonational phrases in detail.

7.1.1 How to define the intonational phrase

In the universal prosodic hierarchy defined in Chapter 2, the intonational phrase appears before the phonological phrase in the order of precedence. Even though Nespor and Vogel (1976) state that one or more phonological phrases may be joined to make a single intonational phrase domain, the kind of information used to construct this domain is far more diversified than they suggest. According to Nespor and Vogel, an intonational phrase's endpoints always correspond to the places in an intonation contour where grammar-related pauses may be inserted into the sentence. If a root sentence is defined as an S ("sentence") that is not dominated by any other node,

then the sentence is said to be a root sentence (Emonds 1976), as demonstrated in (1). Intonational phrases are signified with the character when they are enclosed in parentheses.

(1)

a. [Lions are dangerous]ι

b. [Jennifer discovered that her attic had been invaded last winter by a family of squirrels]ι

According to Nespor and Vogel, in addition to root sentences, intonational phrases need various specific construction types to be effective. Structures (2a-f) include multiple elements such as parentheses, non-restrictive relative clauses, tag inquiries, vocatives, expletives, and some relocation components, among other things (Nespor & Vogel 1976). According to Jensen (1993), appositives are words that, when combined, must result in the production of an intonational phrase (2g). These structures will always be presented because, according to Nespor and Vogel (cf. Safir 1975), these formations have no structural relationship to a sentence tree. Because they evolve into intonational phrases in any language that uses them, these kinds of structures will always be present:

(2)

a. Lions [as you know]ι are dangerous. (parenthetical expression)

b. My brother [who absolutely loves animals]ι just bought himself an exotic tropical bird. (nonrestrictive relative clause)

c. That's Theodore's cat [isn't it?]ι (tag question)

d. [Clarence]ι I'd like you to meet Mr. Smith. (vocative)

e. [Good heavens]ι there's a bear in the back yard. (expletive)

f. They are so cute [those Australian koalas]ι. (right dislocation)

g. Duncan and Mary [our next-door neighbours]ι have a lovely Labrador retriever. (appositive)

To demonstrate that (2a) is derived from (1a), we must first insert the parenthetical sentence into the root phrase and then compare (1a) and (2a). Strings next to the required intonational phrase must generate their own intonational phrases, which may be classified in (3a). For example, it is possible to convey intonation phrases in (2b-g) utterances using the word intonational (3b-g).

(3)

a. [Lions]ι [as you know]ι [are dangerous]ι

b. [My brother]ι [who absolutely loves animals]ι [just bought himself an exotic tropical bird]ι

c. [That's Theodore's cat]ι [isn't it?]ι

d. [Clarence]ι [I'd like you to meet Mr. Smith]ι

e. [Good heavens]ι [there's a bear in the back yard]ι

f. [They are so cute]ι [those Australian koalas]ι

g. [Duncan and Mary]ι [our next-door neighbours]ι [have a lovely Labrador retriever]ι

Furthermore, it does not matter where these structures are in a sentence, and they always form an intonational phrase. Based on the analyses above, Nespor & Vogel (1976) formulated the definition of the intonational phrase as in (4).

(4) Intonational Phrase (IPh) Formation domain

An Intonational Phrase domain may consist of

a. all the φs in a string that is not structurally attached to the sentence tree

at the level of s-structure, or

b. any remaining sequence of adjacent φs in a root sentence.

As noted in Chapter 2, non-phonological concepts are not necessarily isomorphic to any morpho-syntactic structure, despite being derived from phonological concepts. Even though the domain of an intonational phrase is often related to a syntactic element, strings on either or both sides of an intervening required intonational phrase are not always isomorphic. In the opinion of Nespor and Vogel (1976), the intonation words on each side of the number (5) (quoted) are not related to any syntactic constituent.

(5)

a. [They have]ι [as you know]ι [been living together for years]ι

b. [He will never]ι [as I said]ι [accept your proposal]ι

c. [Charles wouldn't]ι [I imagine]ι [have done such as thing]ι

d. [That's the tortoise that]ι [as you know]ι [inhabits the Galapagos Islands]ι

7.1.2 Restructuring of the intonational phrase

When establishing the number of intonational phrases included in an utterance's intonational phrase count, other criteria must be considered in addition to grammatical errors. For example, there are several occurrences of longitudinal variation, stylistic diversity, and the employment of contrastive emphasis in a single piece, to name a few examples. In addition, instead of a limited range of tones, as opposed to the other components of prosody, intonation phrases incorporate a wide range of techniques, which is a distinctive characteristic of this kind of expression.

A recent study has shown a link between the generation of phonological phrases and the branching of several languages, including Italian, English, Kinyambo, and Fuzhou, among others,. Throughout this dissertation, Chapters2 and 6 have gone into considerable length about this subject matter. If you speak one of the languages described above, the linguistic complement may contain the non-branching initial addition of the lexical head as part of the linguistic complement. It is true

that non-branching phonological phrases are often shorter than branching phonological representations, and this is true regardless of which language is being investigated.

In the same manner that the phonological term has been reformed, the intonational phrase has been reorganized. To be more specific, according to Nespor and Vogel the length of the initial intonational expression is essential when breaking it down into smaller words and a longer first intonational phrase is more likely to be broken down into more minor terms. Based on their results, individuals are more likely to avoid sequences with extremely short and significantly changing intonation lengths than others. Because the vast majority of these brief statements were derived from lengthier words that had been reformatted, the vast majority were initially far more significant in total length than the vast majority of these short statements—following international law, breaking down an intonational phrase that is more than one word in size, such as (1b), into more minor intonational terms is unlawful. Below is an example of the importance of length from Nespor and Vogel. The utterance is divided into smaller intonational phrases as in "a" and "b," but the division of "c" and "d" are unacceptable:

(6)

a. [Jennifer discovered]ι [that her attic had been invaded last winter]ι [by a family of squirrels]ι

b. [Jennifer discovered that her attic]ι [had been invaded last winter by a family of squirrels]ι

c. ? [Jennifer]ι [discovered]ι [that her attic]ι [had been invaded]ι [last winter]ι [by a family]ι [of squirrels]ι (series of very short Is)

d. ? [Jennifer]ι [discovered that her attic had been invaded last winter by a family of squirrels]ι (sequences of Is of very different lengths)

Respectively, (a-d) can be interpreted as: In her attic, Jennifer found that the squirrels had created a winter house for themselves, something she had not realized until she went up there to check. Jen had discovered that her attic had become the home of an entire squirrel family throughout the previous winter, and she was taken aback by the condition of the nest. Jennifer's attic had been overtaken by a family of squirrels the last winter (a string of concise I's), and she was forced to flee when she could not keep up with them. In the previous winter, Jennifer had found a squirrel family that had taken up residence in her attic and had decided to do more research into their existence. Specifically, the lengths of the sequences in this situation are significant considerations. Various elements influence how a sentence is reconstructed in the brain, and the length of an intonational phrase is just one of these variables.

The number of intonational phrases employed in a speech is determined by a range of factors, including their prominence, performance, and semantics. Longer intonation phrases are related to faster speech velocity and vice versa, according to Nespor and Vogel, but shorter terms are associated with slower speech velocity. It is possible to condense the number (1b) to a single long intonational word if it is said quickly (1b). It may be possible to break it down into shorter utterances using the examples in (6a) and (6b) to demonstrate this (6b). When giving formal speeches, it is customary to speak at a slower pace to enable attendees to pay closer attention to what is being said. If the presenter’s way of speaking is formal, an intonational phrase will be separated from its context. Nespor and Vogel claim that to maximize the effectiveness of the restructuring process, it is critical to highlight the contrastive predominance of one feature after the process rather than the other characteristics (Barbosa & Raso, 2017). Among the distinctions made by Bing (1979) are the differences between contrastive prominence and contrastive emphasis, which is not legally necessary in certain situations, while the former is. Contouring the

string by accentuating one component, on the other hand, involves structural alterations, although contrastive stress is unnecessary in this case. See examples:

(7)

a. [Paul called Paula before Carla called Carl]ɪ

b. [Paul called Paula before she called him]ɪ

c. [Paul called Paula]ɪ [before *she*]ɪ [called *him*]ɪ

As can be seen from (7), the sentence in (7a) is allocated one ɪ since a solitary root sentence dominates it. Paradoxically, the pronouns in (7b) require the audience to co-allude the pronouns to the things, making an alternate understanding from (7a). This understanding should be acknowledged by putting additional noticeable quality on the pronouns and consequently causes the single ɪ in (7b) to be rebuilt as three more modest ɪs, as introduced in (7c). It is essential that sentences in (7a) and (7b) have something similar in terms of syntactic construction, while they are not the same as one another prosodically, which once more upholds the possibility that the prosodic design varies from the syntactic construction. The prosodic patterns of the sentences in (a) and (b) are radically different even though they share some common grammatical characteristics. Because of the nature of the language, it is not feasible to create the complete intonation statement in its entirety. It is believed that an intonation phrase must be generated before one or more phonological representations may be produced to achieve a restructuring of the speech sound. They contend that the restrictions imposed by syntactic constraints place even more significant limits on the rearrangement of intonational phrases. In most circumstances, it is usual to abstain from modifying the intonation of the words that follow, even after a noun phrase. See examples from Nespor and Vogel:

(8)

a. [The giant panda eats only one type of bamboo in its natural habitat]ι

b. [The giant panda]ι [eats only one type of bamboo]ι [in its natural habitat]ι

c. [The giant panda]ι [eats only one type of bamboo in its natural habitat]ι

d. [The giant panda eats only one type of bamboo]ι [in its natural habitat]ι

Pupils in eighth grade may break down the sentence in (8a) into more minor intonational phrases, resulting in the three restructure options in (b), depending on their aptitude. Because this is not the end of a noun phrase, the likelihood of a rearrangement occurring here is relatively low. According to the species, a native Big Panda will only eat one kind of bamboo at a time, so make sure you have enough on hand. The giant panda only consumes one type of bamboo, and it is a very specialized variation of that bamboo. It only consumes a kind of bamboo in its natural environment, and that variety is a specific variety.

By looking at (9b), it can be seen that restructuring is only allowed after the subject NP and not after any other nouns, which indicates that the NP restriction in embedded possessive forms applies:

(9)

a. [My friend's neighbor's aunt's mother knows a famous writer]ι

b. [My friend's neighbor's aunt's mother]ι [knows a famous writer]ι

In (9a), the mother of a well-known author is a fan of one of my friend's neighbors, who lives nearby. We may further establish that prosodic and syntactic structures are not isomorphic with the NP constraint. This sentence appears to restrict the first intonation phrase that emerged from restructuring, which can also be illustrated in examples below:

(10)

a. [I would never have believed the children of John and Mary to be able to become so ill mannered]ι

b. [I would never have believed the children of John and Mary]ι [to be able to become so ill mannered]ι

In the opinion of Nespor and Vogel, specific noun phrases do not alter the order of the words they include. Although separating an argument from its verb is a frequent practice in the language community, the NP constraint is met when a statement is separated from its verb:

(11)

a. [That lady always gives meat to the stray cats that live in the park]ι

b. ?*[That lady always gives meat]ι [to the stray cats that live in the park]ι

(12)

a. [That lady always buys meat for the stray cats that live in the park]ι

b. [That lady always buys meat]ι [for the stray cats that live in the park]ι

The examples above indicate that this restriction does not apply to optional arguments, as shown by the following (12). A stray animal in the park is fed every day by that woman, who gives meat to the animals. Those homeless animals in the park are grateful to that woman for her regular contributions and she is thankful for her charity. Initially, [the woman provides food to stray animals in the park] is a kind gesture. That woman often donates meat for the stray cats in the garden, which she receives from local butchers, for which she is grateful. However, although it is not permitted, it is permissible to rearrange the sequence of intonation before the commencement of the following S' as long as no other NP requirements are broken. As a result, (13a) may be

rebuilt to become (13b), but (14a) will not be reconstructed to become (13b) as a result of this (14b):

(13)

a. [I thought you already knew that he was moving to southern Italy]ι

b. [I thought you already knew]ι [that he was moving to southern Italy]ι

(14)

a. [I thought you knew the family that was moving to southern Italy]ι

b. * [I thought you knew the family]ι [that was moving to southern Italy]ι

In the examples above, "You" seemed to be aware of his migration to southern Italy, which "I" interpreted as evidence of your knowledge rather than ignorance. Apparently, he made his way to the southern Italian region, which I am sure you are well familiar with as long as you are familiar with the family who migrated to south Italy. When an argument is expressed as a sentence, it is permitted to deconstruct it into an intonational phrase to support the restructuring:

(15)

a. [Our neighbor truly believes that black cats bring bad luck]ι

b. [Our neighbor truly believes]ι [that black cats bring bad luck]ι

The following is true: [According to the tradition of our next-door neighbor, black cats are unlucky.] Nespor and Vogel supply a rating of the limitations based on their evaluation of each of the three requirements stated below: I have stumbled across a slew of NP>S'>>arguments while on the lookout for one. Consequently, the required argument constraint is stricter than the S' constraint, and the NP consistency requirement is even more stringent than the necessary argument constraint (13-14). Aside from the first of these three constraints, grammar does not affect the reorganization of intonational phrases. In the opinion of Nespor and Vogel, lists and intricate

embedded structures each have their own distinct intonation patterns that can be distinguished from one another. Therefore, instead of rearranging the intonational words in a list-based phrase, mixing the intonational words in a list-based phrase can be an alternative:

(16)

a. [The big]ι [fat]ι [ugly]ι [nasty beast]ι [scared away the children]ι

b. [That mountain road is long]ι [narrow]ι [windy]ι [and bumpy]ι

c. [Everyone at the party ate]ι [talked]ι [sang]ι [and danced]ι

d. [Ducks]ι [geese]ι [swans]ι [and coots]ι [inhabit this lake]ι

e. [They own two cats]ι [three dogs]ι [four parakeets]ι [and a turtle]ι

f. [Let's invite]ι: [Arnold]ι [Arthur]ι [Archibald]ι [and Zachary]ι

g. [We were told to buy the following]ι: [milk]ι [eggs]ι [bread]ι [and cheese]ι

In the case of a list, the concatenation of any item may result in the production of an intonational phrase, which fails the last NP criteria. The NP violation is the technical term for this. Therefore, to account for (16a-g), Nespor & Vogel propose the following rule:

(17) List Restructuring (optional)

In a sequence of more than two constituents of the same type, i.e., x1, x2, ...xn,

an intonation break may be inserted before each repetition of the node X.

When dealing with substantial nested structures, such as the list issue, altering the intonation of phrases influences the NP constraint's enforceability. As seen in (17), no matter how they are implemented, all embedded construction restructurings fail the NP test:

(18)

a. [This is the cat]ι [that ate the rat]ι [that ate the cheese]ι

b. [The book in the bag]ι [on the table]ι [in the study]ι [belongs to Albert]ι

c. [The woman that represents the company]ι [that owns the stores]ι [that sell the machines]ι [that brew coffee]ι [is a friend of mine]ι

A vivid interpretation of the examples above can be: Here is a picture of a cat that you may look at if you want to. [Albert] is the owner of this property. a. [the contents of my bag are] [the book in my bag is] [the contents of my bag are]. b. There is a book available for purchase. The study book belongs to Albert, who is the owner of the book. c. In which enterprises do they have a financial interest? A trader, a coffee roaster, and a good buddy, that is what he is all in one. According to Nespor and Vogel, embedded structures are equivalent to lists in their respective theories of computation. They claim that embedded constructs may hold sequences of nodes X in the same manner as lists can do so (17). While prepositional phrases are not used in (17a), they are used in (17b) and to varying degrees in (17c). According to Nespor and Vogel, the structure of (17a) makes it impossible to break the sentence down into its component pieces. It is feasible to prove, for example, that the noun has a role to play in shaping the formation of the intonational phrase. However, instead of being split down into fewer components, tonality is broken down into a more significant number of more extensive features instead.

In summary, many factors influence the outcome of restructuring, including the length of source intonation phrases, the speaker's talking speed and way of speaking, and the relevance of contrastive words, among other things (Smith, Erickson, & Savariaux, 2019). The noun phrase (NP) constraint is the most critical constraint among the three syntactic restrictions. List Restructuring is optional to effectively manage lists and embedded structures, especially when considering the NP constraint. This restructuring of the intonational phrase gives additional proof to the autonomy of the prosodic structure from the syntactic construction since a similar sort of restructuring of the constituents of a specific string is never permitted in syntax.

7.1.3 The Intonation Phrase Follows Language-Specific Phonological Principles

According to Selkirk (1977), an intonational phrase is defined as the region in which an intonational contour forms and takes shape. Through their research, the authors further show that the intonation phrase may be used to express a wide range of segmental phonological ideas across languages (Nespor and Vogel, 1976). Many different types of s-Voicing are investigated, including Tuscan Italian intervocalic Spirantization, Spanish Nasal Assimilation, and Greek s-Voicing. Nespor and Vogel convert Georgia Toscana's voiceless stops /p, t, k/ into fricatives [ɸ, θ, h] between two [-consonantal] segments inside and across words, as well as between two [-consonantal] segments between two [-consonantal] segments within and between syllables (1976). As a result, this rule does not apply to all intonational phrases, as seen by the example below:

(1)

a. [Hanno catturato sette canguiri appena nati]ι

‘They have captured seven newly born kangaroos.’

b. [Almerico]ι # [quando dorme solo]ι [cade spesso dall’amaca]ι

‘Almerico, when he sleeps alone, often falls out of the hammock.’

The application of this rule is achievable if the whole segmental context of the rule is kept in the intonational phrase created by restructuring rules. However, it is also possible that its application will be curtailed to a lesser extent. Some examples from Nespor and Vogel include the following:

(2)

a. [Quel giardino ha una gabia piena di corvi canarini colibrì e pellicani]ι

‘That garden has a cage full of crows, canaries, hummingbirds, and pelicans.’

b. [Quel giardino ha una gabia piena di corvi]ι [canarini]ι [colibrì]ι [epellicani]ι

(20a) forms a single intonational phrase by the basic formation rule. The GT rule can apply within the domain; while in (20b), GT applies within the first small intonational phrase and gets blocked in the sentence elsewhere. The following rule is the Intervocalic Spirantization rule, which changes the affricates /tʃ/ and /dʒ/ into the corresponding fricatives [ʃ] and [ʒ] between [-consonatal] segments within and across words. This rule exhibits the same behavior as Gorgia Toscana: it is applicable within the intonational phrase while getting blocked across the boundaries of intonational phrases. See examples from Nespor and Vogel:

(3)

a. [Il mio criceto cerca il suo cibo negli angoli della gabbia]ι

'My hamster looks for its food in the corners of the cage.'

b. [Santo cielo]ι [c'è un verme in questa ciliegia]ι

'Good heavens, there's a worm in this cherry.'

It is important to note that this rule only applies inside an intonation phrase and does not apply outside of it, as seen in example (21). However, there are a few exceptions to this rule, such as the Georgia Toscana area of Italy, which is a good example. See examples from Nespor and Vogel:

(4)

a. [Hanno citato cinque recensioni cinquanta libri cento articoli e duecento lavori inediti]ι

'They cited five reviews, fifty books, one hundred articles, and two hundred unpublished works.'

b. [Hanno citato cinque recensioni]ι [cinquanta libri]ι [cento articoli]ι [eduecento lavori inediti]ι

The Nasal Assimilation rule in Spanish has broad applicability, similar to the two Italian principles listed above. However, following Nespor and Vogel, this rule applies inside the intonational phrase but does not apply beyond national boundaries. See examples:

(5)

a. [Las plumas de faisán cuestan tantísimo hoy día]ι

'Pheasant feathers are very expensive nowadays.'

b. [Carmen]ι [cántanos una nueva canción]ι [por favor]ι

'Carmen, sing us a new song, please.'

This norm applies inside shorter intonational phrases, just as it did in the two previous Italian standards that came before it, even when the phrases are restructured. A restructuring that modifies the context, on the other hand, is strictly prohibited. The rapidity with (24a) and (24b) are uttered in respect to one another when it comes to Nasal Assimilation is striking in its own right:

(6)

a. [Usa su sombrero carísimo con seis plumas de tucán cuando desea crear la impresión que es una persona muy importante]ι

'(She) wears her very expensive hat with six toucan feathers when she wants to create the impression that she is a very important person.'

b. [Usa su sombrero carísimo con seis plumas de tucán]ι [cuando desea crear la impresión que es una persona muy importante]ι

It is possible to use ideas such as Georgia Toscana, Intervocallic Spirantization, and Nasal Assimilation when a string is stated in Tuscan Italian, and another is heard in Spanish. However, according to Nespor and Vogel's study (1976), a prosodic unit should be used to create standards because of its ability to be rearranged. Because of its capability for rearrangement, the intonation

phrase occupies a significant position in a prosodic hierarchy. Therefore, it must be separated from other grammatical elements and not be isomorphic.

7.1.4 Summary

This section explored the conversations of the intonational phrase within the framework of prosodic phonology, particularly the view from Nespor and Vogel (1976). The formation and restructuring rules of the intonational phrase across languages are organized and devised. When compared to the phonological phrase, the intonation phrase has the advantage of being more flexible (Blake, 2020). The construction of intonational phrases across languages provides a persuasive argument in favor of including the basic formation rule as well as minor restructuring rules in the grammar. It has likewise been exhibited that the intonational phrase framed by the essential formation rule and smaller intonational phrases formed by the restructuring can fill in as the domain of certain phonological rules in different languages, which offers further support for the independence of this prosodic constituent.

7.2 The intonational phrase in the Chengdu dialect

7.2.1 Basic intonational phrase in the Chengdu dialect

In English, Italian, Spanish, and other languages, root sentences can form independent intonational phrases since they are associated with intonation contours. An intonational phrase is the domain of an intonation contour. There are such root sentences in the Chengdu dialect as well. See examples:

a. [人　只　多]ι

[zen^{31} tsi^{51} to^{45}]

→[zen$^{\mathbf{43}}$ tsi^{54} to^{45}]

people only many

‘So many people.’

b. [他 嘞 包包 好 看]ɪ

[t^ha^{45} n^lei^{45}pau^{45}pau^{45}xau^{51}k^han^{213}]

→[t^ha^{45} n^lei^{45}pau^{45}pau^{45}xau^{55}k^han^{213}]

He POSS bag good look

‘His bag is good-looking.’

c. [我 看 倒 书 在]ɪ

[ŋo^{51}k^han^{213}tau^{51}su^{31} tsai^{213}]

→[ŋo^{51}k^han^{213}tau^{51}su^{31} tsai^{213}]

I look PROG book PROG

‘I am reading a book.’

d. [这 本 书 是 烂 书]ɪ

[tsɛ^{213} pen^{51}su^{45} si^{213}n^lan^{213} su^{45}]

→[tsɛ^{32} pen^{51}su^{45} si^{213}n^lan^{213} su^{45}]

This CI book be broken book

‘This book is a badly-written book.’

Similar to constructions in other languages, the Chengdu dialect also has specific syntactic constructions associated with intonation contours, including parenthetical, expressions, vocatives, expletives, appositives, and certain moved elements. See examples:

a. [那 个 男 嘞,]ɪ [你 晓 得 不 嘛,]ɪ [只 有 那 么 笑 人 咯]ɪ

[$n^lɛ^{213}$ko^{213}$n^lan^{31}$$n^lei^{45}$] [ny^{51}ɕiau^{51}tɛ^{31}pu^{31}ma^{31}][tsi^{51}iəu^{51}n^la^{213}mo^{45}ɕiau^{213}zen^{31}n^lo^{31}]

→[$n^lɛ^{32}$ko^{213} $n^lan^{31}$$n^lei^{45}$] [ny^{51}ɕiau^{55}tɛ^{31}pu^{31}ma^{31}][tsi^{51}iəu^{51}n^la^{32} mo^{45}ɕiau^{32}zen^{31}n^lo^{31}]

That CI male NOM you know be not only have that laugh people

'That man, you know what, is really interesting' (parenthetical expression)

b. [张 姐,]ɩ [你 嘞 裙 子 好 好 看 哦]ɩ

[tsaŋ^{45}tɕiɛ^{51}][ny^{51}n^{l}ei^{45} tɕ^{h}yn^{31} tsi^{51}xau^{51}xau^{51}k^{h}an^{213}o^{31}]

→[tsaŋ^{45}tɕiɛ^{51}][ny^{51}n^{l}ei^{45} tɕ^{h}yn^{31} tsi^{51}xau^{51}xau^{55}k^{h}an^{213}o^{31}]

Zhang sister you POSS skirt good good look

'Sister Zhang, your skirt is really good-looking' (vocative)

c. [日 他 先 人 板 板,]ɩ [手 机 掉 咯]ɩ

[zi^{31} t^{h}a^{45} ɕian^{35}zen^{31}pan^{51}pan^{21}] [səu^{51}tɕi^{45}tiau^{213}n^{l}o^{31}]

→[zi^{43} t^{h}a^{45} ɕian^{45}zen^{31}pan^{51}pan^{51}] [səu^{54}tɕi^{45}tiau^{213}n^{l}o^{31}]

Fuck his ancestor plank cellphone forget

'Damn! I lost my phone!' (expletive)

d. [他 们 弟 娃儿,]ɩ [张 三,]ɩ [是好看]

[t^{h}a^{45}mən^{45} ti^{213} uaə^{31}] [tsaŋ^{45}san^{45}] [si^{213}xau^{51}k^{h}an^{213}]

→[t^{h}a^{45}mən^{45} ti^{32} uaə^{31}] [tsaŋ^{45}san^{45}] [si^{213}xau^{55}k^{h}an^{213}]

He POSS younger brother kid Zhang San good look

'My younger brother, Zhang San, likes you very much' (appositive)

e. [长 得 乖,]ɩ [那 个 女 娃 子]

[tsaŋ^{51}tɛ^{31} kuai^{45}] [n^{l}ɛ^{213}ko^{213} n^{j}y^{51}ua^{31}tsi^{51}]

→[tsaŋ^{55}tɛ^{31} kuai^{45}] [n^{l}ɛ^{32} ko^{213}n^{j}y^{51}ua^{31}tsi^{51}]

Grow very cute that CI girl

'She is very good-looking, that girl.' (right dislocation)

The examples above are syntactically correct when pauses are embedded in the positions indicated by the punctuation, which implies one of the two sides of syntactic constructions. These constructions relate to intonational phrases alone. Since pauses are introduced to coincide with the boundaries of strings, these strings then also structure intonational phrases. Therefore, Nespor and Vogel (1976) proposed the fundamental formation rule of the intonational phrase, which can account for ι-formation cross-linguistically. Consequently, it is also applicable in the prosodic phonology of the Chengdu dialect. Moreover, if the violation of Exhaustivity is allowed, then the intonational phrase in the Chengdu dialect can dominate the phonological phrase and the clitic group as in the examples above. Therefore, by adopting the proposal of Nespor and Vogel, the primary domain formation rule of the intonational phrase in Chengdu dialect can be summarized as:

Intonational Phrase (IPh) domain in the Chengdu dialect

The domain of ι in Chengdu may consist of

a. all the CGs/φs in a string that is not structurally attached to the sentence tree at the level of s- structure, or

b. any remaining sequence of adjacent CGs/φs in a root sentence.

7.2.2 Restructuring of the intonational phrase in the Chengdu dialect

Since the cross-linguistic account of ι-formation is applicable in the prosodic phonology of the Chengdu dialect, it can be assumed that the restructuring of intonational phrases also exists. Supposedly, the restructuring should follow various non-syntactic factors such as length, rate of speech, style, and contrastive prominence. There is also the tendency that longer intonational phrases would be broken down into smaller intonational phrases. See examples:

(7)

a.	她	说	没	上	学	嘞	那	个	是	五	幺
	t^ha^{45}	so^{31}	mei^{45}	$saŋ^{213}$	$ɕyo^{31}$	$n^lɛ^{45}$	$n^lɛ^{213}$	ko^{213}	si^{213}	vu^{51}	iao^{45}
→	t^ha^{45}	so^{31}	mei^{45}	$saŋ^{32}$	$ɕyo^{31}$	$n^lɛ^{45}$	$n^lɛ^{32}$	ko^{213}	si^{213}	vu^{51}	iao^{45}
	she	speak	no	school		MOD	that	CI	be	five	one
	二	遭	地	震	震	伤	咯				
	$ɚ^{213}$	$tsao^{31}$	ti^{213}	$tsen^{213}$	$tsen^{213}$	$saŋ^{45}$	n^lo^{31}				
→	$ɚ^{213}$	$tsao^{31}$	ti^{32}	$tsen^{213}$	$tsen^{32}$	$saŋ^{45}$	n^lo^{31}				
	two	PASS	ground	shake	shake	hurt	CRS				

'she said that one who doesn't go to school was hurt by the earthquake on May, 12^{th}.'

b. [她说没上学嘞那个是五幺二遭地震震伤咯]ι

c. [她说]ι [没上学嘞那个]ι [是五幺二遭地震]ι [震伤咯]ι

(8)

a.	昨	天	清	早	八	晨	她	过	来	敲
	tso^{31}	t^hian^{45}	$ɕin^{45}$	$tsao^{51}$	pa^{31}	sen^{31}	t^ha^{45}	ko^{213}	n^1ai^{31}	k^hau^{45}

[1] The coronal nasal *n* in Chengdu dialect is actually a lateralized nasal sound, which means airflow goes out of the nasal cavity and oral cavity at the same time when it is pronounced (Zhen, 1957). According to Shi (2011), the nasality contrast of nasal initials and non-nasal initials is 45, which suggests that the fusion of /n/and /l/ is not only about the sound value, but also the phoneme distinction, and /n/and /l/ have been merged as one phoneme. There are allophonic variations of nasalized-lateral and lateralized nasal depending on strict conditions. This dissertation will mark IPA [n] and [l] according to the tendency of the actual pronunciation.

→	tso^{43}	t^{h}ian^{45}	ɕin^{45}	tsao^{51}	pa^{43}	sen^{31}	t^{h}a^{45}	ko^{32}	n^{l}ai^{31}	k^{h}au^{35}
	yesterday		morning				she	pass	come	knock
	门	喊	我	切	吃	肥	肠	粉	儿	
	mən^{31}	xan^{51}	ŋo^{51}	tɕ^{h}iɛ^{213}	ts^{h}i^{31}	fɛ^{31}	ts^{h}aŋ^{31}	fən^{51}	ɚ^{51}	
→	mən^{31}	xan^{55}	ŋo^{51}	tɕ^{h}iɛ^{32}	ts^{h}i^{31}	fɛ^{43}	ts^{h}aŋ^{31}	fənɚ^{51}		
	door	shout	I	go	eat	intestines		noodle		

'She came to knock at my door and asked me to eat intestine noodles yesterday early morning.'

b. [昨天清早八晨她过来敲门喊我切吃肥肠粉儿]ι

c. [昨天清早八晨]ι [她过来敲门]ι [喊我切吃肥肠粉儿]ι

For native speakers, all three intonational phrase formations (a, b and c) are acceptable. However, both (c) sound more natural than the other two in the examples above. As discussed previously, the first factor influencing the ultimate number of intonational phrases within an utterance across languages is the rate and style of speech, and this is true in the Chengdu dialect. The slower one string is, the stronger the tendency that an intonational phrase will be broken into shorter ones. Usually, aged people speak slower than younger ones, which leads to more pauses in speech when producing a long sentence. Therefore, the same sentence may be divided into different numbers of intonational phrases. See example:

(9)

a. [这个男的]ι [只笑人]ι

b. [这个男的只笑人]ι

'This man is very interesting.'

Generally speaking, a formal speech has a slower rate of utterance than the informal one, and sentences uttered in formal speeches may have more than one intonation contours, but the same sentences uttered in colloquial speaking may contain just one single intonational phrase. For example:

(10)

a. [他 恳请]ι [各 位家长]ι [辅导娃儿]ι

[$t^ha^{45}k^h\text{ən}^{51}tɕ^hin^{51}$] [$ko^{31}vei^{213}tɕia^{45}tsaŋ^{51}$] [$fu^{51}tau^{213}va^{31}ɚ^{45}$]

→ [$t^ha^{45}k^h\text{ən}^{55}tɕ^hin^{51}$] [$ko^{43}vei^{213}tɕia^{45}tsaŋ^{51}$] [$fu^{55}tau^{213}$ $va^{43}ɚ^{45}$]

he beg every CI parent tutor kid

'He begs every parent to tutor their kids.'

b. [老 师 喊 妈 老汉儿 回 切 检 查 娃儿 嘞 作 业]ι

[$n^lau^{51}si^{45}$ $xan^{51}ma^{45}n^lau^{51}xanɚ^{213}$ $huei^{31}ɕiɛ^{213}$ $tɕian^{51}ts^ha^{31}$ $va^{31}ɚ^{31}n^lɛ^{45}tso^{31}ŋ̍iɛ^{213}$]

→ [$n^lau^{54}si^{45}$ $xan^{51}ma^{45}n^lau^{55}xanɚ^{213}$ $huei^{31}ɕiɛ^{45}$ $tɕian^{55}ts^ha^{31}$ $va^{31}ɚ^{45}n^lɛ^{45}tso^{43}ŋ̍iɛ^{213}$]

Teacher call mother father return check kid homework

‘The teacher requires parents check kids’ homework after returning home.’

The next factor is the contrastive prominence. Assigning contrastive prominence to a particular part in the original intonational phrase also affects the restructuring. Example (b) above can be a single intonational phrase, but if 回切 ‘returning’ is assigned with prominence, the single intonational phrase can be restructured as two or more smaller intonational phrases:

c. [老师喊妈老汉儿些回切]ι [检查娃儿的作业]ι

‘The teacher requires parents to check kids’ homework after returning home seriously.’

Below is another example that shows that the root sentence was one single intonational phrase but can be broken into two intonational phrases when a particular part is emphasized:

(11)

a.	[张 姐	那 个	女 儿	歪 得 很]
	[tsaŋ^{45}tɕiɛ^{51}	n^{l}ɛ^{45}ko^{213}	n^{j}y^{51}ə^{31}	uai^{45}tɛ^{31}xən^{51}]
→	[tsaŋ^{45}tɕiɛ^{51}	n^{l}ɛ^{32}ko^{213}	n^{j}yə^{51}	uai^{45}tɛ^{31}xən^{51}]
	Zhang sister	that CI	daughter	slanting very much

‘Sister Zhang’s daughter is very short-tempered.’

b. [张姐那个女儿]ι [歪得很]ι

‘Sister Zhang’s daughter is very short-tempered.’

Certain syntactic constraints also regulate the intonational phrase's restructuring in the Chengdu dialect as in different languages. According to the examples, it can be seen that ι-restructuring in this dialect is likely to occur at the end of a noun phrase, and the original utterance can be broken into short intonational phrases that end with noun phrases. On the other hand, ι-restructuring does not often occur after the verb, as shown in the examples below:

(12)

a. [昨天清早八晨她过来敲门喊我切吃肥肠粉儿]ι

b. [昨天清早八晨]ι [她过来敲门]ι [喊我切吃肥肠粉儿]ι

c.* [昨天清早八晨]ι [她过来敲]ι [门喊我切吃肥肠粉儿]ι

d.* [昨天清早八晨]ι [她过来敲门喊]ι [我切吃那家肥肠粉儿]ι

'She came to knock at my door and asked me to eat intestine noodles yesterday early morning.'

Because of the NP constraint, one original intonational phrase can only be restricted so that the restructuring occurs at the end of the subject NP. It will not be accepted if the restructuring occurs inside the subject NP. See examples:

(13)

a. [张 姐 那 个 女 儿 嘞 同学 歪 得 很]

[tsaŋ^{45}tɕiɛ^{51} n^{l}ɛ^{45}ko^{213} nʲy^{51}ə^{31} n^{l}ei^{45} t^{h}oŋ^{31}ɕyo^{31} uai^{45}tɛ^{31}xən^{51}]

→ [tsaŋ^{45}tɕiɛ^{51} n^{l}ɛ^{32}ko^{213} nʲyə^{51} n^{l}ei^{45} t^{h}oŋ^{43}ɕyo^{31} uai^{45}tɛ^{31}xən^{51}]

Zhang sister that CI daughter POSS classmate slanting very much

'Sister Zhang's daughter's classmate is very short-tempered.'

b. [张姐那个女儿嘞同学]ι [歪得很]ι

c.* [张姐]ι [那个女儿嘞同学歪得很]ι

d.* [张姐那个女儿]ι [嘞同学歪得很]ι

The formation of obligatory intonational phrases also shows NP constraint in this dialect. Recall the argument of Nespor and Vogel, syntactic constructions such as parenthetical expressions, vocatives, and expletives obligatorily form an intonational phrase no matter where

they occur in a sentence. Chengdu dialect presents this feature as well, in other words, sentences would be more acceptable when these constructions are placed at the end of a noun sentence, while less acceptable when placed after a verb or other syntactic constituents:

(14)

a. [那 个 男 嘞,]ɪ [你 晓 得 不]ɪ [只 有 那 么

[nˡɛ^{213}ko^{213}nˡan^{31}nˡei^{45}] [ny^{51}ɕiau^{51}tɛ^{31} pu^{31}] [tsi^{51}iəu^{51} nˡa^{213}mo^{45}

→ [nˡɛ^{32} ko^{213} nˡan^{31}nˡei^{45}] [ny^{51}ɕiau^{55}tɛ^{31}pu^{31}] [tsi^{55}iəu^{51} nˡa^{32} mo^{45}

That CI male NOM you know be not only have that

笑 人 咯]ɪ

ɕiau^{213} zen^{31} nˡo^{31}]

ɕiau^{32} zen^{31} nˡo^{31}]

laugh people final-particle

'That man, you know what, is really interesting'

b. [那 个 男 嘞 只 有 那 么 笑 人 咯,]

[nˡɛ^{213}ko^{213}nˡan^{31}nˡei^{45}tsi^{45}iəu^{51}nˡa^{213}mo^{45} ɕiau^{213}zen^{31}nˡo^{31}]

→ [nˡɛ^{32} ko^{213} nˡan^{31}nˡei^{45}tsi^{45}iəu^{51}nˡa^{32} mo^{45} ɕiau^{32} zen^{31}nˡo^{31}]

That CI male NOM only have that laugh people final-particle

[你 晓 得 不] n

[ny^{51}ɕiau^{51}tɛ^{31} pu^{31}]

[ny^{51}ɕiau^{55}tɛ^{31}pu^{31}]

you know be not

'That man is really interesting, you know what.'

c.? [那个 男嘞 只 有,]ɩ [你晓得不,] [那么

[nˡɛ^{213}ko^{213}nˡan^{31}nˡei^{45} tsi^{51} iəu^{51}] [ny^{51}ɕiau^{51}tɛ^{31} pu^{31}] [nˡa^{213}mo^{45}

→ [nˡɛ^{32} ko^{213} nˡan^{31}nˡei^{45} tsi^{55} iəu^{51}] [ny^{51}ɕiau^{55}tɛ^{31}pu^{31}] [nˡa^{32} mo^{45}

That CI male NOM only have you know be not that

笑人咯]ɩ

ɕiau^{213}zen^{31}nˡo^{31}]

ɕiau^{32} zen^{31}nˡo^{31}]

laugh people final-particle

'That man is, you know what, very interesting.'

d.? [那 个 男 嘞 只有 那么]ɩ [你晓得不,]ɩ

[nˡɛ^{213}ko^{213}nˡan^{31}nˡei^{45} tsi^{45} iəu^{51} nˡa^{213}mo^{45}] [ny^{51}ɕiau^{51}tɛ^{31} pu^{31}]

→ [nˡɛ^{32} ko^{213} nˡan^{31}nˡei^{45} tsi^{45} iəu^{51} nˡa^{32} mo^{45}] [ny^{51}ɕiau^{55}tɛ^{31}pu^{31}]

That CI male NOM only have that you know be not

笑人咯]ɩ

ɕiau^{213}zen^{31}nˡo^{31}]

ɕiau^{32} zen^{31}nˡo^{31}]

laugh people final-particle

'That man is very, you know what, interesting.'

As mentioned before, ɩ-restructuring occurs at the end of noun phrases but with exceptions, namely, not all types of noun phrases. Usually, when two obligatory arguments are there right after

the same verb, the intonational phrase boundary is assigned at the end of the second argument instead of the first one. See for example:

(15)

a.	[她 端 一碗	肥 肠 粉	给 我 嘞	朋 友]ι
	[$t^ha^{45}tuan^{45}i^{31}uan^{51}$	$fei^{31}tshaŋ^{31}fən^{51}$	$kɛ^{45}ŋo^{51}n^lei^{45}$	$p^hoŋ^{31}iəu^{51}$]
→	[$t^ha^{45}tuan^{45}i^{43}uan^{51}$	$fei^{43}tshaŋ^{31}fən^{51}$	$kɛ^{45}ŋo^{51}n^lei^{45}$	$p^hoŋ^{43}iəu^{51}$]
	she hold one MEASURE	intestine powder	give I POSS	friend
	‘She passed a bowl of sausage noodles to my friend.’			
b. ?	[她端一碗肥肠粉]ι [给我嘞朋友]ι			

In English, the restructuring of the intonational phrase before the beginning of a new S’ conflicts with NP constraint, the resulting division of an utterance is not acceptable, as exemplified.

a. [I thought you knew the family that was moving to southern Italy]ι

b. * [I thought you knew the family]ι [that was moving to southern Italy]ι

However, in the Chengdu dialect, when the argument is a sentence with ι-restructuring, it is possible to separate the obligatory argument from the verb, which proves that the ι-restructuring in this dialect can occur before a new S’. The S’ constraint is stronger than the obligatory argument constraint. See examples:

(16)

a. [老师喊妈老汉儿些回切][检查娃儿嘞作业]ι

b. [老师喊]ι [妈老汉儿些回切检查娃儿嘞作业]ι

‘The teacher requires parents to check kids’ homework after returning home seriously(this doesn’t seem right).’

In Nespor and Vogel's example, the intonational phrase boundary is allocated before the start of the relative clause in (b), which is not permitted since the boundary is embedded inside the noun phrase and violates the NP constraint. Therefore, they furthered the claim that NP constraint is stronger than S' constraint. However, in the example from the Chengdu dialect, the beginning of a new S' is another position where ι-restructuring can take place: the syntactic construction "没上学嘞" is placed before the head noun to work as the relative clause as in the example "[她说]ι [没上学嘞那个]ι [是五幺二遭地震]ι [震伤咯]ι ('She said the earthquake hurt that boy who does not go to school on May, 12th')." In most cases in the Chengdu dialect, the basic word order is "relative clause + head noun," which indicates that within one noun phrase, it is impossible for the intonational phrase restructuring to occur before the relative clause, while it is possible that in this dialect, the rank rule (NP>S') is invalid. You (2017) verified this rank in Fuzhou dialect and concluded that since the obligatory argument constraint can be violated when an obligatory argument is a sentence, a hierarchy among these three constraints in the Fuzhou dialect may be proposed as NP/S'>> obligatory argument. This conclusion can also be applied to the Chengdu dialect since the relative clause is always preceding the head noun in both dialects.

Although the three factors (NP constraint, S' constraint, and obligatory argument constraint) play essential roles in ι-restructuring, none of them is inviolable. Like in other languages, the intonational phrase in Chengdu also dominates one or more phonological phrases/clitic groups. Therefore, the restructuring usually appears between two phonological phrases/clitic groups. However, if the ι-restructuring is caused by performance factors (rate/style of speech) and semantic factors (contrastive prominence), then the restructuring may occur within a phonological phrase/clitic group.

There are also situations where the original intonational phrase can be divided into two parts: either a string is produced at a slow speed or there is emphasis on a particular part of a string, a phonological phrase, or a clitic group contained in the original intonational phrase. In these cases, the two parts are separated by the intonational phrase boundaries and are contained in two adjoining intonational phrases. Therefore, the ɪ-restructuring happening inside a phonological phrase or a clitic group in this way might violate the three constraints above. Additionally, as in English and other languages, lists constitute a particular factor in restructuring the intonational phrase. Every item in one list forms an independent intonational phrase, and pauses are placed on both sides of each item. See examples:

(17)

a.	[她 是 个]ɪ	[精灵]ɪ	[懂事]ɪ	[得行 嘞	娃儿]ɪ
	[$t^ha^{45}si^{213}ko^{213}$]	[$tɕin^{45}n^lin^{31}$]	[$toŋ^{51}si^{213}$]	[$tɛ^{31}ɕin^{31}n^lei^{45}$	$va^{31}ɚ^{45}$]
→	[$t^ha^{45}si^{213}ko^{32}$]	[$tɕin^{35}n^lin^{31}$]	[$toŋ^{55}si^{213}$]	[$tɛ^{43}ɕin^{31}n^lei^{45}$	$va^{43}ɚ^{45}$]
	She be CI	smart	sensible	capable MOD	kid
	‘She is a smart, sensible, and scapable kid.’				

b.	[书 房 头	有 一 排	书 柜,]ɪ	[一 张	书 桌,]ɪ
	[su^{45} $faŋ^{31}$ $t^həu^{31}$	$iəu^{51}$ i^{31} p^hai^{31}	su^{45} $kuei^{213}$]	[i^{31} $tsaŋ^{45}$	$su^{45}tso^{31}$]
→	[su^{45} $faŋ^{31}$ $t^həu^{31}$	$iəu^{51}$ i^{31} p^hai^{31}	su^{45} $kuei^{213}$]	[i^{31} $tsaŋ^{45}$	$su^{45}tso^{31}$]
	Book room LOC	have one Cl	bookshelf	one Cl	book table
	[两 把	椅子]ɪ			
	[$n^liaŋ^{51}pa^{51}$	i^{51} tsi^{31}]			

→ [nˡiaŋ^{51}pa^{51} i^{51} tsi^{31}]

two Cl chair

'There is one row of bookshelves, one study table, and two chairs in the study room.'

c. [冒 菜,]ɪ [串 串儿,]ɪ [烧 烤,]ɪ [干 锅,]ɪ [火 锅,]ɪ

[mau^{213}ts^{h}ai^{213}] [ts^{h}uan^{213}ts^{h}uanɚ^{213}] [sao^{45}k^{h}au^{51}] [kan^{45}ko^{45}] [xo^{51}ko^{45}]

→ [mau^{32} ts^{h}ai^{213}] [ts^{h}uan^{213}ts^{h}uanɚ^{55}] [sao^{45}k^{h}au^{51}] [kan^{45}ko^{45}] [xo^{54}ko^{45}]

boil dish strings burn dry pot firepot

[是 典 型 嘞 四 川 饮 食]ɪ

[si^{213}tian^{51}ɕin^{31} nˡei^{45} si^{213} ts^{h}uan^{45} in^{51} si^{31}]

→ [si^{213}tian^{55}ɕin^{31} nˡei^{45} si^{32} ts^{h}uan^{45} in^{55} si^{31}]

be typical MOD Sichuan food

'Maocai, Chuanchuanr, barbecue, griddle and hot-pot are typical Sichuan foods.'

d. [成 都 有 三 宝,]ɪ [火 锅,]ɪ [美 女,]ɪ

[ts^{h}ən^{31}tu^{45} iəu^{51} san^{45}pau^{51}] [xo^{51} ko^{45}] [mei^{51} nʲy^{51}]

→ [ts^{h}ən^{43}tu^{45} iəu^{51} san^{45}pau^{51}] [xo^{54} ko^{45}] [mei^{55} nʲy^{51}]

Chengdu have three treasure fire pot pretty girl

[大 熊 猫]ɪ

→ [t^{h}a^{213}ɕyoŋ^{31}mau^{45}]

[t^{h}a^{213}ɕyoŋ^{43}mau^{45}]

big panda

'Chengdu has three treasures: hot-pot, pretty girls, and pandas.'

Nespor and Vogel (1976) indicated that an intonational phrase boundary is embedded before every element in the string. The rule of List Restructuring can be supported by instances discussed above in Chengdu.

7.2.3 Summary

This section discussed the intonational phrase in the Chengdu dialect, specifically the intonation contour, pause position, restructuring of the domain, and the basic domain formation rule of the intonational phrase in Chengdu (which is based on Nespor & Vogel's cross-linguistic account of ι-formation). It can be seen that the intonational phrases in Chengdu resemble features of intonational phrases in other languages and some other Chinese dialects. From the data above, in the Chengdu dialect, root sentences and specific syntactic constructions, such as parenthetical expressions, vocatives, expletives, appositives, and certain moved elements, can form intonational phrases on their own. However, the intonational phrase in Chengdu is slightly different from the intonational phrase in a way that can directly dominate both the clitic group and the phonological phrase. Furthermore, the boundaries of an intonational phrase should be inserted in the positions where pauses may be introduced.

Similarly, ι-restructuring in Chengdu also depends on a variety of factors, including the length of the original intonational phrase, the rate and the style of speech, and contrastive prominence as in other languages. However, unlike other languages, NP constraint in Chengdu has the same strength as S' constraint in ι-restructuring (according to Nespor & Vogel's study of other languages, NP constraint > S'). Therefore, the rule of List Restructuring can still deal with the intonational phrase restructuring of lists in Chengdu, which provides the resemblance of the restructuring of the intonational phrase between Chengdu and the other languages.

7.3 TS application in the domain of intonational phrase in Chengdu

Similar to other prosodic constituents, the intonational phrase in Chengdu is additionally pertinent to certain phonological phenomena. Two features should be discussed to distinguish intonational phrases from other elements. Firstly, most phonological rules that are valid in domains of other prosodic constituents get blocked in-between intonational phrases. In other words, when ɪ-restructuring takes place within a phonological phrase or a clitic group because of performance or semantic factors, rules applicable inside these inner domains would be invalid. Second is that when more than one inner domain is placed within one intonational phrase, which is articulated quickly, then the phonological rules that are invalid inside these embedded domains or across domains might be alternatively set off.

According to Chen & Norman (1965a), a terminal juncture is a pause or actual stop in the flow of speech and is always associated with intonation contours. Therefore, the terminal juncture can be interpreted as the boundaries of intonational phrases. Furthermore, based on the claim of Chen & Norman, the application of TS is blocked before the terminal juncture in the Chengdu dialect. Examples below present an investigation of TS application across boundaries of intonational phrases, while invalid applications are marked with "#" and questionable TS forms are marked in bold:

(18)

a.	[这 是	那 家	新 开 嘞	肥 肠 粉]ɪ	[我
	[tsɛ^{213}si^{213}	n^{l}ɛ^{213}tɕia^{45}	ɕin^{45}k^{h}ai^{45}n^{l}ɛ^{45}	fɛ^{31}ts^{h}aŋ^{31}fən^{51}]	[ŋo^{51}
→	[tsɛ^{32} si^{213}	n^{l}ɛ^{32} tɕia^{45}	ɕin^{45}k^{h}ai^{45}n^{l}ɛ^{45}	fɛ^{43}ts^{h}aŋ^{31}fən^{51}]#	[ŋo^{51}
	*[tsɛ^{32} si^{213}	n^{l}ɛ^{32} tɕia^{45}	ɕin^{45}k^{h}ai^{45}n^{l}ɛ^{45}	fɛ^{43}ts^{h}aŋ^{31}fən**^{55}**]	[ŋo^{51}
	this be	that CI	new open NOM	intestine powder	I
	天 天	来 吃]ɪ			
	t^{h}ian^{45}t^{h}ian^{45}	n^{l}ai^{31}tsi^{31}]			
→	t^{h}ian^{45}t^{h}ian^{45}	n^{l}ai^{43}tsi^{31}]			
	t^{h}ian^{45}t^{h}ian^{45}	n^{l}ai^{43}tsi^{31}]			
	day day	come eat			

‘This is the newly-opened intestine noodle restaurant. I come to eat every day. ’

b.	[长 得	乖,]ɪ	[那 个	女 娃 子]
	[tsaŋ^{51}tɛ^{31}	kuai^{45}]	[n^{l}ɛ^{213}ko^{213}	n^{j}y^{51}ua^{31}tsi^{51}]
→	[tsaŋ^{55}tɛ^{31}	kuai^{45}]#	[n^{l}ɛ^{32} ko^{213}	n^{j}y^{51}ua^{31}tsi^{51}]
	*[tsaŋ^{55}tɛ^{31}	kuai**^{35}**]	[n^{l}ɛ^{32} ko^{213}	n^{j}y^{51}ua^{31}tsi^{51}]
	Grow	cute	that CI	girl

‘She is very good-looking, that girl.’

c. [她 说]ɪ [没 上 学 嘞 那 个]ɪ [是 五 幺

[t^ha^{45} so^{31}] [mei^{45} $saŋ^{213}$ $ɕyo^{31}$ $n^lɛ^{45}$ $n^lɛ^{213}$ ko^{213}] [si^{213} vu^{51} iao^{45}

→ [t^ha^{45} so^{31}]# [mei^{45} $saŋ^{32}$ $ɕyo^{31}$ $n^lɛ^{45}$ $n^lɛ^{32}$ ko^{213}]# [si^{213} vu^{51} iao^{45}

*[t^ha^{45} $so^{\mathbf{43}}$] [mei^{45} $saŋ^{32}$ $ɕyo^{31}$ $n^lɛ^{45}$ $n^lɛ^{32}$ $ko^{\mathbf{32}}$] [si^{213} vu^{51} iao^{45}

she speak no school MOD that CI be five one

二]ɪ [遭 地 震 震 伤 咯]

$ɚ^{213}$] [$tsao^{31}$ ti^{213} $tsen^{213}$ $tsen^{213}$ $saŋ^{45}$ n^lo^{31}]

→ $ɚ^{213}$]# [$tsao^{31}$ ti^{32} $tsen^{213}$ $tsen^{32}$ $saŋ^{45}$ n^lo^{31}]

*$ɚ^{\mathbf{32}}$] [$tsao^{31}$ ti^{32} $tsen^{213}$ $tsen^{32}$ $saŋ^{45}$ n^lo^{31}]

two PASS ground shake shake hurt CRS

'she said that one who does not go to school was hurt by the earthquake on May 12th.'

d. [冒 菜,]ɪ [串 串儿,]ɪ [烧 烤,]ɪ [干 锅,]ɪ [火 锅,]ɪ

[$mau^{213}ts^hai^{213}$] [$ts^huan^{213}ts^huanɚ^{213}$] [$sao^{45}k^hau^{51}$] [$kan^{45}ko^{45}$] [$xo^{51}ko^{45}$]

→ [mau^{32} ts^hai^{213}]# [$ts^huan^{213}ts^huanɚ^{55}$]# [$sao^{45}k^hau^{51}$]# [$kan^{45}ko^{45}$]# [$xo^{54}ko^{45}$]#

*[mau^{32} $ts^hai^{\mathbf{32}}$] [$ts^huan^{213}ts^huanɚ^{\mathbf{55}}$] [$sao^{45}k^hau^{\mathbf{54}}$] [$kan^{45}ko^{\mathbf{45}}$] [$xo^{54}ko^{\mathbf{35}}$]

boil dish strings burn dry pot firepot

[是 典 型 嘞 四 川 饮 食]ɪ

[$si^{213}tian^{55}ɕin^{31}$ n^lei^{45} si^{32} ts^huan^{45} in^{55} si^{31}]

– [$si^{213}tian^{55}ɕin^{31}$ n^lei^{45} si^{32} ts^huan^{45} in^{55} si^{31}]

*[$si^{213}tian^{55}ɕin^{31}$ n^lei^{45} si^{32} ts^huan^{45} in^{55} si^{31}]

be typical MOD Sichuan food

'Maocai, Chuanchuanr, barbecue, griddle and hot-pot are typical Sichuan food.'

After the application of TS in all types of intonational phrases discussed above, it can be seen that TS is blocked across all the boundaries of intonational phrases in Chengdu. Furthermore, in addition to the domain of intonational phrases, speaking speed and emphasis on parts of a sentence also impact the application of TS, which may result in the blocking of TS at particular positions. See examples:

(19)

a.	他	好	乖		
	t^ha^{45}	xau^{51}	$kuai^{45}$		
→	t^ha^{45}	$xau^{\mathbf{54}}$	$kuai^{45}$	(no emphasis)	
→	t^ha^{45}	$xau^{\mathbf{51}}$	$kuai^{45}$	(emphasis on 好 'very')	
	he	very	cute		
	'He is very nice.'				

b.	这	家	冒 菜		爆	香	
	$ts\varepsilon^{213}$	$tɕia^{45}$	mau^{213}	ts^hai^{213}	pau^{213}	$ɕiaŋ^{45}$	
→	$ts\varepsilon^{213}$	$tɕia^{45}$	$mau^{\mathbf{32}}$	ts^hai^{213}	$pau^{\mathbf{32}}$	$ɕiaŋ^{45}$	(normal rate of speech)
→	$ts\varepsilon^{213}$	$tɕia^{45}$	$mau^{\mathbf{32}}$	ts^hai^{213}	$pau^{\mathbf{213}}$	$ɕiaŋ^{45}$	(slow rate of speech)
	this	CI	boil	dish	explode	appetizing	
	'Maocai at this store is super appetizing.'						

The examples above both have two different readings. When produced with regular reading, TS applies in the corresponding domains in both (a) and (b) as usual. However, when uttered with emphasis or slow speaking speed, in other words, when the prominence is assigned, TS gets

blocked in each domain. In (a), 好 ‘very’ undergoes TS in the domain of phonological phrase when uttered normally but denies TS with the emphasis. While in (b), 爆 undergoes the TS in the domain of phonological phrase 爆香, but the TS got blocked when the string is uttered at a slow speed, and 爆 is lengthened in terms of articulation. Therefore, the data above can prove that the rate/style of speech and contrastive prominence play a role in the restructuring of the intonational phrase in the world’s languages and are valid in the Chengdu dialect. It can be concluded that the ι-restructuring brought about by both performance and semantic factors can occur within a clitic group or a phonological phrase in Chengdu, and in this way, the utterances would be divided into different parts, including the separated phonological phrases and clitic groups. In the examples below, boundaries of intonational phrases are inserted between separated parts, and the blocking is marked with “#”:

(20)

a.	[他	好	乖].	(root sentence)
	[他	好]en[乖]	(emphasis on 好 ‘very’)	
	[t^ha^{45}	xau^{51}]	$kuai^{45}$	
→	[t^ha^{45}	xau^{51}]#	$kuai^{45}$	
	he	very	cute	
	‘He is very nice.’			

b.	[这	家	冒 菜	爆	香]ɪ	(root sentence)
	[这	家	冒 菜	爆]ɪ	[香]ɪ	(slow rate of speech)
	[tsɛ^{213}	tɕia^{45}	mau^{213} ts^{h}ai^{213}	pau^{213}]	[ɕiaŋ^{45}]	
→	[tsɛ^{213}	tɕia^{45}	mau$^{\mathbf{32}}$ ts^{h}ai^{213}	pau^{213}]#	[ɕiaŋ^{45}]	
	this	CI	boil dish	explode	appetizing	

'Maocai at this store is super appetizing.'

In addition to slow rate and emphasis, a rapid tempo may also block phonological rules within or across boundaries in embedded domains in Chengdu. However, the triggering is optional and thus will not be discussed in detail. Below is an example, where blocking is marked with "#" while the application is marked with "=":

(21)

a.	[[吃]φ	[蛋	烘 糕]φ]ɪ	
	[[ts^{h}i^{31}]	[tan^{213}	xoŋ^{45}kau^{45}]	
→	[[ts^{h}i$^{\mathbf{31}}$]#	[tan^{213}	xoŋ^{45}kau^{45}]	(normal rate of speech)
	[[ts^{h}i$^{\mathbf{43}}$]=	[tan^{213}	xoŋ^{45}kau^{45}]	(rapid tempo)
	eat	egg	bake cake	
	'eat pancakes'			

吃 'to eat' and 蛋烘糕 'pancake' are two phonological phrases formed by the φ-formation rule that embedded in the intonation phrase (a), therefore, when (a) is read with a normal rate, TS rule cannot be applied between two phonological phrases.But when (a) is uttered with a rapid tempo, TS rule is triggered between 吃 and 蛋烘糕, and thus 吃 undergoes TS and changes to the sandhi tone.

7.4 Summary

This chapter investigated the intonational phrase in the hierarchy, which is the last constituent discussed in this paper. Under the framework of Nespor and Vogel, the first section reviewed the basic definition and restructuring of the domain of the intonational phrase and revisited the idea that the intonational phrase is also the domain of application for segmental rules across languages. The following sections investigated the intonational phrase in the Chengdu dialect, which revealed that the intonational phrase in this dialect resembles common properties with the intonational phrase cross languages in terms of formation and the restructuring of the domain. In the Chengdu dialect, root sentences and some syntactic constructions (parenthetical expressions, vocatives, expletives, appositives, and certain moved elements) can form independent intonational phrases just like in other languages. Therefore, the formation rule of the domain of intonational phrase in Chengdu was established on the basis of Nespor and Vogel's original definition.

Furthermore, similar to the properties in other languages, the length of the original intonational phrase, the rate and the style of speech, and contrastive prominence all impact the restructuring of the intonational phrase in the Chengdu dialect. In this dialect, three constraints restrict ι-restructuring: NP constraint, S' constraint, and obligatory argument constraint. However, NP constraint and S' constraint are stronger than obligatory arguments regarding the degrees of restriction. To account for cases of lists, the rule of List Restructuring proposed by Nespor & Vogel (1976) can be applied in the dialect. The above linguistic data also demonstrated that the Chengdu dialect's intonational phrase resembles the intonational phrase cross languages.

Specifically, the application of TS is blocked across boundaries of all types of intonational phrases regardless of formation. The ι-restructuring brought about by the slow rate, the formal

style of discourse, and the prominence assignment may disregard NP and S constraints. The obligatory argument constraint occurs at positions within a phonological phrase, or a clitic group prompts the blocking of phonological rules within phonological domains. Then again, as exhibited by linguistic data, when an intonational phrase is produced with a rapid tempo, the phonological rules that are invalid when impeded inside or across the implanted domain(s) might be alternatively set off.

The statement that the ι formation rule and ι-restructuring (including factors that affect the restructuring and constraints that impose restrictions on the restructuring) are universal can be supported by data from the Chengdu dialect in the discussion above, which indicates that the formation and the restructuring of the intonational phrase in Chengdu resemble some common features with the intonational phrase in different languages.

Chapter VIII Conclusion

The dissertation examines the Chengdu dialect through the lens of prosodic phonology. One objective of the study is to conduct a detailed analysis and description of the phonological system of the Chengdu dialect by utilizing methodologies and concepts from prosodic phonology theory. In addition, this dissertation attempts to use the Chengdu dialect investigations to broaden our grasp of and provide additional insight into prosodic phonology.

With these two objectives, I conducted research on the Chengdu dialect, looking for the major constituents of prosodic phonology within the universal prosodic hierarchy, from the smaller unit to the larger, including the syllable, the foot, the prosodic word, the clitic group, the phonological phrase, and the intonational phrase. Due to phonological phenomena that refer to the prosodic domains discussed earlier, it is shown that a number of these universal prosodic constituents should be designated as indispensable prosodic domains within the Chengdu dialect prosodic phonology with only one exception, the foot. Therefore, I have demonstrated that it should be excluded from the Chengdu dialectda tentative prosodic hierarchy proposed in the third chapter. Experimental and perceptional studies show a lack of conclusive evidence and dubious truth regarding the binary metrical contrast between syllables in Chengdu. Moreover, based on the analysis, no single phonological phenomenon can be referred to as the domain of the foot in this dialect. Therefore, I have concluded that the foot does not play a role in the Chengdu dialect phonological system.

The most significant and smallest units in the prosodic hierarchy, the utterance, and mora, respectively, receive no specific attention in this dissertation,e analysis. In the chapter discussing the syllables and the foot, I mentioned that previous research claiming mora as the tone-bearing unit in some dialects of Chinese,we still need more linguistic data to the support establishing the

mora as an independent prosodic unit. As for utterances, no observations have been reported in the phonological system of the Chengdu dialect in previous studies, nor do I or my informants find any clue of such utterances. As a result, there is currently no substantial evidence to support the existence of this domain in the Chengdu dialect. In sum, utterance and mora are not found in the Chengdu dialect prosodic hierarchy.

To wrap up all the analyses of Chengdusy prosodic constituents from early chapters, the entire picture of the prosodic hierarchy of this dialect is presented below:

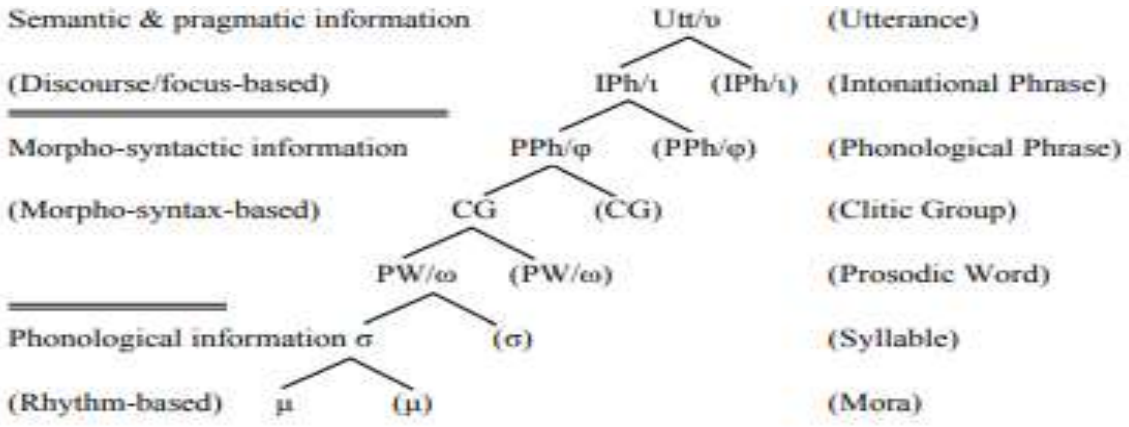


Figure 34 Prosodic hierarchy in the Chengdu dialect

With the investigation of TS application in detail (the blocking and application of phonological restrictions), this dissertation discusses the phonological phenomena in Chengdu. It has demonstrated that particular phonological phenomena can be initiated in one domain but inhibited in another. Additionally, a single phonological phenomenon found in the Chengdu dialect can be applied within different domains. The list below highlights the domain formation and phonological phenomena that refer to these prosodic domains in the Chengdu dialect:

Table 65 Prosodic domains and phonological phenomena in the Chengdu dialect

Prosodic domain	Phonological phenomena and domain formation
Syllable (σ) (Chapter III)	**Formation of the domain**: the domain of σ is a syllable. Phonological phenomena: vowel change application /e/→[ə], [o]
Prosodic Word (ω) (Chapter IV)	**Formation of the domain**: The syntactic tree's terminal node is of the domain ω **The phonological phenomena**: phonological phenomena application conditioned through morpho-syntactic words' subtypes: TS application (reduplicated adjectives, polysyllabic monomorphemic words, compounds, and derived words) MTS application (sound splitting words & diminutive nouns)
Clitic Group (CG) (Chapter V)	**Formation of the domain**: The CG domain involves one independent (for instance, the nonclitic) prosodic constituents (φ, ω or CG) together with any adjacent Plain clitic(s)/nondirectional clitic(s) to the extent that there exists no possible host for more category memberships sharing. Directional clitic(s) **Phonological phenomena** TS blocking in Type A CG (between the enclitic and the host) TS application in type B CG (between the host and proclitic)
Phonological phrase (φ) (Chapter VI)	**Formation of the domain:** The φ domain: Marks each lexical head X, on the right edge, except where XP is an adjunct Marks the right edge of the first phonetically overt head Y on the non-recursive side of the lexical head X (either functional or lexical if any) outside of XP; right edge of X or Y that represents ωs/CGs belongs to a different φ The first compliment of X on its recursive side is a non-branching φ restructuring which is joined into the φ that contains X. **Phonological phenomena**: The syntactic structure gives conditions on the phonological phenomena application: TS application
Intonational Phrase (ι) (Chapter VII)	**Formation of the domain**: The domain may entail: Any remnant sequence of adjacent CGs/φs in a root sentence or all the CGs/φs in a string that is not attached structurally to the sentence tree at the level of s-structure ι restructuring: (a) or (b) constructs can be broken down into smaller ιs if factors like style, constructive prominence, rate of speech, items a length contained in a list are involved. **Phonological phenomena** TS blocking across the ι boundaries (including those formed through ι-restructuring, certain syntactic constructions, and root sentences) TS optional application (although originally blocked) in a ι that is uttered at a rapid tempo.

Additionally, I have included a printout that demonstrates how certain phonological phenomena associated with a particular domain may not be initiated in an embedded domain when the external and internal domains are established via reference to the same information type and hierarchical location: the blocking of TS occurs within the embedded type A clitic group domain, while the application of TS within the phonological phrase is most likely to occur within the embedded type A clitic group domain, between the enclitic and the prosodic word host. On the other hand, if the larger domain and the embedded domain are constructed using distinct information types, bigger domain-bound phonological phenomena may be applicable in the embedded domain.

In summary, this dissertation,, pertinent discussion and discoveries offer a number of contributions to the study of the Chengdu dialect. Beginning with a complete explanation of the Chengdu dialectti phonological system, with a focus on the relationships between the phonology and other grammar components and related phonological phenomenon. The domains of TS application and other phonological phenomenon are then discussed, and in the process, some well-established controversies in Chengdu are reconfigured and clarified, such as the foot, the existence of tone sandhi at the phrasal level, and the way that phonological phenomena refer to certain types of morpho-syntactic information. Also, this dissertation provides an in-depth account of first-hand data in the Chengdu dialect, serving as an invaluable resource for future research. Finally, it contributes to the phonological system of Chengdu by addressing a wide range of semantic, syntactic, and morphology issues and promotes a grasp of the Chengdu dialect morphology, semantics, and syntax.

The dissertation also provides substantial data to support critical statements about prosodic phonology theory and hence has far-reaching theoretical ramifications. First, it provides empirical

evidence for the existence of prosodic constituents and the prosodic hierarchy in general. Then, the linguistic data demonstrates that phonetic processes and phonologic rules have application domains such as prosodic constituents. It also demonstrates that certain prosodic constituents like the clitic group do not appear to be isomorphic to any morpho-syntactic structures, despite their construction to convey morpho-syntactic information, which establishes and confirms the fundamental claim about the non-isomorphism of phonological and syntactic representations. In this manner, it also provides motivation for the establishment of prosodic constituents and the establishment of the prosodic hierarchy. The restriction of the rule of application and the domain formation of the individual prosodic constituents within the Chengdu dialect further affirm that a particular constituent needs to be established by referring to a particular amount and semantic, syntactic, and morphological information within its definition domain. The clitic group may demonstrate dominance over another clitic group or a matching phonological phrase in Chengdu, implying that violations of Layeredness and Nonrecursivity are acceptable. This reasoning establishes sufficient proof and rationale for the increased requirement and necessity to have a weakened Strict Layer Hypothesis (Zhang, 1992, 2017). This phonological phrase analysis enables the integration of phonological phrases with the RBA and EBA in the Chengdu dialect for the first time. Finally, an additional case is made for implementing restrictions on rule application along with the limits of the embedded domain, demonstrating that such restrictions should be viewed as an intrinsic element of Chengdu prosodic phonology.

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