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FOREWORD

This last year has been busy for the journal not only in terms of the volume of submissions but also due to the newliest demands as an online journal. Words of appreciaton go to the authors who have contributed to this edition, all the reviewers, finally to the production team, who prepared the papers for publication. Altogether this summer's edition of the journal brings together six research articles.

The first paper was authored by **Karen HUANG**, who acoustically analyzed neutral tone syllables in Taiwan Mandarin to show the effects of stress and accent on its tone patterns.

The following paper is a corpus study on phonemic status of Bangla nasal vowels and was written by **Jahurul ISLAM**. It offers a new insight into the number of such vowels, which is lower than reported up until now.

Nina GOLOB and **Mateja PETROVČIČ** wrote an article on vowel sequences in Japanese and Chinese, and reviewed their appearance in official Latin scripts of the two languages and pronunciation catches in those scripts.

A paper by **Liulin ZHANG** dedicates its attention to a character-based historical overview of the notional passive construction in Chinese through corpus analysis.

Yet another paper on Chinese was written by **LI Wenchao**, who focused on the evolution of the Chinese verb 断 (*duàn* 'break') and discussed the development of its several syntactic functions.

Last but not least, **I-hao WOO**'s paper on Mandarin Chinese perfective suffix *-le* proposed a straightforward definition on the core function of the suffix, and provided a simple way for the instruction of it.

Editors and Editorial Board wish the regular and new readers of the ALA journal a pleasant read full of inspiration.

Nina Golob

RESEARCH ARTICLES

PHONOLOGICAL IDENTITY OF THE NEUTRAL-TONE SYLLABLES IN TAIWAN MANDARIN: AN ACOUSTIC STUDY

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Abstract

Taiwan Mandarin, one of the more syllable-timed dialects of Mandarin, has fewer unstressed syllables than Standard Mandarin. Acoustic analyses show that the supposedly unstressed syllables—neutral-tone syllables—in Taiwan Mandarin behave differently from those of Standard Mandarin. Unlike Standard Mandarin, these syllables do not raise their pitch after Tone 3. They have a distinct static mid-low pitch target and the target is implemented with a stronger articulatory strength. Moreover, acoustic analyses demonstrate that not all of these "unstressed syllables" are unstressed. The phonetic evidence suggests that these neutral-tone syllables should be analyzed as unaccented rather than unstressed in Taiwan Mandarin. These unaccented syllables are only lexically marked, and their pitch is neutralized into a mid-low tone. This study sheds light on how rhythm can affect stress and accent in a lexical tone language.

Keywords: Taiwan Mandarin; neutral tone; rhythm; lexical tone; stress; neutralization

Povzetek

Tajvanska kitajščina, ena ritmično bolj zlogovnih različic kitajščine, pozna manj nepoudarjenih zlogov kot standardna kitajščina. Akustične analize kažejo, da zlogi v nevtralnem tonu, torej tisti nepoudarjeni, v tajvanski kitajščini izkazujejo drugačne lastnosti kot tisti v standardni kitajščini; za nizkim tonom ne pride do tonskega višanja. Z razliko od standardne kitajščine so ti zlogi izgovorjeni z značilnim enakomernim srednje nizkim tonom in so izgovorjeni z večjo jakostjo. Poleg tega je iz akustičnih analiz moč razbrati, da ne izkazujejo vsi nepoudarjeni zlogi akustičnih lastnosti nepoudarjenosti. Zato nekatere fonetične raziskave podajajo predlog, da bi takšne zloge v tajvanski kitajščini definirali kot nenaglašene in ne kot nepoudarjene. Nenaglašeni zlogi so opredeljeni samo pomensko, njihov ton je nevtraliziran v enakomerno srednje nizko višino. Akustične analize poleg tega razkrivajo, da niso vsi zlogi, ki naj bi bili nepoudarjeni, tudi v resnici nepoudarjeni. Fonetični dokazi nakazujejo, da bi morali v tajvanski kitajščini zloge v nevtralnem tonu obravnavati kot nenaglašene, ne pa kot nepoudarjene. Nenaglašeni zlogi so označeni le leksikalno, pri čemer se njihova tonska višina nevtralizira v srednje nizki ton. Ta študija prikazuje, kako lahko ritem vpliva na poudarek in naglas v jezikih z leksikalnim tonom.

Ključne besede: tajvanska kitajščina; nevtralni ton; ritem; leksikalni ton; poudarek; nevtralizacija

1   Introduction

Languages use accent to divide an utterance into shorter phrases. Some languages only rely on pitch to mark prominence, such as Japanese (pitch accent); some other languages, namely stress accent languages, use a range of phonetic material to mark prominence (Beckman, 1986; Ewen & Hulst, 2001). Stress accent languages differ in which acoustic correlates (and in what combinations) they use to mark prominence. Stressed syllables are associated with one or more of the following acoustic correlates: higher fundamental frequency (f0) (Garellek & White, 2015; Gordon & Applebaum, 2010; Lieberman, 1960; Llisterri, Machuca, de la Mota, Riera, & Ríos, 2003), greater intensity (Gordon & Applebaum, 2010; Kochanski, Grabe, Coleman, & Rosner, 2005; Prieto & Ortega-Llebaria, 2006; Sluijter & Van Heuven, 1996), longer duration (Arvaniti, 2000; Crystal & House, 1988; Fry, 1955; Sluijter & Van Heuven, 1996; Williams, 1985), as well as vowel quality (De Jong & Zawaydeh, 1999; Gordon & Applebaum, 2010; Ortega-Llebaria & Prieto, 2007).

Since f0 is one of the acoustic correlates of stress, one might wonder whether lexical stress is compatible with tone, especially the complex tone systems in which f0 contours are utilized to contrast every syllable. The answer is yes. Lexical stress can be found in complex lexical tone languages, mostly located in East Asia. Although some complex tone languages are argued to have no lexical stress, e.g. Cantonese (Bauer & Benedict, 1997) and Southern Vietnamese (Brunelle, 2017), other complex tone languages have been documented to have lexical stress. In these cases, the contrast of stress is manifested through the reduction of unstressed syllables—reduced duration and different degrees of tone neutralization are often found. For example, in Burmese, the unstressed syllables are called "minor" syllables. A minor syllable has a shorter duration and its vowel is neutralized to [ə]. The pitch of the minor syllable has been described as "variable" (Bradley, 1982) and shows no high f0 peak (Gruber, 2011). In Thai, it has been reported that the five lexical tones are neutralized into three tonal registers (low, mid, high) when they are unstressed (Potisuk, Gandour, & Harper, 1994, 1996). However, this analysis is still controversial (Gandour, Tumtavitikul, & Satthamnuwong, 1999; Moren & Zsiga, 2006). Similarly in Nanchang Chinese, a Gan dialect, the lexically unstressed syllables also show tone neutralization in which the five lexical tones are neutralized into two different pitch patterns due to shorter rime durations (J. Liu & Zhang, 2012).

1.1   Standard Mandarin

Standard Mandarin is perhaps the best-studied case of lexical stress in complex tone systems. The unstressed syllables are mostly lexically determined in Standard Mandarin (SM) and they are referred to as having a "neutral tone" (Chao, 1968, p. 36). An unstressed syllable reduces in SM (Chao, 1933, 1956, 1968; Luo & Wang, 1957). The unstressed vowel centralizes towards a schwa and its coda nasal is usually deleted

while the vowel is nasalized (Duanmu, 2000, p. 256; Lin & Yan, 1990). As a result, an unstressed syllable is also shorter in duration. The mean duration of unstressed syllables is about 50%-60% of the stressed ones (J. Cao, 1986; Lee & Zee, 2008; Lin & Yan, 1980). As for intensity, an unstressed syllable does not necessarily have a weakened maximum intensity compared to a stressed syllable or its preceding syllable (J. Cao, 1986; Lin & Yan, 1980), and the intensity curves seem to co-vary with the pitch contours (Lee & Zee, 2008). Furthermore, there are lenition processes found only in unstressed syllables. In connected speech, an unstressed vowel can be devoiced or deleted when the vowel is high and after a fricative, an aspirated stop, or an affricate (Duanmu 2000:257). The initial of an unstressed syllable in connected speech also often undergoes lenition (Chao, 1968, p. 38; Duanmu, 2000, pp. 255-256; S. Xu, 1980, p. 159).

Stress also affects Mandarin on the suprasegmental level. There are four lexical tones. Tone 1, Tone 2, Tone 3, and Tone 4 have high level /H/ [˥], rising /LH/ [˩˥], dipping (low falling) /L/ [˨˩] and high falling /HL/ [˥˩] pitch contours, respectively. The underlying tone of an unstressed syllable in SM is not realized, and its pitch is determined by the preceding tone (Chao, 1932; Luo & Wang, 1957). Therefore an unstressed syllable is considered toneless (Duanmu, 2007, pp. 242-243) and has what is normally termed neutral tone /Ø/[1]. The earlier descriptions of the unstressed syllables were mainly impressionistic (Chao, 1932, 1933; Kratochvil, 1968), but Chao's description (1968, p. 27) is still widely cited: the pitch of the neutral tone is *half-low* after Tone 1 /H/, *middle* after Tone 2 /LH/, *half-high* after Tone 3 /L/, and *low* after Tone 4 /HL/. The instrumental studies showed similar results, though the findings slightly varied in terms of the contour details (Cheng, 1973; Dreher & Lee, 1968; Gao, 1980; Lin & Yan, 1980; Shen, 1990). The most recent acoustic studies showed that the pitch contours of the neutral tone were [˥˩, ˥˩, ˩˥/˥˩, ˨˩] after the four lexical tones /H, LH, L, HL/ [˥, ˩˥, ˨˩, ˥˩], respectively (Lee & Zee, 2008). The pitch contours of a neutral tone appear to be an extension of the preceding tone (Z. Li, 2003). However, Chen and Xu (2006) found that when there are consecutive unstressed syllables, the pitch contours slowly approach a mid-level target over the course of these syllables.

At least in Standard Mandarin, scholars disagree on how lexical stress (or lack of stress) in complex tone languages should be analyzed (L. Liu, 2002). Unlike other non-tonal languages where primary stress in a word is marked, it seems that the unstressed syllables are marked in these complex tone languages. Because of that, many analyses marked the unstressed syllables as having a short tone and specify the short duration as a feature of the underlying tone since it is common in complex tone languages to have the categories of both long and short tones (e.g. Cantonese, Thai). The problem with the short tone analysis in Standard Mandarin is that some syllables appear to be

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[1] The notation /H, LH, L, HL, Ø/ are used to refer to the underlying tones following Duanmu's convention. (2007). Tone 1-4 and the neutral tone are marked as ā, á, ǎ, à, and a (without a tone mark) respectively in the standard Romanization system *Hanyu Pinyin.*

de-stressed at the post-lexical level. Aside from the lexically marked neutral-tone syllables, which comprise about 15-20% of the syllables in written texts (W. Li, 1981, p. 35), SM speakers tend to de-stress the second syllable of disyllabic or trisyllabic words in colloquial speech (Chao, 1932; Shen, 1990, pp. 38-39). Although unstressed syllables can also be stressed if the word is infrequent (Chao, 1932; Jing, 2002), overall, about one-third of all SM syllables are unstressed and toneless in SM in connected speech (Duanmu, 2000, pp. 257-258). Therefore in SM, it is better to analyze these syllables as unstressed, and treat the neutral tone in SM as a phonetic representation of an unstressed syllable.

1.2   Taiwan Mandarin

However, not all Mandarin dialects exhibit a similar pattern. Taiwan Mandarin is a dialect spoken in Taiwan that has been influenced by Southern Min. Mandarin was brought into Taiwan as a standard language when the Nationalist government lost the civil war and retreated to Taiwan in 1949. While the Mainland immigrants spoke some variety of Mandarin, 70% of the population in Taiwan spoke Southern Min as a first language and were forced to speak Mandarin as a second language (Sandel, 2003). After decades of language shift, Mandarin has become the dominant language and has developed into a fully-fledged dialect (Her, 2010). One of the features of the Taiwan Mandarin dialect is that the differences between Taiwan Mandarin (TM) stressed and unstressed syllables are not very distinct perceptually—TM is often described as being more impressionistically syllable-timed compared to SM (Kubler, 1985).

Since the syllable canons are similar across Mandarin dialects, the more syllable-timed rhythm in TM lies in the contrast between stressed and unstressed syllables. Like SM, TM also lexically marks the four lexical tones and the neutral tone. However, lexically marked neutral-tone syllables and syllable de-stressing occur less frequently in TM than in SM (Duanmu, 2007, p. 308; Kubler, 1985, p. 161; Swihart, 2003, p. 110; Tsao, 2000). Also, Duanmu (2000, pp. 266-267) noticed that, unlike in SM, vowel devoicing and deletion are not found in unstressed syllables in TM. Consonant reduction is found in TM, but it can happen in stressed syllables too. Even consonants in word initial position can reduce in TM, for example /kʰə-ʂi/: [kʰɤ-sɯ] 'but' becomes [ɤ-sɯ], and /ʐan-xəu/: [zan-xəu] 'afterwards' becomes [ã-əu] [2]. This unconditioned consonant reduction may be a manifestation of the rhythmic differences between SM and TM because the reduction is not restricted to unstressed syllables—a more syllable-timed language tends to have a similar treatment on both stressed and unstressed syllables (Dauer, 1983).

Fewer neutral-tone syllables can be demonstrated in the prescriptive grammar in TM. I compared the words in the List of Neutral-Tone Words for the Standard Mandarin

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[2] Many TM speakers often de-retroflex /ʂ/ and /ʐ/.

Proficiency Test[3] with the online Revised Mandarin Chinese Dictionary published by the Ministry of Education in Taiwan. I found that all the suffixes and the reduplicants remain prescriptively marked as having a neutral tone in TM. However, only about half of the compound words (138/272) were marked as having full-neutral disyllabic patterns in TM[4], while the other half (134/272) were marked with lexical tones. For example, *xiàba* [ɕjɑ^{HL}pɑ$^{\emptyset}$] 'chin' in SM remains marked as /HL-Ø/ in TM, but *yuèliang* [yɛ^{HL}ljɑŋ$^{\emptyset}$] 'moon' in SM is marked as /HL-HL/ in TM. I further examined these prescriptive neutral-tone syllables in TM by trying to input the syllables/characters in the computer's operating system[5] assuming that the input system is designed to let TM users input these syllables in the most intuitive way. I found that 116 out of 138 (84%) of the TM prescriptive neutral-tone syllables in compound words cannot be found under the neutral-tone entry. This piece of evidence shows that only 8.1% ((138-116)/272) of the SM full-neutral compound words are treated as full-neutral in TM. The percentage of full-neutral disyllabic words might be even lower. For example, although a neutral tone needs to be typed in *luó-bo* [lwo^{LH}pwo$^{\emptyset}$] 'radishes' and *yào-shi* [jɑo^{HL}ʂɨ$^{\emptyset}$] 'keys', they seem to be pronounced *luó-bō* [lwo^{LH}pwo^{H}] and *yào-shǐ* [jɑo^{HL}sɨ^{L}] (or *yào-shí* [jɑo^{HL}sɨ^{LH}]) in TM respectively.

Aside from the compound words, the prescriptive neutral-tone markings on grammatical suffixes, final particles, and reduplicants also do not seem to fully reflect TM speakers' phonological representation of these neutral-tone syllables. It seems that only some of the prescriptively marked neutral-tone syllables are recognized by TM speakers. For example, the experiential aspect suffix *-guo* [kwo$^{\emptyset}$] and many directional complements such as *-shang* [ʂɑŋ$^{\emptyset}$] 'up' and *-lai* [lɑɪ$^{\emptyset}$] 'come' are not reduced; instead they are pronounced with lexical tones *guò, shàng, lái* [kwo^{HL}; ʂɑŋ^{HL}; lɑɪ^{LH}]. As for reduplications, only kinship terms are produced with a neutral tone. Verbal reduplication and nominal reduplication are produced with an identical tone. For example, *kànkan* [kan^{HL}-kə̃$^{\emptyset}$] 'to take a look' is pronounced as [kan^{HL}-kan^{HL}]; *xīngxing* [[ɕiŋ^{H}-ɕĩ$^{\emptyset}$] 'star' is pronounced as [ɕiŋ^{H}-ɕiŋ^{H}]. When the reduplication is used to show endearment, a [L-LH] or [L-H] pitch pattern is used in TM (Hsu, 2006, pp. 119-120). For example, *bàba* [pɑ^{HL}-pɑ$^{\emptyset}$] 'father' and *māma* [mɑ^{H}-mɑ$^{\emptyset}$] 'mother' can be pronounced as bǎbá [pɑ^{L}-pɑ^{LH}] and *mǎmá* [mɑ^{L}-mɑ^{LH}] respectively, while *jǐejie* [tɕjɛ^{L}-tɕjɛ$^{\emptyset}$] 'older sister' can be pronounced as *jiějiē* [tɕjɛ^{L}-tɕjɛ^{H}]. This phenomenon can also be shown in

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[3] *Putonghua shuiping ceshi yong qingsheng cibiao* 普通话水平测试用轻声词表 is a study guide of neutral-tone words for non-native speakers to study in order to pass the Standard Mandarin Proficiency Test held by the People's Republic of China government.

[4] Mandarin has trochaic disyllabic feet. Therefore unstressed syllables occur at the second syllables of a disyllabic compound words. Full-neutral here indicates that the first syllable has a full tone (one of the four lexical tone), and the second syllable has a neutral tone.

[5] One of the most common character input methods in Taiwan is the New Phonetic Input (新注音輸入法) in the Microsoft operating system, in which the users have to input both the segment and the tone (4 lexical tones and 1 neutral tone) in order to input the character.

colloquial writing online. For example, sometimes 媽媽 *māma* [mɑ^H-mɑ^∅] 'mother' is written as 馬麻 (*mǎmá* [mɑ^L-mɑ^LH]), 弟弟 *dìdi* [ti^HL-ti^∅] 'younger brother' is be written as 底迪 (*dǐdí* [ti^L-ti^LH]), and 寶寶 *bǎobao* [pɑo^L-pɑ^∅] 'baby' is written as 寶包 (*bǎobāo* [pɑo^L-pɑo^H]). It is worth noting that the [L-H] pattern is only adopted when the reduplicated syllable is /L/ (Hsu, 2006). It is very likely that the TM speakers analyze the post-L raising pitch of the reduplicants as a /H/. As for final particles such as *ba* [pɑ^∅], *ne* [nə^∅], *la* [lɑ^∅], *ya* [jɑ^∅], and *a* [ɑ^∅], they are also marked with a neutral tone in TM prescriptively. However, their pitch values also vary depending on the intonation of the sentence (Chao, 1968; Shen, 1990).

For the remaining neutral-tone syllables in TM, some of them clearly do not possess an underlying lexical tone. For example, the second syllable of *dìdi* [ti^HL-ti^∅] 'younger brother' seems to have a neutral tone because the second *di* [ti^∅] is not pronounced with [HL]. Many reduplicated kinship terms also show a similar pattern in which the second syllable clearly does not possess a lexical tone of the character. Some of them, mostly grammatical suffixes and final particles, do not have a lexical tone that are transparent to the present-day speakers because they were reduced and grammaticalized diachronically. For example, durative *zhe* [ʈʂə^∅] was grammaticalized from *zháo* [ʈʂɑo^LH] 'contact', but this origin is not obvious to the speakers.

Only a few studies have investigated the acoustic properties of these remaining neutral-tone syllables. Two preliminary studies suggest that the pitch of the TM neutral tone is not influenced by the preceding lexical tones (J. Li, 2005; Tseng, 2004). The pitch pattern of the TM neutral tone was described as having a "certain pitch target" (J. Li, 2005) or pronounced with a low entering tone (short tone) (Tseng, 2004). However, both preliminary studies were based on limited sets of data without controlling for the environment or systematically comparing them to the other lexical tones. It remains unclear how the pitch patterns of the neutral tone should be characterized in relation to the other lexical tones, and whether these syllables are in fact unstressed. If the TM neutral tone has some kind of tonal target, as both previous studies suggested, does that imply the TM neutral-tone syllable has its own tonal representation? If the TM neutral tone has an underlying pitch target that is different from the existing four lexical tones and it is not reduced, we might need to posit a new lexical tone in Taiwan Mandarin. On the other hand, it could simply be the case that the unstressed syllables in TM still reduce and undergo tone neutralization, but its pitch patterns were neutralized differently from SM. To the best of my knowledge, there has been no complete study that examines the acoustic features of the neutral tone in TM and further analyzes the phonological identity of the TM neutral tone.

This acoustic study aims to answer the following research questions: 1) What is the pitch target of the TM neutral tone? Specifically, how is its pitch contour different from the SM neutral tone, and how is the pitch contour different from the other TM lexical tones? 2) Is the TM neutral tone unstressed like in SM? Are the syllables reduced in

duration or intensity? By answering these questions, I hope to characterize the TM neutral tone syllables and provide a clearer picture of the phonological identity of these "unstressed" syllables in TM. As Taiwan Mandarin is perceived as more syllable-timed than SM, the treatment of the so-called "unstressed" syllables in TM is a perfect chance to help us understand how rhythmic differences are manifested in a tone language. It would also further our understanding of lexical stress in complex tone languages.

In this study, I will examine the neutral-tone syllables in TM. I will focus on the grammatical morphemes and the reduplicated kinship terms because unlike particles and compound words, these items are both frequent and relatively stable in pitch. Two production tests were conducted to characterize the neutral tone in TM: the first test in Section 2 investigated the consecutive neutral tones in TM in comparison with the previous SM results in order to uncover the pitch target of the neutral tone, while the second test in Section 3 compared the neutral tone with the similar Tone 3 /L/ to characterize the pitch target of the neutral tone and to observe whether the neutral-tone syllables are reduced.

2   The pitch target of the neutral-tone syllables

In Standard Mandarin, consecutive neutral tones are influenced by the preceding lexical tones and slowly approach to a mid target—unlike a lexical tone, where the influence of the preceding lexical tone is overcome quickly to implement its tonal target, the influence of the preceding lexical tones is still substantial at the end of three consecutive neutral tones (Chen & Xu, 2006). I hypothesize that unlike SM, consecutive TM neutral tones do not exhibit similar tonal behavior. I expect that when producing consecutive neutral tones, the TM speakers will approximate a pitch target in each consecutive neutral tone. Therefore the carry-over effects of the preceding lexical tones are expected to be overcome quicker than the SM neutral tones, and neutral-tone contours with different preceding tones will share similar contour shapes and pitch registers in the second and the third neutral tone.

2.1   Design

Several prescriptive neutral-tone syllables were tested. They include four reduplicants (RED)[6] *ma, po, nai,* and *mei* [mɑ$^\emptyset$, pʰwo$^\emptyset$, nɑɪ$^\emptyset$, mɛ$^\emptyset$], the nominalizer (NMLZ)/ possessive (POSS) *de* [tə$^\emptyset$], the plural (PL) *men* [mən$^\emptyset$], the durative (DUR) *zhe* [tʃə$^\emptyset$], and the

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[6] As discussed in 1.2, reduplication in TM seldom has a neutral tone and it tends to adopt different pitch contour to show endearment. Here we have chosen kinship terms that are more likely to show a neutral tone for elicitation. However, a reduplicated /H/ in kinship terms is usually /H/ and a reduplicated /LH/ in kinship terms is usually /HL/. Although this design is not ideal, reduplication needed to be included in this experiment because it was the only way to elicit three consecutive neutral tones.

perfective (PFV) *le* [lə$^\emptyset$]. These tested neutral-tone syllables were combined into three sets of meaningful consecutive neutral tone syllables: 1) *-X-men-de* [~mən$^\emptyset$tə$^\emptyset$] '-RED-PL- POSS', 2) *-zhe-de* [tʃə$^\emptyset$ tə$^\emptyset$] '-DUR-NMLZ', and 3) *-le-de* [lə$^\emptyset$ tə$^\emptyset$] '-PFV-NMLZ'. The first set of sentences had three consecutive neutral tones and the other two sets had two. Each set was put into a meaningful sentence in order to elicit a more natural speech. An example of a sentence is given below. The full list of stimuli sentences is provided in the Appendix A.

		X			Y		
		L	N	N	HL		
tā	*xǐhuān*	*pǎo*	*-le*	*-de*	*nà*	*-ge*	*rén*
[tʰɑ^H	ɕi^{L}hwan^H	pʰɑo^L	lə$^\emptyset$	tə$^\emptyset$	nɑ^{HL}	kə$^\emptyset$	ɹən^{LH}]
3S	like	run	-PFV	-NMLZ	that	CLF	person

'He likes the person that ran away'

Adopting Chen and Xu's (2006) methodology, in order to see the influence of the preceding lexical tones, the syllable before the consecutive neutral tones (X) varied in four lexical tones. N represents the neutral-tone syllables (two or three), and the syllable following the consecutive neutral tones (Y) also varied in order to control for contextual influence. Only /L/ and /HL/ were included because /L/ starts at the lowest pitch and /HL/ starts at the highest pitch. As a result, the subjects read 4 (lexical tone of X)* 3 (sets of consecutive neutral-tone syllables)* 2 (Y) = 24 sentences.

Six male and six female TM speakers who were between 21 and 33 years old without any speaking or hearing impairment were recruited. The subjects all grew up in Taiwan and their parents all speak Southern Min as their native language. All twelve subjects speak Southern Min, Mandarin, and English. The subjects had not resided in any foreign country for more than three months in the preceding year, a fact that reduces the possibility of dialectal influences from other Mandarin varieties.

The subjects were asked to read these 24 sentences written in Chinese characters. These neutral tone combinations are semantically natural and relatively frequent, and the subjects were expected to produce them without any difficulties. There was no practice session but the subjects were encouraged to re-read a sentence if they felt they had made a mistake.

2.2   Data

The subjects were recorded with a Zoom H2 recorder in quiet offices. The speech was recorded with the sample rate of 44100 Hz and was analyzed in Praat. Only the rimes of the syllables were segmented in order to compare the f0 contour across different syllables. Otherwise a syllable with an initial obstruent only has f0 readings in half of the syllable while a syllable with an initial sonorant has f0 readings throughout the

syllable. Phonetic studies also show that the pitch contours in the initial consonants are irregular, and the tones are not implemented until the beginning of the rimes (Howie, 1976; Y. Xu, 1999).

The rimes were hand-labeled. With the aid of a Praat script, the f0 of the rimes were measured at the midpoint of all the 1/10 intervals (5%, 15%...95% point of the rime). Measurements were then examined to adjust for pitch-halving and pitch doubling. If a tested syllable had more than 5 consecutive pitch data missing (mostly due to creaky voice), the whole sentence was deleted.

The f0 values were first converted into semitones, and then normalized to z-score by speakers in order to reflect the relative pitch height within each speaker's pitch range—the pitch data distribute between -2 ~ 2 semitone z-score (-2, -1, 0, 1, 2), which can be interpreted as low, mid-low, mid, mid-high, and high pitch range. The pitch data presented in charts were normalized in semitone z-score. However, pitch data in semitone were used in statistical analyses.

2.3   Analysis

The data were further analyzed with linear mixed models in SPSS Statistics 23. A mixed models approach was chosen because it retained the remaining data without listwise deletion when there were missing data in repeated measures. The models first included all the tested fixed effects, random intercepts, and random slopes. The tested fixed effects were kept intact regardless of their statistical significance, but other parameters were then reduced to reach the best-fit model. Model selection was done based on the comparison of the Akaike Information criterion (AIC) score. Insignificant interactions were first dropped from the models to see if it yielded a lower AIC score; insignificant main effects were then dropped unless they contributed to a significant interaction.

In this experiment, in order to analyze the pitch contours of the consecutive neutral tones, the dependent variables were the repeated measures of pitch readings. My main focus is to see the effects of the preceding tones on the consecutive neutral tones. Therefore the fixed effects included the preceding tone X (H, LH, L, HL) as a factor, position (10 pitch points labelled 0-9 representing the 5%, 15%, 25%,…, 95% point) as a covariate, and the X–position interaction which captured the pitch changes along the repeated measured pitch points (i.e. pitch contour) by various preceding tones. The random effects included both subjects (12 speakers) and items (tested sentences) as random intercepts in order to control for the variations coming from the speakers and the tested item. By-subject random slopes on position, preceding tone X, following tone Y (HL, L), the neutral tone category (*zhe-de*, *le-de*) in the case of two consecutive tones, and their interactions were included; and by-item random slopes on position was also included.

Based on my hypothesis, I expect to see that at the second and the third neutral tone, the influence of the preceding tone is overcome, which means that the fixed effect of the preceding tone will not be significant; I also expect that the second and the third neutral tones will share a similar pitch contour regardless of their preceding lexical tones. Therefore the fixed effect of the X–position interaction is expected to be insignificant.

2.4   Results

2.4.1   Two consecutive neutral tones

The average pitch contours of the two consecutive neutral tones are plotted in Figure 1. Only the rimes were measured and graphed. The figure shows the eight average normalized pitch contours of the 12 TM speakers producing two sets of two consecutive neutral tones (-*zhe-de* and -*le-de*). The eight pitch contours varied the four preceding tones (syllable X) and the two following tones (syllable Y).
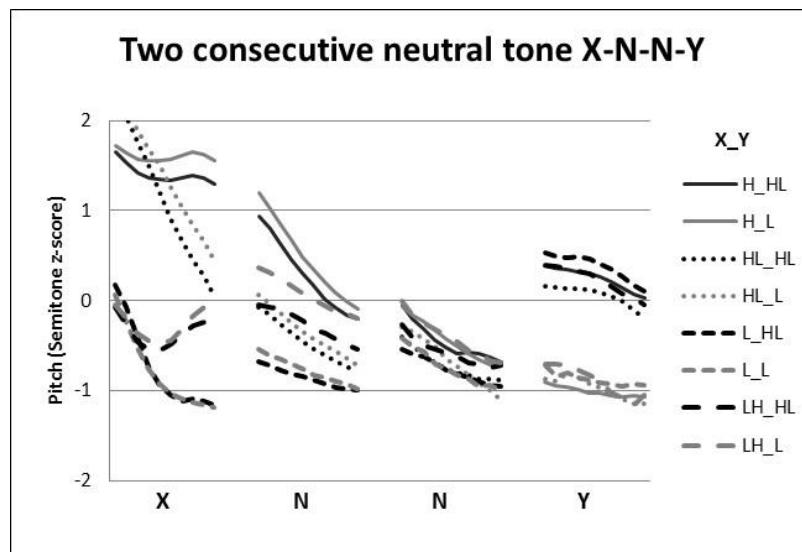
Figure 1: Results of the two consecutive neutral tones

As shown in Figure 1, the first syllable X illustrates the four different lexical tones. Then the different degrees of the falling pitch contours move from the end of the first syllable X toward the mid to mid-low range in the first neutral tone except for the one after /L/. The eight pitch contours of the second neutral tone syllables are more homogeneous compared to the first neutral tone. They generally fell from mid to mid-low pitch range.

Two sets of linear mixed model confirm the visual observation stated above. For the first neutral tone, the linear mixed model showed that there were significant effects of preceding tone [$F(3, 22.266)=23.794$, $p<.001$], position [$F(1, 37.524)=126.291$, $p<.001$], and the tone–position interaction [$F(3, 12.187)=19.923$, $p<.001$]. The estimates of the fixed effects, shown in Table 1, illustrate that at 5% of the first rime (baseline), the neutral tone after /H/ is 1.719 semitone higher than that after /LH/ (baseline) ($p=.001$), and the neutral tone after /L/ is 1.856 semitone lower than that after /LH/ ($p<.001$). The significant position effect confirms that the contours were not flat statistically. The first neutral tone after /LH/ (baseline) reduced 0.142 semitone per unit (10% of the rime), and the pitch contours after different lexical tones differed: the first neutral tone after /H/ reduced a further 0.148 semitone ($p<.001$), making its estimated pitch contour fall 0.290 semitone per unit; the pitch contour after /L/ fell less than that after /LH/ ($p=.039$), only 0.075 (=-0.142+0.067) semitone per unit. Overall, if the pitch at 5% of the rimes was higher (such as after /H/), the pitch contour fall was sharper, which suggests the convergence of the pitch contours.

Table 1: Estimates of fixed effects on the first neutral tone in two consecutive neutral tones

Parameter	Estimate (semitone)	SE	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	19.691	1.632	11.710	12.063	0.000	16.125	23.257
[X=H]	1.719	0.433	21.757	3.971	0.001	0.821	2.618
[X=HL]	-0.650	0.440	22.851	-1.476	0.154	-1.562	0.261
[X=L]	-1.856	0.433	21.723	-4.288	0.000	-2.754	-0.958
[X=LH]	0[b]	0.000	.	.	.	.	.
position	-0.142	0.023	26.495	-6.146	0.000	-0.190	-0.095
[X=H] * position	-0.148	0.029	11.605	-5.178	0.000	-0.211	-0.086
[X=HL] * position	-0.029	0.030	13.147	-0.979	0.345	-0.093	0.035
[X=L] * position	0.067	0.029	11.457	2.336	0.039	0.004	0.129
[X=LH] * position	0[b]	0.000	.	.	.	.	.

At the second neutral tone, the linear mixed model showed that while the effects of the preceding lexical tone were still significant on the pitch ($F(3, 38.656)=4.465$, $p=.009$) and position [$F(1, 30.219)=129.241$, $p<.000$], their interaction was not significant ($F(3, 11.677)=0.5$, $p=.689$). The estimates of fixed effects shown in Table 2 reveal that at 5% of the second neutral tone rime, the pitch estimate after /HL/ was 0.566 semitone lower than the pitch estimate after /LH/ ($p=.033$). The pitch fall of the second neutral tone after /LH/ was estimated to be -0.126 semitone per unit ($p<.001$), but its slope was not significantly different from those after other lexical tones. The estimates show that while the preceding tone effect was significant, the differences between different preceding tones were within 1 semitone; furthermore, these pitch contours after different lexical tones share a similar degree of pitch fall, and the

estimated degree of pitch fall was small (around -0.13 semitone per unit), suggesting a shallower pitch fall.

Table 2: Estimates of fixed effects on the second neutral tone in two consecutive neutral tones

Parameter	Estimate	SE	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	18.674	1.585	11.226	11.779	0.000	15.193	22.154
[X=H]	0.190	0.248	37.495	0.768	0.447	-0.311	0.691
[X=HL]	-0.566	0.255	39.940	-2.215	0.033	-1.082	-0.049
[X=L]	-0.517	0.247	37.447	-2.088	0.044	-1.018	-0.015
[X=LH]	0[b]	0.000	.	.	.	.	.
position	-0.126	0.016	27.828	-8.006	0.000	-0.158	-0.094
[X=H] * position	-0.018	0.018	10.529	-1.044	0.320	-0.058	0.021
[X=HL] * position	-0.004	0.019	13.300	-0.220	0.829	-0.045	0.037
[X=L] * position	0.000	0.018	10.502	0.024	0.981	-0.039	0.040
[X=LH] * position	0[b]	0.000	.	.	.	.	.

2.4.2   Three consecutive neutral tones

All the pitch contours of the three consecutive neutral tones were plotted and examined. Ten tokens which were obviously different from others were excluded, which will be discussed separately. The average pitch contours of the three consecutive neutral tones varying the preceding and the following tones are shown in Figure 2. The results show that the reduplicants, the first neutral tone among the three, behaved differently from other neutral-tone syllables. The reduplicants seem to have lexical tones /H/ after /H/: *māma* /H-Ø/ 'mother' is produced as /H-H/, suggesting that the second syllable was not produced with a neutral tone, but its lexical tone of the character. Also, the reduplicant in the word *pópo* /LH-Ø/ 'mother-in-law' had a higher falling pitch contour compared to the first neutral tone after /LH/ in Figure 1, and the pitch contour is similar to Tone 4 (high falling)—the high falling Tone 4 stays in the high register (0 ~ 2 semitone z-score) (Huang, 2013). Therefore, despite the reduplicants after /HL/ and /L/ falling to the mid to mid-low range as observed in two consecutive neutral tones, the first neutral tone in this set was excluded from the analysis. As for the second neutral tone, the pitch contours all fell and merged to the same pitch range (-0.5 ~ -1 semitone z-score). The pitch contours of the third neutral tone overlapped with each other and generally fell from -0.5 semitone z-score to -1 semitone z-score.
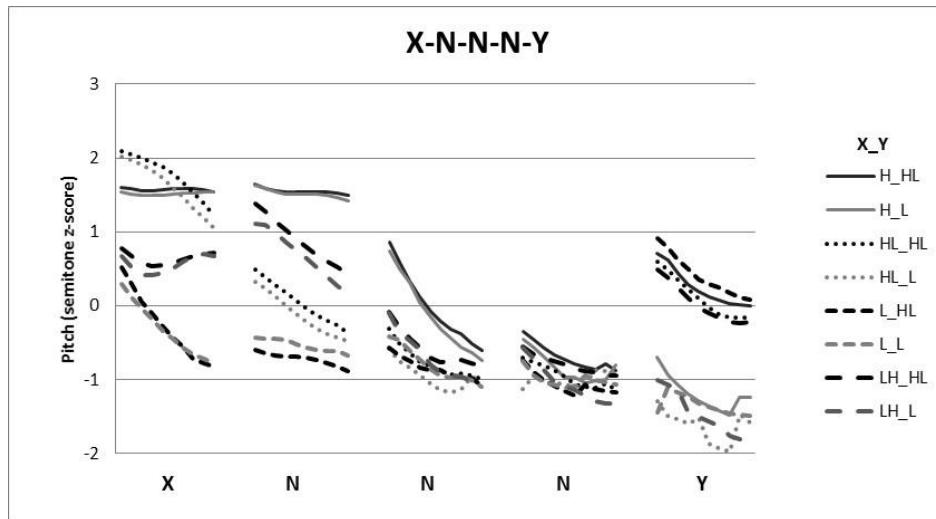
Figure 2: Results of three consecutive neutral tones: X-red-pl-poss-Y

The linear mixed model analysis shows that at 5% of the second neutral-tone rime, there were significant fixed effects of the preceding lexical tone X [F(3, 5.694)=12.230, p=.007], position [F(1, 8.369)=67.130, p<.001], as well as their interaction [F(3, 4.244)=15.882, p=.009]. The estimates of the fixed effects shown in Table 3 reveal that at 5% of the second neutral tone rime, the pitch after /H/ was 1.046 semitone higher than the pitch after /LH/ (p=.041), and the pitch after /L/ was 1.169 semitone lower than the pitch after /LH/ (p=.028). As for the pitch contour, the pitch contour after /H/ has a much sharper pitch fall (-0.285 semitone/unit) compared to the contour after /LH/ (-0.176 semitone/unit), and the difference (-0.110 semitone/unit) was statistically significant (p=.015). The pitch contours with varying preceding tones seem to converge as found in the first neutral tone in two consecutive neutral tones.

Table 3: Estimates of fixed effects on the second neutral tone in three consecutive neutral tones

Parameter	Estimate	SE	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	18.430	1.807	10.458	10.201	0.000	14.429	22.432
[X=H]	1.046	0.397	5.606	2.636	0.041	0.058	2.033
[X=HL]	-1.169	0.400	5.776	-2.924	0.028	-2.157	-0.182
[X=L]	-0.726	0.405	6.022	-1.795	0.123	-1.715	0.263
[X=LH]	0[b]	0.000	.	.	.	.	.
position	-0.176	0.028	10.339	-6.381	0.000	-0.237	-0.115
[X=H] * position	-0.110	0.027	4.082	-4.043	0.015	-0.184	-0.035
[X=HL] * position	0.060	0.028	4.437	2.159	0.090	-0.014	0.135
[X=L] * position	0.037	0.028	4.704	1.319	0.248	-0.037	0.112
[X=LH] * position	0[b]	0.000	.	.	.	.	.

Toward the third neutral tone, the effects of the preceding tone lexical tone on pitch range and pitch contour slopes had disappeared. The linear mixed model on the third neutral tone revealed that there were no significant effects from preceding tone [$F(3, 2.430)=4.509$, $p=.154$] or interaction [$F(3, 4.075)=2.058$, $p=.246$]. The position effect was also statistically insignificant [$F(1, 8.645)=2.997$, $p=.119$], suggesting the pitch contours were flattened. The estimates of fixed effects are shown in Table 4. In summary, the preceding lexical tone (X) affected the second neutral-tone syllables, but not the third neutral-tone syllables.

Table 4: Estimates of fixed effects on the third neutral tone in three consecutive neutral tones

Parameter	Estimate	SE	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	17.599	1.768	10.408	9.952	0.000	13.679	21.518
[X=H]	-0.121	0.374	2.497	-0.323	0.772	-1.460	1.218
[X=HL]	-1.221	0.379	2.607	-3.224	0.059	-2.537	0.094
[X=L]	-0.642	0.388	2.838	-1.654	0.202	-1.917	0.634
[X=LH]	0[b]	0.000	.	.	.	.	.
position	-0.166	0.079	10.940	-2.100	0.060	-0.340	0.008
[X=H] * position	-0.003	0.052	3.942	-0.055	0.958	-0.148	0.142
[X=HL] * position	0.109	0.053	4.114	2.064	0.106	-0.036	0.253
[X=L] * position	0.057	0.053	4.205	1.083	0.337	-0.087	0.202
[X=LH] * position	0[b]	0.000	.	.	.	.	.

2.5   Discussion

This experiment modifies Chen and Xu's study (2006) on the SM neutral tone and examines how consecutive neutral tones differ in TM. The first difference between the two dialects lies in the tonal variation of the reduplicants. Our results showed that not all of the reduplicants behave like other neutral tones—the reduplicant in *māma* /H-Ø/ 'mother' was produced with a lexical tone /H/. Also, the reduplicant in *pópo* /LH-Ø/ 'mother-in-law' had a higher falling pitch. This high falling pitch contour of the reduplicant after /LH/ is similar to the SM neutral tone after /LH/. However, because this pitch contour is only found in /LH-Ø/ reduplicated kinship terms and it is not observed in other /LH-Ø/ words, this is likely to be a sporadic variation. The TM speakers likely lexicalized the SM pitch contour of /LH-Ø/ as /LH-HL/ in those kinship terms. If the TM speakers had adopted the SM neutral tone of high falling contour after /LH/, we would expect it to show up in other neutral tone syllables after /LH/ as well. Therefore this production test was unable to elicit three consecutive neutral tones in the context of four different lexical tones.

In addition, several tokens were excluded due to the tonal variations of the reduplicants. Six out of the ten excluded pitch contours also show possible SM influences on these reduplicated kinship terms. First, one male and one female subject

produced the reduplicated /H/ *ma* with a falling pitch contour instead of a high level pitch when X was /H/ and Y was /L/. This pitch contour of high-falling was similar to the pitch pattern of /H-Ø/ in SM. However, both of the speakers only had this pitch contour in X-RED-PL-POSS before /L/, but not before /H/, which suggests that the pitch pattern was sporadic, not consistent. In addition, six tokens were removed because two other male subjects produced the word *năi-nai* /L-Ø/ 'grandmother' with a [L-H] pitch contour, and a female subject consistently produced the words *n ǎ i-nai* /L-Ø/ 'grandmother' and *pó-po* /LH-Ø/ 'mother-in-law' with a [L-LH] pitch contour. As discussed earlier in 1.2, it is common in colloquial TM to adopt [L-H] or [L-LH] pitch contours on reduplicated kinship terms or nicknames when the reduplicated syllables are /L/ or /LH/, in order to show endearment (Hsu, 2006). The tonal variation in the reduplicated kinship terms in the data was likely due to dialect mixtures. The speakers likely borrowed a certain lexicalized pitch pattern rather than borrowing the neutral tone from a different dialect.

The main difference between TM and SM neutral tones, which is the main focus of this experiment, lies in the pitch contour of these consecutive neutral tones. Figure 3 compares the results of three consecutive neutral tones before /L/ produced by the TM subjects in (a) with the ones produced by two SM speakers in (b). Two SM speakers were recruited to complete the same task as the TM speakers. The results from the two SM speakers show similar pitch patterns as reported by Chen and Xu (2006). Therefore it is presented for comparison, despite the small sample size.
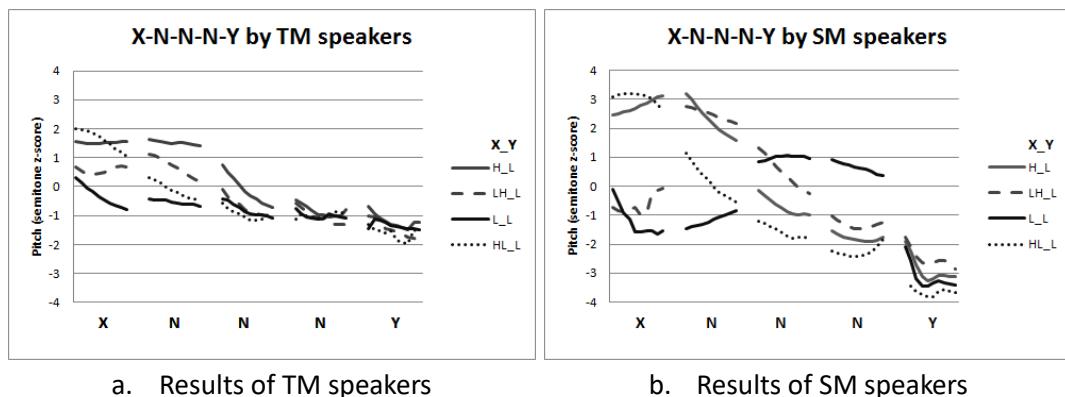
a.   Results of TM speakers   b.   Results of SM speakers

Figure 3: Comparison of the results of X-red-pl-poss-Y by TM and SM speakers

Comparing Figure 3(a) and (b), the pitch range of TM is smaller than that of SM, as reported by previous acoustic studies (Fon & Chiang, 1999; Torgerson, 2005). The pitches of TM range between 2 ~ -2 semitone z-score, while the pitches of SM range between 3 ~ -3.5 semitone z-score. More importantly, the pitch contours of TM and SM differ drastically. In TM, aside from the reduplicated /H/ and the reduplicated /LH/, all neutral tones have slight falling pitch contours reaching to -0.5 ~ -1 semitone z-score.

In contrast, as found in Chen and Xu (2006), all four SM pitch contours are distinct. The SM neutral tones after /H/ gradually move from high to the mid-low pitch range; the neutral tones after /LH/ complete the rising at the first neutral tone, and then lower to the mid-low range in the following neutral tones; the neutral tones after /L/ gradually rise to the high register until the second neutral tone, and then slowly lower to mid pitch range; the neutral tones after /HL/ have a fast pitch drop in the first neutral tone, and remain at mid-low pitches in the following neutral tones. The four pitch contours only start to converge to mid-level at the end of the third neutral tone in SM.

The influences of the preceding lexical tone differed in SM and TM. The pitch range of the neutral tones in SM remains 3 ~ 3.5 semitone z-score even in the third neutral tone, while the pitch range of the TM neutral tones reduced over time. In SM, the neutral tones are heavily influenced by the preceding lexical tones, and the influence of the preceding lexical tone is significant even at the end of the third neutral tone syllables (Chen & Xu, 2006, p. 61). Furthermore, aside from the obvious different pitch patterns of the post-L neutral tones contour, the influences of the preceding /H, LH, L/ were still obvious at the third neutral tone in SM. On the other hand, the four pitch contours in TM immediately started to converge in the first neutral tones. The results of the first neutral tone in 2.4.1 and the second neutral tones in 0 show that if the pitch was higher due to the influence of the preceding lexical tone, the pitch fall was also estimated to be larger. The pitch contour started to converge and reach toward a mid to mid-low pitch. Although the effect preceding tone was still significant at the second neutral tone in two consecutive neutral tones, the estimated effect was small, and the pitch contours in the context of varying preceding tones share a similar slope. The third neutral tone in three consecutive neutral tones further shows that the influences of preceding tone on pitch were no longer significant, and these pitch contours share a similar flattened slope as well. Overall, compared to the SM neutral tone, the pitch target of the TM neutral tone is implemented in a faster manner. In SM, the mid pitch target claimed by Chen and Xu was unable to be implemented at the end of the third neutral tone. However, the results show that the TM pitch target was approximated immediately at the first neutral tone, and the preceding lexical tone effects had disappeared at the third neutral tone.

Unlike SM, the TM neutral tone seems to have a static pitch target in the mid-low to low pitch range. This experiment shows that in TM, each consecutive neutral tone aims to reach to a mid-low pitch range. The pitch contours started to flatten in the following neutral tones, which indicates that the pitch contour had been approximating to the pitch target. Although the estimated beginning pitches of these neutral tone rimes were slightly higher than the end point of the preceding neutral tone, the differences were minimum (less than 1 semitone). These differences are very likely due to the pitch raising effect of their preceding voiceless onset /t/ (Hombert, 1977; Hombert, Ohala, & Ewan, 1979; Ohala, 1972), rather than targeting for a falling pitch contour.

It should be noted that, although the TM neutral tone has a static pitch target that is approximated in a faster manner compared to the SM neutral tone, the articulation strength to approach this target was still weaker than a pitch target of a lexical tone. The previous studies on carry-over effects of preceding lexical tones showed that the influence of the end pitch of the preceding lexical tone lasted until the end of following /H/ and /LH/ in SM, but not until the end of following /HL/ and /L/ (Y. Xu, 1997); and the carry-over effects of the preceding tones are significant only at the end of the /LH/ tone in TM (Huang, 2013).

To sum up, the results show that the consecutive TM neutral tone has a mid-low or low pitch target, and the target was approached faster than the SM neutral tone, which suggests that it is more similar to a lexical tone. However, the results from this experiment alone are unable to characterize the TM neutral tone. It is unclear how these neutral-tone syllables fit into TM phonology, and if so, how they should be characterized. The next experiment compares the TM neutral-tone syllables with low-tone syllables, with the aim to investigate these questions.

3   Neutral-tone syllables vs. low-tone syllables

This experiment aims to find out whether the TM neutral tone should be treated as a lexical tone or a neutralized tonal pattern. Although the previous experiment showed that the TM neutral tones are more lexical-tone-like compared to SM, it is also possible to analyze these TM neutral-tone syllables as unstressed, and their pitches were neutralized into a mid-low tone. Furthermore, if these neutral-tone syllables had a lexical tone, how would it be distinct from the other lexical tones? In order to investigate 1) whether these neutral-tone syllables are unstressed, and 2) whether these neutral-tone syllables are distinct from the other lexical tones, this experiment compares the pitch, duration, and intensity of these TM neutral-tone syllables with the same acoustic properties of the low-tone (Tone 3) syllables. Out of the four lexical tones, Tone 3 was chosen because it is the shortest tone in connected speech in Taiwan Mandarin (Deng, Shi, & Lu, 2008; Shi & Deng, 2006). Moreover, the pitch contour of Tone 3 (low-falling) is the most similar to the TM neutral-tone syllables.

If these neutral-tone syllables were to have a weaker prominence, they would have a reduced duration (or even a reduced intensity) compared to the shortest lexical tone. In that case, it is best to analyse them as unstressed syllables with tone being neutralized into a mid-low pitch. However, if the neutral-tone syllables were not reduced in length or intensity, there is no acoustic evidence to support the analysis to treat these neutral-tone syllables as unstressed. They should be analysed as having a lexical tone. In that case, if these neutral-tone syllables had a distinct pitch target from the low tone, they should be analysed as having a fifth tone.

3.1   Design

The same subjects in the first experiment were asked to read a list of disyllabic words/phrases that contain the neutral-tone syllables and their corresponding low-tone syllables with the same segments or rimes. The tested (near) minimal pairs were both the second syllables of disyllabic words with varying preceding lexical tones.

Table 5: Tested corresponding control syllables with the same segment

Pair	words	Disyllabic words for elicitation			
	Tested syllables	[H-∅] [H-L]	[LH-∅] [LH-L]	[L-∅] [L-L]	[HL-∅] [HL-L]
-zi	*zi* [tsɨ[∅]]	*zhuō-zi* [tʂwo^H-tsɨ[∅]] 'table'	*jiá-zi* [tɕʝa^{LH}-tsɨ[∅]] 'clip'	*yǐ-zi* [i^L-tsɨ[∅]] 'chair'	*niè-zi* [njɛ^{HL}-tsɨ[∅]] 'tweezer'
	zi [tsɨ^L]	*jūn-zǐ* [tɕyn^H-tsɨ^L] 'gentleman'	*jiǎ-zǐ*[7] [tɕʝa^{LH}-tsɨ^L] '60 years'	-	*niè-zǐ* [njɛ^{HL}-tsɨ^L] 'unfilial child'
-zhe	*zhe* [tʃə[∅]]	*tīng-zhe* [tʰiŋ^H-tʃə[∅]] 'listening'	*dú-zhe* [tu^{LH}-tʃə[∅]] 'reading'	*xiǎng-zhe* [ɕʝaŋ^L-tʃə[∅]] 'thinking'	*zuò-zhe* [tswo^{HL}-tʃə[∅]] 'sitting'
	zhe [tʃɤ^L]	*shāng-zhě* [ʃaŋ^H-tʃɤ^L] 'injured person'	*dú-zhě* [tu^{LH}-tʃɤ^L] 'reader'	-	*zuò-zhě* [tswo^{HL}-tʃɤ^L] 'author'
-en	*men* [mən[∅]]	*tā-men* [tʰa^H-mən[∅]] '3PL'	*rén-men* [zən^{LH}-mən[∅]] 'people'	*wǒ-men* [uo^L-mən[∅]] '1PL'	*jiào-shòu-men* [tɕjao^{HL}-ʃo^{HL}-mən[∅]] 'professors'
	ben [pən^L]	*jī-běn* [tɕi^H-pən^L] 'basic'	*chéng-běn* [tʃʰəŋ^{LH}-pən^L] 'cost'	-	*kè-běn* [kʰɤ^{HL}-pən^L] 'textbook'
-Cə	*le* [lə[∅]] *de* [tə[∅]] *ge* [kə[∅]]	*chī-le* [tʃi^H-lə[∅]] 'eaten' *suān-de* [swan^H-tə[∅]] 'sour ones' *bā-ge* [pa^H-kə[∅]] 'eight'	*lái-le* [lai^{LH}-lə[∅]] 'come' *tián-de* [tʰjan^{LH}-tə[∅]] 'sweet ones' *yí-ge* [i^{LH}-kə[∅]] 'one'	*mǎi-le* [mai^L-lə[∅]] 'bought' *kǔ-de* [kʰu^L-tə[∅]] 'bitter ones' *wǔ-ge* [u^L-kə[∅]] 'five'	*qù-le* [tɕʰy^{HL}-lə[∅]] 'gone' *là-de* [la^{HL}-tə[∅]] 'spicy ones' *sì-ge* [sɨ^{HL}-kə[∅]] 'four'

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[7] *jiǎ-zǐ* /tɕʝa^L-tsɨ^L/ was used to elicit the [LH-L] tonal pattern with *zi* in order to create a minimal pair with *jiá-zi* / tɕʝa^{LH}-tsɨ[∅]/ because /L-L/ is phonetically the same as [LH-L] in TM (Myers & Tsay, 2003).

Pair	words	Disyllabic words for elicitation			
	Tested syllables	[H-Ø] [H-L]	[LH-Ø] [LH-L]	[L-Ø]	[HL-Ø] [HL-L]
	che [ʧʰɤ^L] *she* [ʃɤ^L]	*lā-chě* [lɑ^H-ʧʰɤ^L] 'pull and drag' *shī-shě* [ʃɨ^H-ʃɤ^L] 'to give'	*xián-chě* [ɕjan^LH-ʧʰɤ^L] 'chitchat' *nán-shě* [nan^LH-ʃɤ^L] 'hard to let go'		*luàn-chě* [lwan^HL-ʧʰɤ^L] 'chitchat' *bù-shě* [pu^HL-ʃɤ^L] 'can't let go'
RED	*shu*[ʃu^Ø] *shen* [ʃən^Ø] *di* [ti^Ø]		*shú-shu* [ʃu^LH-ʃu^Ø] 'uncle'	*shěn-shen* [ʃən^L-ʃən^Ø] 'aunt'	*dì-di* [ti^HL-ti^Ø] 'brother'
	shǔ [ʃu^L] *shěn* [ʃən^L] *dǐ* [ti^L]	-	*fān-shǔ* [fan^H-ʃu^L] 'sweet potato'	*píng-shěn* [pʰiŋ^LH-ʃən^L] 'judges'	*dì-dǐ* [ti^HL-ti^L] 'underground'

Table 5 lists all the tested words used to elicit the syllables. The neutral-tone *-zi* [tsɨ^Ø] 'DIM' was compared with *-zǐ* [tsɨ^L], and *-zhe* [ʧə^Ø] 'DUR' has a corresponding low-tone syllable *-zhě* [ʧɤ^L] 'person'. The neutral-tone *-men* [mən^Ø] 'PL' was compared with *-běn* [pən^L] 'origin' because *měn* does not exist in Mandarin due to a phonological gap. For the same reason, three neutral-tone syllables with an /ə/ rime (*le* [lə^Ø] 'PFV', *de* [tə^Ø] 'POSS; NMLZ', and *ge* [kə^Ø] 'CLF') were compared with *shě* [ʃɤ^L] and *chě* [ʧʰɤ^L] [8]. Phonetically the rimes of *chě* and *shě* are described as [ɤ], while the rimes of the neutral-tone *de*, *le*, *ge* are described as [ə] because they are unstressed and reduced. However, even in SM, the quality difference between a stressed /ə/: [ɤ] and an unstressed /ə/: [ə] is not obvious (M. Lin & Yan, 1990). As for the reduplicated syllables, they were compared to their corresponding syllables that have a similar pitch and the same segments respectively: *shu* [ʃu^Ø], *shen* [ʃən^Ø], *di* [ti^Ø] in the kinship terms were compared to *shǔ* [ʃu^L], *shěn* [ʃən^L], and *dǐ* [ti^L]. The two kinship terms *shú-shu* [ʃu^LH-ʃu^Ø] and *shěn-shen* [ʃən^L-ʃən^Ø] are sometimes applied with a /L-LH/ or /L-H/ pitch contour to show endearment in colloquial TM. However, the adaptation of the pitch contours is generally less common in read speech. Therefore these words were still chosen to compare with the low tone counterparts. The reduplicated high tone syllables were not included because the reduplicated *mā* kept the high tone as mentioned in the previous experiment.

The tested neutral-tone syllables were elicited in four different disyllabic words with varying preceding tones, but the tested low-tone syllables were tested only in the combination of /H-L/, /LH-L/, and /HL-L/ due to Tone 3 Sandhi—/L/ becoming [LH] when it is after another /L/. Therefore /L-L/ was not elicited because it is phonetically the same as [LH-L] in TM (See Myers and Tsay (2003) for a review). All the disyllabic

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[8] *ge* /Ø/ does have a low-tone corresponding syllable *ge* /L/. However, this syllable is very limited in its occurrences in words. As a result, it was not included as a corresponding syllable.

words were carried in the frame sentence *qǐngshuō* X X *bācì* [tɕʰiŋ^L ʃwo^H X X pɑ^H tsɨ^{HL}] 'Please say XX eight times'. All the sentences were written in Chinese characters. The 45 tested sentences were randomly mixed with the 73 filler sentences. The subjects were asked to read every sentence just once, but they could repeat a sentence if they felt they made a mistake. The whole procedure, including both experiments, took about 15 minutes.

3.2   Data analysis

The pitch data of this experiment was processed as described in 2.2. In addition, the duration and the average intensity were also extracted. In order to compare the pitch (contour) between /L/ and /∅/, two sets of linear mixed models were fitted to the data. The first set analyzed the pitch contour differences between the low tone and the neutral tone at the first half and the second half of the rime. For the first half of the rime, the dependent variable is the repeated measured pitch in semitone at 5%, 15%, 25%, 35%, 45%; and for the second half of the rime, it is at 55%, 65%, 75%, 85%, 95%. Fixed effects for the two models included the tested tone (L, ∅) as a factor, position (the 5 pitch points coded in 0, 1, 2, 3, 4) as a covariate, and their interaction. The factor tested tone can capture their pitch differences at the starting point, and the tone–position interaction can capture the differences of the contour movement. In order to account for the speaker and item variances, the random effects included both intercepts of the subjects and tested items, as well as by-subject random slopes for tested tone, preceding tone (H, LH, L, HL), tested pair (*zhe*, *zi*, Cə, *en,* RED) and their interactions.

The second set of linear mixed model further investigated the effects of preceding tones and testing pair between /L/ and /∅/ at the 75% of the second rime. The dependent variable was the pitch in semitone at 75% of the second rime. Fixed effects included preceding tone to examine the carry-over effects, tested pair to examine pair variations, and tested tone (L, ∅) to examine whether they are distinct. All their interactions were included as fixed effects as well. As for random effects, it included subjects and items as intercepts and their random slopes for all the fixed effects. If these TM neutral-tone syllables had a distinct lexical tone, I expect them to have a distinct pitch contour from the low tone regardless of its preceding tone and tested pair. Their pitch target should also be implemented in a similar manner compared to the low tone.

As for the duration, the rimes were also chosen to be measured instead of syllables because languages generally do not count the onset in their calculation of syllable weight; only the rimes are relevant to syllable weight. As for the intensity, the average intensity of the rimes were also extracted with a Praat script. Durational and intensity comparison were carried out with linear mixed models with pair segments (-*en*, *zi*, -*zhe*, Cə, and -*u*, -*en*, -*i* in reduplication pairs) and interaction between tone and pair segment as fixed effects. As for random effects, random intercepts for subjects and tested words

and their random slopes for all the fixed effects were included. If the neutral-tone syllables were unstressed, I expect the durations of the TM neutral-tone syllables to be significantly shorter than the low-tone syllables regardless of the pairs. I do not expect the TM neutral-tone syllables to have a lower intensity as reduced intensity was not found in SM unstressed syllables either (J. Cao, 1986; Lin & Yan, 1980).

3.3   Results

3.3.1   Pitch contours

The average normalized pitch contours of the low tone and the neutral tone with varying preceding lexical tones are plotted in Figure 4. The neutral tone had four pitch contours with varying preceding tones, represented by the solid lines, but the low tone syllable had only three average pitch contours, represented by the dotted lines, with preceding [H, LH, HL] because [L-L] does not exist in Mandarin due to Tone 3 Sandhi.
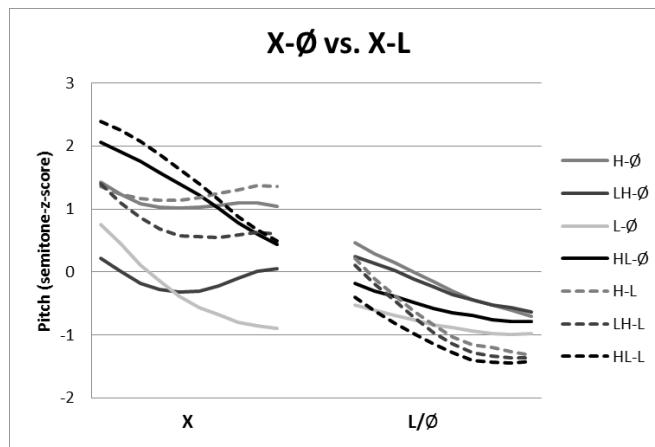
Figure 4 Comparisons of tested neutral-tone syllables with the Tone 3 syllables by the same rimes

As shown in Figure 4, the tested neutral tone contours reach to a mid to mid-low pitch range (0.5 ~ -1 semitone z-score) toward the second half of the second rime, while the low tone contours overcome the influences of the preceding tones in a faster manner and reach to the mid-low to low pitch range (-1 ~ -1.5 semitone z-score). The first sets of linear mixed model was conducted to examine the contour movement. The best-fit linear mixed model[9] for the first half of the rime revealed significant fixed effects of position [$F(1, 11.869)=150.233$, $p<.001$] and tone–position interaction [$F(1, 1037.321)=139.452$, $p<.001$], but not for the tone [$F(1, 25.218=.025$, $p=.875$]. The

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[9] The best fit model included tested tone, position, and their interaction as fixed effects, and the random effects included intercepts of subjects and items, as well as by-subject random slopes of preceding tone, tone, pair, position, and pair–position interaction.

estimates of the fixed effects, as shown in Table 6, suggests that at the 5% of the rime (baseline), the neutral tone pitch estimate was not different from the low tone one. However, the estimated pitch change for the neutral tone is -0.246 semitone per unit (10% of the rime), which is smaller than the estimated pitch change for the low tone -0.562 (=-0.246-0.317) semitone, and the difference was statistically significant ($p<.001$). The pitch fall of the low tone in the first half of the rimes was more substantial (2.248 semitone from 5% to 45%). On the other hand, at the second half of the rime, the best-fit model [10] revealed that there was significant fixed effects of both tone [$F(1, 15.510)=23.264$, $p<.001$] and position [F(1, 967.208)=68.610, p<.001], but the tone–position interaction [$F(1, 966.724)=.849$, $p=.357$] was not significant anymore. The estimates of fixed effects in the right column of Table 6 shows that at the 55% of the rime (baseline), the low tone is 1.41 semitone lower than the neutral tone ($p<.001$)—the pitch differences between the /L/ and /Ø/ were quite substantial at the middle part of the rimes. The pitch change estimate for the neutral tone were -0.117 semitone per 10% rime, which is not significantly different from the pitch change estimate for the low tone -0.094 (=-0.117+0.023) semitone. This suggests that both /L/ and /Ø/ have a flattened pitch fall at the second half of the rimes. The estimates of fixed effects are shown in Figure 5 to visually present what the modeled pitch contours looks like.

Table 6: Estimates of fixed effects on the first half and the second half of the rime

Parameter	First half of the rime (5%, 15%, 25%, 35%, 45%)					Second half of the rime (55%, 65%, 75%, 85%, 95%)				
	Estimate	SE	df	t	Sig.	Estimate	SE	df	t	Sig.
Intercept	19.205	1.709	11.351	11.236	.000	18.073	1.595	11.201	11.333	.000
[Tone=L]	.063	.393	25.218	.159	.875	-1.414	.293	15.510	-4.823	.000
[Tone=N]	0	0	.	.	.	0	0	.	.	.
position	-.246	.033	12.635	-7.352	.000	-.117	.014	955.279	-8.266	.000
[Tone=L] * position	-.317	.027	1037.321	-11.809	.000	.023	.025	966.724	.921	.357
[Tone=N] * position	0	0	.	.	.	0	0	.	.	.

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[10] Its fixed effects included tone, position, and their interaction; its random effects included intercepts of subjects and items, as well as by-subject random slopes of preceding tone, tone, and pair.
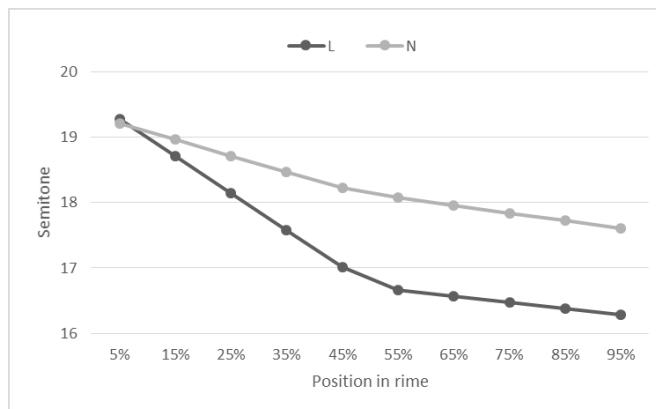
Figure 5: Estimated pitch contours of the rimes of /L/ and /Ø/

The second set of the linear mixed model was carried out to investigate the effects of preceding tones and testing pair between /L/ and /Ø/ at the 75% of the second rime. The best fit model included preceding tone, tested pair, tested tone, and all the interactions as fixed effects. The random effects included an intercept for subjects and by-subject random slopes for the effects of tone and the interaction between tone and preceding tone. This model revealed that at 75% of the second rime, the pitch was significantly influenced by preceding tone [$F(3, 46.962)=9.190$, $p<.001$] and tested tone [$F(1, 13.356)=51.545$, $p<.001$]. The pair and all the two-way interactions were not statistically significant, but there were a significant three-way interaction between tone, preceding tone, and pair [$F(7, 259.041)=2.929$, $p=.006$]. The pitch of the neutral tone at this position was significantly higher than the low tone, and the estimated mean difference between /L/ and /Ø/ was 1.422 semitone ($p<.001$), similar to the estimated difference at the 55% point in the previous model. To better understand the fixed effects, the estimated marginal means with varying preceding tones and tested tones were calculated as shown in Table 7. Post-hoc pairwise comparisons using Bonferroni were carried out to 1) compare /L/ and /Ø/ after different preceding tones, and 2) compare the preceding tone effect on /L/ and /Ø/. The first comparison shows that /L/ and /Ø/ are different after /H, HL, LH/, the estimated mean differences are 1.746, 1.427, 1.712 semitone (all $p<.000$). The second comparison indicates that at this position, the pitch of the neutral tone was influenced by preceding tone—when after /L/, it is lower than after /H, LH, HL/, the estimated mean differences are 0.906 ($p=.001$), 1.014 ($p<.001$), and 0.341 ($p=.883$) semitone respectively. On the other hand, the pitches of the low tone were quite similar regardless of its preceding tone, their differences were not statistically significant.

Table 7: Estimated marginal means by preceding tone and tested tone

Prec. Tone	/L/			/Ø/		
	Mean	SE	df	Mean	SE	df
H	16.468	1.595	11.404	18.214[b]	1.589	11.226
HL	16.223	1.598	11.482	17.649	1.591	11.272
L	.	.	.	17.308	1.590	11.252
LH	16.610	1.593	11.321	18.322	1.589	11.216

To further investigate the significant interaction between tone, preceding tone, and pair, post-hoc pairwise comparisons using Bonferroni were carried out, and the results are shown in Table 8. This Table only compares /L/ and /Ø/ when the preceding tone was /H, HL, LH/ because [L-L] do not exist due to Tone 3 Sandhi. The results show that most of the differences between /L/ and /Ø/ after different preceding tones were significant except for the pitch differences in the *en* pair and the *zhe* pair when the preceding tone was /HL/.

Table 8: Pairwise comparisons between the pitch of /L/ and /Ø/
at the 75% of the rime by pair and preceding tone

Prec.T	/H/				/HL/				/LH/			
Pair	Mean Dif.	SE	df	Sig.	Mean Dif.	SE	df	Sig.	Mean Dif.	SE	df	Sig.
Ce	1.070*	.359	65.073	.004	1.808*	.346	58.915	.000	1.242*	.327	53.517	.000
en	1.370*	.583	230.121	.020	.520	.467	151.883	**.267**	2.082*	.423	122.268	.000
RED	.[d]	.	.	.	1.522*	.478	160.868	.002	1.705*	.429	127.149	.000
zhe	1.923*	.477	159.292	.000	.820	.694	269.626	**.238**	2.115*	.561	220.741	.000
zi	2.721*	.510	185.017	.000	2.463*	.672	262.548	.000	1.415*	.475	161.586	.003

In addition to the pitch data, it is worth noting that the pitch contours of many tested syllables were excluded when more than five consecutive f0 readings in their second rime were not available due to their creaky voice quality, which resulted from the lowering of the pitch. The numbers of syllables excluded due to creaky voice are shown in Table 9. Patterning with the pitch data, the low-tone syllables generally have a higher percentage of creaky voice (42.6%) than the neutral-tone syllables (21.0%). Furthermore, the preceding tone also plays a role as well—the neutral tone after /HL, L/ was found with more creaky-voice syllables (31.0% and 26.2%) than the neutral tone after /LH, H/ (11.9% and 13.9%).

Table 9: Proportions of syllables excluded due to creaky voice

	Cə		zhe		-en		-zi		red		Total	
	/L/	/∅/	/L/	/∅/	/L/	/∅/	/L/	/∅/	/L/	/∅/	/L/	/∅/
H	11/24	5/36	5/12	1/12	7/12	1/12	7/12	3/12	3/12		45.8%	13.9%
HL	8/24	10/36	8/12	4/12	5/12	3/12	9/12	8/12	4/12	1/12	47.2%	31.0%
L	-	9/36	-	4/12	-	4/12	-	5/12	-	0/12	-	26.2%
LH	7/24	4/36	6/12	2/12	3/12	1/12	5/12	3/12	4/12	0/12	34.7%	11.9%
Total	36.1%	19.4%	52.8%	22.9%	41.7%	18.8%	58.3%	39.6%	30.6%	2.8%	42.6%	21.0%

A model of Generalized Estimating Equations (GEE) was further fitted to analyze the repeatedly measure binary outcomes. The best fit model selected by the lowest QICC indicated significant effects of tested tone (L or ∅), preceding tone, pair (all p<.001), as well as interaction between tone and preceding tone (p=.002). The details of the parameter estimates are attached in Appendix B. These estimates show that the difference between /L/ and /∅/ was statistically significant (B=1.41, Wald χ^2= 10.462, *p*=.001), which indicates that compared to /∅/, having a /L/ increase the likelihood of having creaky voice by 4.068 times (exp(B)=4.068). Furthermore, the effects of preceding tone and tone–preceding tone interaction show that for the neutral tone, the likelihood to be creaky is influenced by the preceding tone. For example, the neutral-tone syllables after /HL/ and /L/ were more likely to have a creaky voice compared to those after /LH/, the likelihood increased by 3.481 and 2.723 times (*p*=.006, *p*=.002) respectively. However, the effect of preceding tone was not significant for the low-tone syllables.

In summary, the neutral-tone syllables are less likely to have a creaky voice, and their pitch contours were generally higher than the pitch contours of the low tone. Also, the pitch height of the neutral tone was influenced by the preceding lexical tones. When the preceding lexical tone had a low offset (/L, HL/), the pitch contours of the neutral tone were closer to the low-tone pitch contours. The number of syllables with creaky voice (and thus excluded) also shows similar trends—a neutral-tone syllable is more likely to be creaky after /L/ and /HL/.

3.3.2 Durations

Table 10 shows the average durations of the rime of the first syllable (S1) and the second syllable (S2) of the tested disyllabic words in milliseconds (ms). The S2/S1 ratios provide a reference for the rhythm of the disyllabic words, but no further comparison will be made because the S1 rimes were not controlled in this experiment. Two S2/S1 ratios are presented in case there was speed variation: slower speech would have more influence on the (average S2)/(average S1) while the average S2/S1 ratios capture the rhythmic proportion of the disyllabic words.

Table 10 Durations and the statistical analyses of the tested pairs

Pair	Tested syllables	S1 rime duration (ms) Mean	S2 rime duration (ms) Mean	SD	estimated differences	(avg. S2)/ (avg. S1)	Avg. S2/S1 ratio Mean
-en	*men* [mən$^\emptyset$]	117.3	147.3	33.1	*p*=.719	1.256	1.317
	běn [pən^L]	115.3	144.5	44.8		1.253	1.286
zi	*zi* [tsɨ$^\emptyset$]	144.1	56.5	22.6	*p*=.009	0.403	0.402
	zǐ [tsɨ^L]	157.7	78.0	28.6		0.495	0.497
zhe	*zhe* [ʧə$^\emptyset$]	140.7	80.0	31.2	*p*<.001	0.569	0.580
	zhě [ʧə^L]	147.9	111.7	30.4		0.755	0.759
Cə	Cə /Ø/	130.2	82.7	27.6	*p*<.001	0.635	0.694
	Cə /L/	146.0	111.7	23.8		0.765	0.851
RED	*shu*[ʃu$^\emptyset$]	114.1	91.7	20.3	*p*=.760	0.804	0.808
	shǔ [ʃu^L]	170.6	87.3	27.1		0.512	0.512
	shen [ʃən$^\emptyset$]	139.2	146.1	28.2	*p*=.740	1.050	1.052
	shěn [ʃən^L]	145.3	150.9	39.3		1.038	1.066
	di [ti$^\emptyset$]	99.6	96.4	33.9	*p*=.691	0.968	0.966
	dǐ [ti^L]	116.8	102.2	20.4		0.875	0.878

A statistical analysis on durations shows that the best-fit model included pair, as well as interaction between tone and pair as fixed effects. For random effects, it included a random intercept for subjects and tested words, and a by-subject random slope for pair. The analysis reveals that the durations of each pair are different [F(6, 40.858=32.822, p<.001] as each rime has inherently different length, but there is also an significant interaction between the pair and the tone [F(7, 32)=8.825, p<.001]. As shown in Table 10, the durational differences between /L/ and /Ø/ within each pair were only statistically significant among the *zi*, *zhe*, and Cə pairs, but not for the *-en* pairs and the reduplication pairs. The model estimates of fixed effects (shown in Appendix C) illustrate that for the Cə pair, /L/ is 29.3 ms longer than /Ø/ (t(32)=6.071, p<.000); for the *zhe* pair, /L/ is 37.1 ms longer (t(32)=4.089, p<.001); and for the *zi* pair, /L/ is 21.5ms longer (t(32)=2.774, p=.009). To sum up, the durational evidence suggests that neutral-tone *zi*, *zhe*, *de*, *le*, *ge* are reduced in duration, but there is no evidence suggesting that the neutral-tone *men* and the reduplicants are reduced in duration.

The comparison of the average intensities of the rimes of the two tones showed that there was no signs of intensity reduction of the neutral-tone syllables in TM, which is not surprising because intensity differences were not even found in SM. The average intensities of the neutral-tone syllables were all slightly higher than their low-tone counterparts, suggesting that the intensity co-varies with the pitch contours as observed by Lee and Zee (2008). However, the differences were not statistically significant.

3.4 Discussion

This experiment compares the pitch contours, durations and intensity of the neutral-tone syllables with the low-tone syllables of the same rimes. The results show that overall the pitch contours of the neutral tone are higher than the low tone. The analysis of the pitch contours show that both /L/ and /Ø/ had a steeper pitch fall in the first half of the rime and a shallower pitch fall in the second half of the rime. According to Y. Xu and Wang (2001), the pitch target of a lexical tone is approximated in a asymptotic manner—the f0 first rapidly move to the pitch target, then slow down gradually over time reaching to a steady state. The asymptotic pitch contours for both /L/ and /Ø/ suggests that both tones approached to their static pitch targets respectively. The statistical analysis further show that the two have a distinct pitch target. At both the 55% and the 75% of the rime, the low tone was about 1.4 semitone lower than the pitch target of the neutral tone, and their differences were statistically significant. Considering the normalized pitch contours shown in Figure 2, the static pitch target of the neutral tone should be characterized as mid-low because by the third neutral tone, the pitch targets were around -1 semitone z-score, the mid-low range of a speaker's pitch, just slightly higher than the following low tone.

One might wonder whether the higher pitch contour of the neutral tone is a result of the pitch "undershoot" because the duration result shows that some of them are shorter than their low-tone counterparts. With a shorter duration, the f0 movement may approach to the pitch target with a dynamic pitch contour rather than an asymptotic one, and it may not reach the pitch target either (Y. Xu, 2005, p. 229). However, the comparison between each pair after different lexical tone (Table 8) shows that those pairs with significant durational differences (*zi*, *zhe* and Cə) did not necessarily have larger estimated pitch differences. Therefore the higher pitch contours of the neutral tone should not be analyzed as a consequence of a shorter duration.

As shown in Figure 4, the end pitches of the neutral tone syllables were generally above -1 semitone z-score, while the low tone syllables mostly end below -1 semitone z-score. A previous perception test (Huang, 2011) also suggested that the end pitch of -1 semitone z-score is the perceptual boundary. When a pitch contour fell to the lower register (-2 ~ 0 semitone z-score), the stimulus was more likely to be identified as a low tone if the end pitch was lower than -1 semitone z-score; and the stimulus was more likely to be identified as a neutral tone if the end pitch was higher than -1 semitone z-score. The results of the perception test showed that the acoustic difference observed here is perceptually distinct to the TM listeners. Furthermore, our acoustic results showed that compared to the neutral tone, the low-tone syllables were more likely to be creaky. The low tone in Mandarin has been observed to co-occur with creaky phonation (Chao, 1968; Davison, 1991; Fon, Chiang, & Cheung, 2004; Zhu, 2012) as creaky voice is a side-effect of low f0 (Kuang, 2013). Mandarin listeners were also

reported to utilize the creaky quality as a secondary cue to aid the low tone identification (Belotel-Grenié & Grenié, 1997; R. X. Yang, 2011), including contrasting with the neutral tone (Huang, 2011). Our results along with the perception evidence suggest that the low tone and the neutral tone have phonologically distinct pitch contours.

A more detailed factorial analysis was carried out at the 75% of the rimes. It shows that the pitch differences between /L/ and /Ø/ are most significant except for two pairs after /HL/. Also, the influence of the preceding tone was still significant on the neutral tone at this point, as suggested in Section 2, but not on the low tone. However, the pairwise comparison between /L/ and /Ø/ shows that the differences after each preceding tone were still significant. The examination of the proportion of creaky syllables also shows a similar pattern. Therefore the lower pitch contours of the neutral tone after /HL/ and /L/ should be treated as phonetically-driven rather than phonologically-targeted, and their contrast with the low tone were still maintained.

Moreover, aside from the phonetic evidence above, the phonological process of Tone 3 Sandhi also suggests that the neutral tone is distinct from the low tone (Tone 3). Tone 3 Sandhi in Mandarin requires that Tone 3 becomes Tone 2 when it is before another Tone 3. However, when a Tone 3 syllable is before a neutral-tone syllable, Tone 3 Sandhi was not triggered. This is another piece of evidence to show that the neutral tone is not the same as Tone 3.

The duration results indicate that not all of the neutral-tone syllables are reduced. The durations of the neutral-tone *zi*, *zhe* and Cə were all shorter than their low-tone corresponding syllables, suggesting that these neutral-tone syllables were shortened. However, the durations of *men* [mən$^{\emptyset}$] and the neutral-tone reduplicants were similar to their low-tone corresponding syllables. Even though these neutral-tone syllables in TM were shorter than their low-tone corresponding syllables, the durational differences were small compared to SM. Specifically, *zi* [tsɨ$^{\emptyset}$] was 28% shorter than *zǐ* [tsɨ^{L}] (56.5 vs. 78.0 ms), and the durations of Cə /Ø/ and *zhe* [ʈʂə$^{\emptyset}$] (about 80 ms) were 27% shorter than the durations of Cə /L/ and *zhě* [ʈʂə^{L}] (about 110 ms). In contrast, in a study comparing the tonal minimal pair of full-full and full-neutral in SM, Lin and Yan (1990) found that the average duration of the neutral-tone S2 rime was 53% shorter than the average duration of the Tone 4 /HL/ S2 rime (100 ms vs. 214 ms). In terms of S2/S1 ratios, TM X-*zi* [tsɨ$^{\emptyset}$] , X-*zhe* [ʈʂə$^{\emptyset}$], and X-Cə /Ø/ were smaller than their low tone corresponding pairs, but the differences were generally around 0.1~ 0.2. On the other hand, the SM data showed their S2/S1 ratio of full-full was 0.89 and the S2/S1 ratio of full-neutral was 0.47. The difference between these two S2/S1 ratios was 0.42. Although Lin and Yan used a different lexical tone to compare, the results are still important for us because when a syllable is in a sentence, /HL/ is the shortest tone in SM while /L/ is the shortest tone in TM (Deng et al., 2008). Lin and Yan's study and mine both compared the neutral tone with the shortest possible lexical tone, and the results

indicate that the durational and rhythmical differences in SM are much larger than in TM.

The split of the results in durations, with the *zi*, *zhe* and *Cə* pairs on the one hand and the *-men* and reduplicants pairs on the other, might be related to their frequency and lexical class. The neutral-tone syllables with shorter durations are all functional morphemes with high frequency, which are more susceptible to phonological reduction compared to content words which carry semantic meaning (Aylett & Turk, 2004; Bybee, Perkins, & Pagliuca, 1994; Selkirk, 1996; Z. Yang, Ramanarayanan, Byrd, & Narayanan, 2013). Specifically, *zhe* [ʧə[∅]] 'DUR', *de* [tə[∅]] 'POSS, NMLZ', and *le* [lə[∅]] 'PFV' are productive verbal and nominal suffixes, *ge* [kə[∅]] 'CLF' is the most productive generic classifier, and the diminutive suffix *zi* [tsɨ[∅]] is a very frequent fossilized morpheme, which does not carry a semantic meaning anymore. All of these morphemes are also very frequent in Mandarin speech (See Cai and Brysbaert (2010) for their frequency). On the other hand, the plural suffix *-men* [mən[∅]] is not obligatory and also limited in its distribution (Norman, 1988, p. 159; Ramsey, 1987, p. 64). As there is no grammatical number in Chinese, the plural meaning carried by the suffix *-men* [mən[∅]] is not redundant. Therefore it is more similar to content words. As for the reduplications, as discussed in 1.2, the verbal reduplication in TM simply reduplicates the lexical tone, and many of the reduplicated kinship terms and nicknames adopt a /L-H/ or /L-LH/ tone regardless of their lexical tone (Hsu, 2006). Therefore it is not surprising that the tested items (all kinship terms) did not have a reduced second syllable.

Although there are multiple factors that could influence the duration of a syllable, such as focus, inherent segment lengths of the rime, or its lexical tone, these factors were controlled in this experiment. The rimes of the compared syllables were the same and were put in an identical frame sentence, and the syllables that were used for comparison with the neutral tone possess the shortest tone in TM: a low tone. If the plural suffix and the reduplicants were unstressed, we would have found the shortening of their duration as observed in the rest of the tested neutral-tone syllables (*zi*, *zhe* and *Cə*). The diverse results suggest that syllable reduction does not apply to all the neutral-tone syllables in TM. The TM neutral-tone syllables all share a similar tonal target, but no acoustic evidence supports the claim that all of the neutral-tone syllables are reduced (unstressed).

4 General discussion

The results from both experiments demonstrate that the TM neutral tone differs from the SM neutral tone in the following ways: 1) The two dialects exhibit different pitch patterns on their neutral tone. As demonstrated in the first experiment, the TM neutral-tone syllables do not show post-L rising, instead they have a static pitch target in the mid-low to low range, and the comparison with the low tone in the second

experiment confirms that the TM neutral tone has a static mid-low pitch target; 2) Compared to the SM neutral tone, the TM neutral tone shows a much stronger articulation strength. The mid-low pitch target of the TM neutral tone was approached in a faster manner compared to that of the SM neutral tone. As shown in the first experiment, the carry-over effect had disappeared in TM at the third consecutive neutral tone, but it remained strong in SM; 3) While the tonal neutralization is tightly connected to stress in SM—a syllable is toneless because it is unstressed—it does not seem to be the case for TM. As mentioned in 1.1, the SM "neutral-tone" syllables were in fact unstressed syllables because the reduction and the pitch patterns were found in all the unstressed syllables, whether they are lexically-marked as unstressed/neutral tone or not. On the other hand, the TM neutral tone does not seem to be tightly connected to stress in TM. It is less common and strictly lexically determined. The presence of the pitch pattern is not found in the de-stressed syllables—it is only found in those syllables which are specified as having a neutral tone underlyingly at the lexical level. Moreover, the durational comparison in Experiment 2 shows that not all of the neutral-tone syllables are reduced. Therefore, it is hard to argue for a correlation between stress and the process of tonal neutralization in Taiwan Mandarin.

Based on the acoustic evidence listed above, I propose that the neutral-tone syllables in TM should be analyzed as unaccented, and the lexical tone in these syllables is neutralized into a mid-low tone. The mid-low pitch target can be interpreted as an unspecified position with a reduced pitch articulation, similar to [ə] in the vowel space. The term *unaccented* is used to show that pitch is the only acoustic cue to mark prominence, such as in pitch-accent languages like Japanese, as opposed to stress-accent language that might utilize other acoustic cues such as durations and intensity to mark prominence (van der Hulst, 2010). By analyzing these syllables as unaccented, we can capture the fact that durational cues are not consistent among the TM neutral-tone syllables, only some of them—mostly frequent function words—are prone to reduction. Therefore, describing the TM "neutral tone" syllables as "unaccented" would be a better analysis than describing all of them as "unstressed". There have been cases of other Mandarin dialects being documented as having unaccented syllables. For example, in the Xinjiang Mandarin dialects Barköl Mandarin and Ürümqi Mandarin, their neutral-tone syllables are analyzed as being unaccented because they undergo tone loss, but are not reduced, and the pitches of these unaccented syllables are conditioned by the preceding lexical tone (D. Cao, 1988; Wei, 2011). Similarly, the TM neutral-tone syllables also undergo tone loss but they are not reduced. The difference is that the TM unaccented syllables are neutralized into a mid-low tone.

There are three alternative ways to analyse the TM neutral tone. In the following discussion I will illustrate why they are inadequate, and thus the TM neutral tone should be analysed as unaccented.

First, the TM neutral-tone syllables can be analysed as having a mid-low lexical tone, which I term the fifth tone. It is because they have a distinct pitch target which differs from the other four lexical tones, and the mid-low pitch target cannot be predicted by the stress pattern and has to be specified underlyingly. Although the TM neutral tone is more lexical-tone like compared to the SM neutral tone, it should be noted that its articulatory strength is still weaker than lexical tones in the similar pitch range. As shown in Experiment 1, although the pitch contours start to converge immediately in the first neutral tone, the carry-over effects were not overcome until the third neutral tone. Although carry-over effects can be still significant on lexical tones, they are usually observed on lexical tones with higher offsets such as /H/ and /LH/ (Huang, 2013; Y. Xu, 1997). This piece of evidence suggests that these syllables do not seem to possess a lexical tone either. If these neutral-tone syllables possess a mid-low lexical tone, their pitch target should implemented in a faster manner. Furthermore, an extra mid-low level tone will be hard to fit in the tonal structure of /H, LH, L, HL/, or the newly proposed tonal structure of Taiwan Mandarin /H, M, L, HM/ (Huang, 2017).

Second, one might analyze these TM neutral-tone syllables the same as those in SM—"these syllables were neutralized because they are unstressed", and the difference between the two dialects is that in TM, the unstressed syllables are neutralized into a mid-low tone. This analysis would be similar to one of the analyses of Standard Thai unstressed syllables: lexical tones are said to be neutralized into a mid tone (Abramson, 1962). Nonetheless, this analysis needs to be rejected because our results show that not all the neutral-tone syllables are unstressed—some do not show a reduced duration. If the neutralized tone is a result of being unstressed, shorter durations are expected to be found in all the neutral-tone syllables.

Another possibility, suggested by some linguists in China (See L. Liu (2002)), is to analyze these neutral-tone syllables as a result of tone sandhi, i.e., syllables that undergo this tone sandhi change their tones to an unspecified tone with a mid-low pitch target. The problem with this analysis is determining the condition of this tone sandhi process. A tone sandhi process might be triggered by adjacent tones, e.g. Mandarin Tone 3 Sandhi; or by its position in a prosodic domain, e.g. Southern Min tone sandhi. However, this tone sandhi process is neither conditioned by its adjacent tones, nor by its position in a prosodic domain. Although they all locate at the right edge of a foot (and possibly other prosodic units), other lexical tones might occur in these positions as well. Therefore, it is not possible to predict the condition of this tone sandhi. In order to adopt this analysis, these linguists argue that the trigger of this tone sandhi is lexically determined, which makes no generalization about this process. This analysis is like stating that all the [d] in English are actually a result of a voicing of /t/, and this voicing process is lexically determined—of course no linguist actually claims this, instead the logical analysis is that /d/ is specified underlyingly. Similarly, rather than specifying the condition of the tone sandhi lexically, one could simply specify the unaccented syllables underlyingly.

The synchronic analysis of unaccented syllables is likely to be one of the manifestations of how the Mandarin neutral-tone syllables were adopted in Taiwan. As discussed in 1.2, the rhythmic features are manifested in the following ways: first of all, TM has less full-neutral disyllabic words. The evidence from the dictionary, computer input system, and online typing conventions suggests that the majority of the prescriptive neutral-tone syllables in compound words in SM are produced with lexical tones. Secondly, there is evidence suggesting that the post-L rising in the SM neutral tone was reanalyzed by the TM speakers as having a /H/ tone. When a Tone 3 is reduplicated in nicknames or kinship terms, a /L-H/ tonal pattern is often used to show endearment (Hsu, 2006). TM speakers likely produce the post-L rising without a reduced duration, and thus reanalyzed the post-L "neutral-tone syllables" as /H/. In comparison, the SM speakers do not treat the post-L rising as a /H/ because the post-L rising is always accompanied by a shorter duration, which serves as an additional perceptual cue. Therefore, the SM listeners identify the high pitch after /L/ as a neutral-tone, not a /H/ tone. This study demonstrates another manifestation of the TM rhythmic features on tones. It shows that, for the rest of the remaining prescriptive neutral tone syllables, at least for those that were examined in this study, the TM speakers likely reanalyzed the SM neutralized tone patterns into a mid-low tone with a weak articulation strength instead of adopting one of the existing lexical tones. This is likely because the SM neutral-tone syllables all have falling pitch contours reaching to the low register except for when they occur after /L/. When the TM speakers did not reduce the duration for these neutral-tone syllables, the SM neutralized pitch patterns were likely treated as a specific pitch contour, rather than a result of destressing and subsequent tone loss. Consequently, these falling pitch contours were generalized by the TM speakers as an unaccented syllable with a mid-low pitch target.

It is worth mentioning that these unaccented syllables are rather peripheral and might be moving towards merging with Tone 3. Acoustic data show their voice quality and pitch contours are sometimes similar to Tone 3, especially when they follow a falling tone or a low tone. Evidence in writing also suggests that the TM speakers are aware of this phonetic similarity. For example, recently some young TM online users use the character 惹 *rě* /ʐəᴸ/ 'to provoke' as a substitute for 了 *le* /ləᶲ/ 'PFV' when posting comments online. The character 惹 *rě* /ʐəᴸ/ can be used as a phonogram because the *lě* /ləᴸ/ syllable does not exist in Mandarin and many TM speakers merged /ʐ/ with /l/; I have also observed that online users write 鵝紫 *ézǐ* /ɣᴸᴴ-tsɨᴸ/ 'goose-purple' as a substitute for 兒子 *érzi* /ɣɹᴸᴴ-tsɨᶲ/ 'son'. These pieces of evidence suggest that TM speakers are aware of the similarity between Tone 3 and the unaccented syllables, and in fact are willing to use Tone 3 to mark them if given the chance to create their own writing.

Furthermore, phonologically some TM speakers seem to treat the neutral-tone syllables as a Tone 3. I conducted a "wug test" on the four productive neutral-tone syllables perfective *le*, durative *zhe*, possessive *de*, and plural *men*. Twelve subjects

were given obsolete characters with a made-up spelling and a made-up meaning, and they were asked to read a meaningful sentence with a tested suffix attached to each made-up character. Interestingly, one subject consistently applied Tone 3 Sandhi on the novel Tone 3 syllable before the neutral-tone syllable, suggesting that he treated the neutral tone as Tone 3 phonologically. This shows that possibly for some TM speakers, the low pitch of the neutral tone has led them to categorize the neutral-tone syllables as a low-tone syllable. Although Tone 3 Sandhi is not triggered in disyllabic L-∅ words because the pitch patterns are lexicalized, in a completely novel situation these neutral-tone syllables are treated like a low tone. Sociolinguistic research on a larger scale needs to be carried out to investigate whether this is a developing tendency, and, if so, how it affects speakers' production.

Unfortunately, this study was not able to examine all the neutral-tone syllables. The ones that were not examined include: 1) those disyllabic compound words that are prescriptively marked as having a neutral tone in computer input systems, 2) final particles, and 3) more nominal reduplications such as other kinship terms and verbal reduplications. However, despite a limited sample, the tested neutral-tone syllables in this study were among those words/syllables that were most frequently used in Mandarin. The emerging pitch contours of the unaccented syllables found in this study should be representative considering that they comprise a large portion of neutral-tone input/output in speech. Furthermore, the split durational results mean that whether or not those untested neutral-tone syllables reduced will not affect the conclusion of this study. Nevertheless, it will still be important to examine more neutral-tone syllables in future studies to investigate how neutral-tone syllables developed, and how they differ between different word classes and frequency. More work on different lexical-tone languages or other Mandarin dialects will also be useful in observing the interaction between tone and stress.

5   Conclusion

This study shows that unlike Standard Mandarin, the prescriptive neutral-tone syllables in TM either possess one of the four lexical tones, or they have a static mid-low pitch target that is different from other lexical tones. Furthermore, not all of these neutral-tone syllables are reduced. In other words, the tonal neutralization is not a result of the de-stressing. I propose that the TM "neutral-tone" should therefore be analyzed as unaccented with a mid-low pitch target. While stress can affect the pitch patterns of lexical tones through different ways of tone neutralization, this study demonstrates that when the contrast between stressed and unstressed syllables is less pronounced, the unstressed syllables cannot be "reversed" back to their original lexical tones, and an analysis of unaccented syllables thus needs to be proposed.

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Appendix A: Sentences used to elicit consecutive neutral tones

X-N-N-N-Y	X-REDUP.-PL-POSS-Y
	tā shuō ***X~X-men-de*** **hǎo/zhòngyào** *duō le*
	[tʰaᴴ ʃwoᴴ mən tə haoᴸ/tʃoŋᴴᴸjaoᴴᴸ twoᴴ lə]
	3S say X~RED-PL-POSS good/important more ASP
	'He said that Xs' are much better/more important.'
Y: /L/	*tā shuō* **mā~ma-men-de hǎo** *duō le* 他說**媽媽們的**好多了
	[tʰaᴴ ʃwoᴴ maᴴmaᵊmənᵊtəᵊ haoᴸ twoᴴ lə]
	'He said that the mothers' are much better.'
	tā shuō **pó~po-men-de hǎo** *duō le* 他說**婆婆們的**好多了
	[tʰaᴴ ʃwoᴴ pʰwoᴸᴴpʰwoᵊmənᵊtəᵊ haoᴸ twoᴴ lə]
	'He said that the mother-in-laws' are much better.'
	tā shuō **nǎi~nai-men-de hǎo** *duō le* 他說**奶奶們的**好多了
	[tʰaᴴ ʃwoᴴ naiᴸnaiᵊmənᵊtəᵊ haoᴸ twoᴴ lə]
	'He said that the grandmas' are much better.'
	tā shuō **mèi~mei men de hǎo** *duō le* 他說**妹妹們的**好多了
	[tʰaᴴ ʃwoᴴ mɛᴴᴸmɛᵊmənᵊtəᵊ haoᴸ twoᴴ lə]
	'He said that the sisters' are much better.'
Y: /HL/	*tā shuō* **mā~ma-men-de zhòngyào** *duō le* 他說**媽媽們的**重要多了
	[tʰaᴴ ʃwoᴴ maᴴmaᴴmənᵊtəᵊ tʃoŋᴴᴸjaoᴴᴸ twoᴴ lə]
	'He said that the mothers' are much more important.'
	tā shuō **pó~po-men-de zhòngyào** *duō le* 他說**婆婆們的**重要多了
	[tʰaᴴ ʃwoᴴ pʰwoᴸᴴpʰwoᵊmənᵊtəᵊ tʃoŋᴴᴸjaoᴴᴸ twoᴴ lə]
	'He said that the mother-in-laws' are much more important.'
	tā shuō **nǎi~nai-men-de zhòngyào** *duō le* 他說**奶奶們的**重要多了
	[tʰaᴴ ʃwoᴴ naiᴸnaiᵊmənᵊtəᵊ tʃoŋᴴᴸjaoᴴᴸ twoᴴ lə]
	'He said that the grandmas' are much more important.'
	tā shuō **mèi~mei-men-de zhòngyào** *duō lee* 他說**妹妹們的**重要多了
	[tʰaᴴ ʃwoᴴ mɛᴴᴸmɛᵊmənᵊtəᵊ tʃoŋᴴᴸjaoᴴᴸ twoᴴ lə]
	'He said that the sisters' are much more important.'
X-N-N-Y	X- PFV -NOM.-Y
	tā xǐhuān ***X-le-de*** **nà**-[CLF] *[noun]*
	[tʰaᴴ ɕiᴸhwanᴴ ləᵊtəᵊ naᴴᴸ]
	3S likes verb- PFV-NMLZ that-CLF noun.
	'He likes the one that ~.'
	nàge ***X-le-de*** **bǐjiào** *[adjective]*
	[naᴴᴸkəᵊ ləᵊtəᵊ piᴸtɕjaoᴴᴸ]
	that verb- PFV-NMLZ compare adjective.
	'The one that [verb] is more [adjective].'
Y:/HL/	*tā xǐhuān* **chāi-le de nà**jiān diàn. 他喜歡**拆了**的那間店
	[tʰaᴴ ɕiᴸhwanᴴ tʃaɪᴴləᵊtəᵊ naᴴᴸtɕjan tjanᴴᴸ]
	'He likes the shop that was torn down.'
	tā xǐhuān **táo-le de nà**ge rén. 他喜歡**逃了**的那個人
	[tʰaᴴ ɕiᴸhwanᴴ tʰaoᴸᴴləᵊtəᵊ naᴴᴸkəᵊ zənᴸᴴ]
	'He likes the person that escaped.'
	tā xǐhuān **pǎo-le de nà**ge rén. 他喜歡**跑了**的那個人
	[tʰaᴴ ɕiᴸhwanᴴ pʰaoᴸləᵊtəᵊ naᴴᴸkəᵊ zənᴸᴴ]
	'He likes the person that ran away.'

	*tā xǐhuān **xiǎo-le de nà**ge rén.*他喜歡**笑了的**那個人 [tʰɑᴴ ɕiᴸhwanᴴ ɕjaoᴴᴸləᵠtəᵠ nɑᴴᴸkəᵠ zənᴸᴴ] 'He likes the one that smiled.'
Y:/L/	*nàge **chāi-le de bǐ**jiào piányí* 那個**拆了的**比較便宜 [nɑᴴᴸkəᵠ tʃɑɪᴴləᵠtəᵠ piᴸtɕjaoᴴᴸ phjanᴸᴴiᴸᴴ] 'The one that was torn down is cheaper'
	*nàge **táo-le de bǐ**jiào qǐngsōng* 那個**逃了的**比較輕鬆 [nɑᴴᴸkəᵠ tʰaoᴸᴴləᵠtəᵠ piᴸtɕjaoᴴᴸ tɕiŋᴴsoŋᴴ] 'The one that was escaped is more relaxed'
	*nàge **pǎo-le de bǐ**jiào kělián* 那個**跑了的**比較可憐 [nɑᴴᴸkəᵠ pʰaoᴸləᵠtəᵠ piᴸtɕjaoᴴᴸ kʰəᴸljanᴸᴴ] 'The one that ran away is more pathetic'
	*nàge **xiào-le de bǐ**jiào kuàilè* 那個**笑了的**比較快樂 [nɑᴴᴸkəᵠ ɕjaoᴴᴸləᵠtəᵠ piᴸtɕjaoᴴᴸ kwɑɪᴴᴸɣᴴᴸ] 'The one that smiled is happier'
X-N-N-Y	**X-DUR-NMLZ-Y**
	*tā xǐhuān **X-zhe-de** **nà-ge** rén* [tʰɑᴴ ɕiᴸhwanᴴ tʃəᵠtəᵠ nɑᴴᴸ] 3S like verb-DUR-NMLZ that-CLF person 'He likes the person who is [verb]-ing.'
	*nàge **X-zhe-de** **bǐjiào** [adjective]* [nɑᴴᴸkəᵠ tʃəᵠtəᵠ piᴸtɕjaoᴴᴸ] that verb-DUR-NMLZ more adjective 'That [verb]-ing one is more [adjective].'
Y:/HL/	*tā xǐhuān **dūn-zhe-de nà**ge rén.*他喜歡**蹲著的**那個人 [tʰɑᴴ ɕiᴸhwanᴴ twənᴴtʃəᵠtəᵠ nɑᴴᴸkəᵠ zənᴸᴴ] 'He likes the person that was squatting.'
	*tā xǐhuān **xián-zhe de nà**ge rén.*他喜歡**閑著的**那個人 [tʰɑᴴ ɕiᴸhwanᴴ ɕjanᴸᴴtʃəᵠtəᵠ nɑᴴᴸkəᵠ zənᴸᴴ] 'He likes the person that was free.'
	*tā xǐhuān **tǎng-zhe de nà**ge rén.*他喜歡**躺著的**那個人 [tʰɑᴴ ɕiᴸhwanᴴ tʰɑŋᴸtʃəᵠtəᵠ nɑᴴᴸkəᵠ zənᴸᴴ] 'He likes the person that was lying down.'
	*tā xǐhuān **zhàn-zhe de nà**ge rén.*他喜歡**站著的**那個人 [tʰɑᴴ ɕiᴸhwanᴴ tʃanᴴᴸtʃəᵠtəᵠ nɑᴴᴸkəᵠ zənᴸᴴ] 'He likes the person that was standing.'
Y:/L/	*Nàge **dūn-zhe-de bǐ**jiào suíbiàn* 那個**蹲著的**比較隨便 [nɑᴴᴸkəᵠ twənᴴtʃəᵠtəᵠ piᴸtɕjaoᴴᴸ swɛᴸᴴpjanᴴᴸ] 'That squatting one is more casual.'
	*Nàge **xián-zhe-de bǐ**jiào tǎoyàn* 那個**閑著的**比較討厭 [nɑᴴᴸkəᵠ ɕjanᴸᴴtʃəᵠtəᵠ piᴸtɕjaoᴴᴸ tʰaoᴸjanᴴᴸ] 'That free one is more annoying.'
	*Nàge **tǎng-zhe-de bǐ**jiào lǎnduò* 那個**躺著的**比較懶惰 [nɑᴴᴸkəᵠ tʰɑŋᴸtʃəᵠtəᵠ piᴸtɕjaoᴴᴸ lanᴴᴸtwoᴴᴸ] 'That lying down one is lazier.'
	*Nàge **zhàn-zhe-de bǐ**jiào rènzhēn* 那個**站著的**比較認真 [nɑᴴᴸkəᵠ tʃanᴴᴸtʃəᵠtəᵠ piᴸtɕjaoᴴᴸ zənᴴᴸtʃənᴴ] 'That standing one is more earnest.'

Appendix B: Parameter Estimates on the occurrences of creaky syllable

Parameter	B	Std. Error	Wald χ^2	df	Sig.	Exp(B)	Lower	Upper
			Hypothesis Test				95% Wald Confidence Interval for Exp(B)	
(Intercept)	-1.754	.4656	14.194	1	.000	.173	.069	.431
[Tone=L]	1.403	.4338	10.462	1	.001	4.068	1.738	9.519
[Tone=N]	0ª	.	.	.	.	1	.	.
[PrecT=H]	.070	.4389	.025	1	.874	1.072	.454	2.534
[PrecT=HL]	1.247	.4549	7.516	1	.006	3.481	1.427	8.489
[PrecT=L]	1.002	.3238	9.571	1	.002	2.723	1.444	5.137
[PrecT=LH]	0ª	.	.	.	.	1	.	.
[Tone=L] * [PrecT=H]	.425	.5627	.570	1	.450	1.530	.508	4.608
[Tone=L] * [PrecT=HL]	-.693	.6220	1.241	1	.265	.500	.148	1.693
[Tone=L] * [PrecT=LH]	0ª	.	.	.	.	1	.	.
[Tone=N] * [PrecT=H]	0ª	.	.	.	.	1	.	.
[Tone=N] * [PrecT=HL]	0ª	.	.	.	.	1	.	.
[Tone=N] * [PrecT=L]	0ª	.	.	.	.	1	.	.
[Tone=N] * [PrecT=LH]	0ª	.	.	.	.	1	.	.
[pair=e]	-.446	.1862	5.726	1	.017	.640	.445	.923
[pair=en]	-.362	.2344	2.381	1	.123	.697	.440	1.103
[pair=i]	.552	.2864	3.710	1	.054	1.736	.990	3.043
[pair=redup]	-1.237	.2967	17.383	1	.000	.290	.162	.519
[pair=zhe]	0ª	.	.	.	.	1	.	.
(Scale)	1							

Appendix C: Estimates of fixed effects of S2 rime duration

Parameter	Estimate	Std. Error	df	t	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Intercept	.056511	.007863	32.298	7.187	.000	.040502	.072521
[pair=Ce]	.025736	.006740	43.748	3.818	.000	.012150	.039322
[pair=en]	.090802	.007915	41.981	11.473	.000	.074829	.106774
[pair=i]	.039883	.011836	36.967	3.370	.002	.015900	.063867
[pair=shen]	.089551	.011836	36.967	7.566	.000	.065567	.113534
[pair=u]	.035204	.011836	36.967	2.974	.005	.011220	.059187
[pair=zhe]	.023497	.007915	41.981	2.969	.005	.007525	.039470
[pair=zi]	0[b]	0	.	.	.	.	.
[tone=L] * [pair=Ce]	.029344	.004833	32	6.071	.000	.019499	.039189
[tone=L] * [pair=en]	-.002816	.007762	32	-.363	.719	-.018626	.012994
[tone=L] * [pair=i]	.005769	.014372	32	.401	.691	-.023506	.035044
[tone=L] * [pair=shen]	.004819	.014372	32	.335	.740	-.024456	.034094
[tone=L] * [pair=u]	-.004434	.014372	32	-.309	.760	-.033709	.024841
[tone=L] * [pair=zhe]	.031737	.007762	32	4.089	.000	.015927	.047548
[tone=L] * [pair=zi]	.021532	.007762	32	2.774	.009	.005722	.037343
[tone=N] * [pair=Ce]	0[b]	0	.	.	.	.	.
[tone=N] * [pair=en]	0[b]	0	.	.	.	.	.
[tone=N] * [pair=i]	0[b]	0	.	.	.	.	.
[tone=N] * [pair=shen]	0[b]	0	.	.	.	.	.
[tone=N] * [pair=u]	0[b]	0	.	.	.	.	.
[tone=N] * [pair=zhe]	0[b]	0	.	.	.	.	.
[tone=N] * [pair=zi]	0[b]	0	.	.	.	.	.

PHONEMIC STATUS OF BANGLA NASAL VOWELS: A CORPUS STUDY

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Abstract

This study investigated the phonemic status of the nasal vowels in Bangla (aka Bengali). It has been claimed for decades that all the seven monophthongal oral vowels in Bangla have phonemically contrastive nasal counterparts; however, an in-depth investigation of the status of nasality for all the vowels is lacking in the current literature. With a phoneme dictionary build from a text corpus of 8 (eight) million word-tokens and about 275 thousand word-types, this study investigated whether all the oral vowels have phonemically contrastive nasal vowels. Findings revealed that only five of the seven monophthongal vowels form phonemically contrastive relationships with their nasal counterparts; nasality in /æ/ and /ɔ/ are not contrastive phonemically.

Keywords: nasal vowels; phonemic status; text corpus; Bangla/Bengali

Povzetek

Članek preučuje fonemski status nosnih samoglasnikov v bengalščini (dialekt aka). Skozi desetletja je prevladovalo mnenje, da ima v bengalščini vseh sedem enostavnih samoglasnikov fonemsko kontrastivni nosni par, vendar pa to mnenje ni bilo podprto s poglobljenimi raziskavami. S pomočjo fonemskega slovarja, ki je bil zgrajen iz besedilnega korpusa z 8 milijoni pojavnic – od tega je približno 275 tisoč različnic – smo preverili, ali imajo vsi osnovni enostavni samoglasniki tudi svoje fonemsko kontrastivne nosne pare. Rezultati nakazujejo, da je takšnih parov v kontrastivni distribuciji samo 5 in da nosna /æ/ and /ɔ/ nista fonemsko kontrastivna.

Ključne besede: nosni samoglasniki; fonemski status; besedilni korpus; bengalščina

1 Introduction

Bangla has been widely described to have a seven-vowel system, and nasality in those vowels have been argued to provide an additional set of phonemically contrastive vowels (Morshed, 1972; Alam, Habib & Khan, 2008; Thompson, 2012). Thus, the seven monophthong vowels /i, e, æ, a, ɔ, o, u/ have been argued to create contrast with their nasal counterparts /ĩ, ẽ, æ̃, ã, ɔ̃, õ, ũ/. All the previous accounts of vowel nasality in

Bangla, however, relied on impressionistic judgment only, and the claim has not been directly and seriously addressed with sufficient and objective data in earlier literature. This study attempts to address the issue of the phonemic status of Bangla nasal vowels with more objective and quantifiable data to better understand the contribution of nasality in phonemic vowel contrasts in Bangla.

2   Background

2.1   Bangla (oral) vowel system

Bangla has a symmetric system of seven vowels. Morshed (1972) listed the vowels as /i, u, e, o, æ, ɔ, a/: two high, two high-mid, two low-mid, and one low vowel (Figure 1). In terms of backness, there are front vs. backness contrasts except for the low one.

	Front	Central	Back
High	i		u
High-mid	e		o
Low-mid	æ		ɔ
Low		a	

Figure 1: Bangla vowels (Morshed, 1972, p. 24)

Shamim (2011) investigated the vowel contrasts in terms of phonological features and reported the same number of vowels, though with a subtle difference. He used the symbol /ɛ/ for the owel /æ/ in Morshed (1972); he calls it a "non-low" ([–low] vowel while /æ/ vowel has often been described as [+low] (Zsiga, 2013: p. 270)). The use of /ɛ/ instead of /æ/ provides an advantage to Shamim's proposal that the contrast between /e/ and /ɛ/ should be captured by means of the [±ATR] feature and not the [low] feature where /e/ is [+ATR] and /ɛ/ [–ATR]. This way, the front vowel pair /e/-/ɛ/ and the back vowel pair /o/-/ɔ/ creates a symmetric pattern where both the contrasts are achieved with the [±ATR] feature. Figure 2 provides the chart he used to represent all the seven Bangla vowels.

	i	e	ɛ	u	o	ɔ	a
high	+	–	–	+	–	–	–
low	–	–	–	–	–	–	+
ATR	+	+	–	+	+	–	–
round	–	–	–	+	+	+	–
back	–	–	–	+	+	+	+

Figure 2: Bangla vowels and phonological features
(Shamim, 2011, p. 8)

While the vowel descriptions in Morshed (1972) and Shamim (2011) were primarily based on native speaker intuition or impressionistic observation, Alam, Habib, and Khan (2008) investigates the acoustic properties of Bangla vowels and reported the same seven vowels. Figure 3 presents the first two formant frequencies of the vowels (F1 on Y-axis and F2 on X-axis). The IPA symbols in the figure represent mean F1 and F2 values for the vowel categories; the corresponding Bangla vowel grapheme is to the left of the IPA symbols. The acoustic space also indicates to a symmetric vowels space for Bangla. The figure also includes the formant frequencies of the nasal vowel, which appear to be crease a similar symmetric vowel space like the oral vowels.
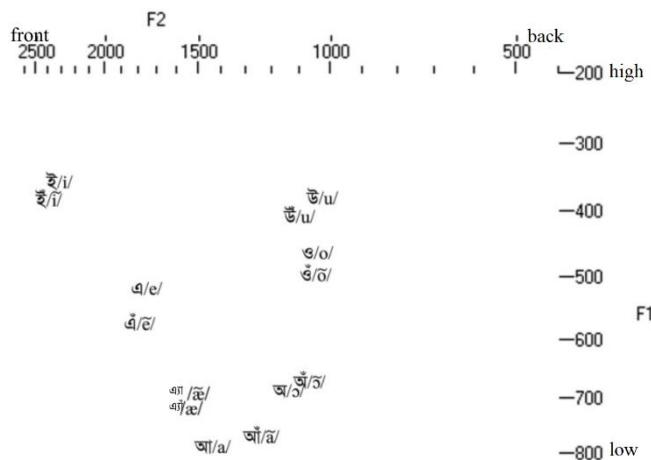
Figure 3: Bangla vowels and acoustic space (with nasals) (Alam et al., 2008, p. 9)

2.2 Nasal vowels in Bangla

That all the seven Bangla oral vowels have their phonemically contrastive nasal counterparts has been widely reported in earlier literature (Morshed, 1972; Alam et al., 2008; Barman, 2011; Thompson, 2012; Basu, Basu, Mitra, & Mandal, 2009; Shamim,

2011; Huq, 2002; Sarkar, 2004; Khan, 2008). As Morshed (1972) described, "… the number of nasalized vowels [in SCB] is equal to that of their oral counterparts, though the frequency of occurrence of nasalized vowels is far less than that of oral vowels" (p. 62). Thus, in Morshed's terms, each of the oral vowels is phonemically contrastive with its oral counterpart. Therefore, he presented two groups of vowels in Bangla: oral and nasal, as shown in Table 1.

Table 1: Oral vs. nasal vowels in SCB (Morshed, 1972)

Oral vowels	Nasal vowels
/i/	/ĩ/
/e/	/ẽ/
/æ/	/æ̃/
/a/	/ã/
/ɔ/	/ɔ̃/
/o/	/õ/
/u/	/ũ/

Khan (2008) also made similar claims that all the Bangla oral vowels have their nasal counterparts; however, he indicated that this might be true to some specific dialects only. In his words, "Bengali has seven vowels in its inventory /i, e, æ, a, o, ɔ, u/," along with "seven nasal vowels for dialects that have contrastive nasalization" (p. 25).

In Barman's (2011) account, "In Bangla, any [oral] vowel may be nasalized. Therefore, all the seven pure vowels in Bangla have their nasalized counterparts" (p. 21). He cites the following words as the evidence of vowel nasality in Bangla (Table 2).

Table 2: Words with nasal vowels (Barman, 2011, p. 21)

Nasal vowel	Word	Gloss
/ã/	/t͡ʃã̱d̪/	moon
/ĩ/	/ĩd̪ur/	rat
/ẽ/	/pẽt͡ʃa/	owl
/õ/	/dʰõa/	smoke
/ũ/	/ũt͡ʃu/	high
/ɔ̃/	/pɔ̃t͡ʃa/	rotten
/æ̃/	/pæ̃t͡ʃ/	complexity

Note: Barman (2011) used /ɑ/ and /ɒ/ instead of /a/ and /ɔ/, respectively

Thompson (2012) presented some minimal pairs to illustrate the scenario in more detail (Table 3). Reports of true minimal pairs, in fact, can provide concrete evidence that the oral-nasal pairs are phonologically contrastive. Unfortunately, most of the earlier studies did not include minimal pairs into the scene, whereas Thompson provided evidence for two Bangla vowels: /o/ and /a/.

Table 3: Oral-nasal minimal pairs (Thompson, 2012, p. 15)

Nasal	Gloss	Oral	Gloss
/bõʈi/	curved knife	/boʈi/	pill
/gã/	village	/ga/	body
/kãʈa/	thorn	/kaʈa/	to cut
/bãd̪ʰa/	bind	/bad̪ʰa/	obstruction
/ãʈa/	fix, stitch	/aʈa/	flour
/kʰãɾa/	sword	/kʰaɾa/	erect
/kãd̪a/	weep	/kad̪a/	clay
/kãtʃa/	unripe, green	/katʃa/	wash

The claims made in earlier literature, as reviewed above, regarding the status of Bangla nasal vowels can indicate two distinct possibilities. First, as most studies claimed, Bangla has a total of fourteen distinctive phonologically contrastive monophthongs, where all the nasal vowels also enjoy equal status as separate phonemes along with the oral vowels. The problem with this assumption is that there has not been any direct attempt to verify this claim with data from Bangla; the claims in earlier studies were based on impressionistic judgments only. Only Thompson's (2012) description included some minimal pairs based on nasality (as presented in Table 3). Even this description presented evidence only for two of the vowels (/o/ and /a/) and not others. Therefore, in the absence of minimal pairs or near-minimal pairs in earlier literature, it is hard to determine if all the nasal vowels are indeed in phonemically contrastive status, and not merely some phonetic variations of the oral vowels.

The second possibility is that not all the seven nasal vowels are phonemically contrastive in Bangla. It could be possible that nasality in some of the oral vowels is determined lexically or by the phonetic contexts. It might be possible that some of the nasal vowels are phonetic variants of their oral counterparts.

3   Methods

To determine if a segment is phonemic in a given language or not, a reliable way is to find minimal pairs or near-minimal pairs based on the target segment. As Kennedy (2017) put forward, "Minimal and near-minimal pairs are convenient tools for us to

discover contrastive oppositions" (p. 117). Kennedy defines a minimal pair as "a pair of words that differ at the surface just by a single phoneme;" he calls the used of minimal pairs as "a convenient shortcut to identify phonemes within languages" (p. 95). For example, the English minimal pair [pit – pet] "pit-pet" indicates that /i/ and /e/ are phonemically contrastive, and so they belong to two separate phonemes. On the other hand, near-minimal pairs are described as "forms that illustrate a phonemic contrast by virtue of containing different segments in equivalent immediate contexts" (Kennedy, 2017, p. 97). For example, Finnish words [ratas] "wheel" and [radan] "of a track" are not minimal pairs because there differ on more than one segments. The status of [t] and [d] here can be contrastive since they both occur in the same environment: [a__a] (full data in Kennedy, 2017, p. 96).

This study attempted to use minimal and near-minimal pairs to investigate whether all the nasal vowels in Bangla are contrastive with their oral counterparts. As the source of data, the study used a corpus of Bangla written text containing about 18 million word-tokens which had nearly 400 thousand word-types. Written text was preferred over any speech data due to several reasons. First, a spoken corpus takes a significant time and resource to build, along with the necessary coding of the necessary parameters. A text corpus is considerably easier to build and access. Secondly, the variety of lexicon is usually lower in a speech corpus; it is hard to ensure all possible word-types in speech (since corpus building usually happens in experimental settings which does not permit much flexibility in terms of experiment length). But, accumulating a big text corpus is somewhat easier (written texts of many languages are produced daily in large quantity, and are often freely available).

A text corpus was deemed suitable for the purpose of phonemic investigation in this study because Bangla orthography mostly corresponds to the spoken form, which is not the case for many other languages, e.g., English. The same approach would not be suitable for English due to extreme lack or correspondence between graphemes and phonemes; in such cases, a carefully built phonemic dictionary, as the CMU dictionary (CMU, 2018) would be necessary. Since most Bangla graphemes are tied in one-to-one relation with the corresponding phonemes, use of a text corpus was deemed suitable for this study. (Of course, Bangla still has some exceptions to the one-to-one correspondence in some cases including complex consonants and inherent vowels; Section 3.2 details of how these issues were handled.)

3.1   Corpus

The corpus used in this study was first developed and used by Arafat, Islam, and Khan (2006) who called it "Prothom Alo Corpus." The corpus consisted of a collection of the text published in the Bangla daily Prothom Alo (which is often considered to be the most widely read Bangla newspaper in Bangladesh). As Arafat et al. (2006) described, the Prothom Alo was chosen for building the corpus because this newspaper was the

"one with less spelling mistakes and with conventional spelling of Bangla words" (p. 2). The corpus consisted of about 18 million word-tokens and 400 thousand word-types. For this study, a subset of the main corpus was used, and it contained about 8 million word-tokens and 275 thousand word-types.

3.2   Data processing

Even though most graphemes in Bangla map to corresponding phonemes consistently, there were some exceptions which needed to be accounted for. This was applicable both to consonants and vowels. For example, the Bangla word "**বাক্য**" (/bak-ko/ "sentence") has a complex grapheme sequence where /k/ is followed by /j/ in "**ক্য**;" but, the combination is not pronounced as [kj]; rather it appears as [kk] in speech. Therefore, the sequence /kj/ was required to be revised as /kk/ in the corpus. Also, Bangla orthography sometimes lack explicit vowel graphemes, but vowels are do appear in speech form. For example, the word "**কবর**" (/kɔbor/ "grave") has a sequence of three consonants only: /k, b, r/; but, two vowels appear in the speech form: [kɔbor]. Thompson (2012) called these 'inherent vowels' (p. 24) which always happen to be /ɔ/ or /o/ depending on the phonological context.

A list of rules was developed and applied to convert the exceptional graphemes discussed above into the corresponding surfacing phonemes. This way, a phoneme dictionary was developed as a modified corpus which consisted of the words in Bangla orthography and their pronunciation as a sequence of phonemic segments.

3.3   Analysis

Nasal vowels in Bangla text are consistently marked with a diacritic called 'chandara-bindu' (ঁ) above the concerned segment, and this convention is almost exceptionless. Therefore, all the vowels having 'chandra-bindu' in the corpus were tagged as nasal vowels. For each of the word-types with a nasal vowel in it, the whole corpus was searched through to find (and record) any word of the same segments minus the nasal marker (essentially, minimal pairs). This process was repeated for all words for each vowel category. In case there were no minimal pairs for a vowel category, further investigations were performed by extracting the environments there occur in order to find and analyze near-minimal pairs.

The text processing and analyses were performed in Python and R (R Core Team, 2017).

4   Results

4.1   Vowel /ɔ/

There were only 22 word-types with the nasal vowel /ɔ̃/ in the whole corpus. And, interestingly enough, none of these words had any minimal or near-minimal pair in terms of nasal-oral difference. Some of the words with /ɔ̃/ were, in fact, French names like /ɔ̃ri/ (Henry) and /mɔ̃lier/ (Moliere) which are often considered to have nasal vowels in the source language. This is an indication that the nasal vowel /ɔ̃/ in these words are lexically inherent. The other words were the count words in Bangla. For example, words like **পঁচাশি** [pɔ̃tʃaʃi] ("eighty-five") or **পঁচাত্তর** [pɔ̃tʃat̪t̪or] ("seventy-five") do have nasal vowels; but, the nasalization in /ɔ/ is not contrastive with the oral counterpart. That is, the oral version [pɔtʃaʃi] is likely to be produced and perceived the same way as [pɔ̃tʃaʃi]. The vowels do not need to be faithful to being nasal which provides a complete optionality for the oral vowel to be nasal or not. This indicates that the nasal vowel may just be in free variation with the oral vowel.

4.2   Vowel /æ/

The corpus did not have any minimal or near-minimal pair for the vowel /æ/. In fact, /æ̃/ (nasal) was the least frequent vowel in the corpus with only 3 word-types: /pæ̃tʃa/ "owl", /pæ̃tʃar/ "of owl", /pæ̃tʃano/ "to twist" (the first two belong to the same morpheme paradigm). Thus, the only context the /æ̃/ vowel appeared in was [p__tʃ]; but, no words were found where the oral /æ/ appeared in the same context. Therefore, there was neither minimal pairs nor near-minimal pairs to establish that /æ/ and /æ̃/ are in contrastive distribution in Bangla.

4.3   Vowel /o/

The corpus had 62 word-types that had nasal /õ/ in them; and there were indeed instances of true minimal pairs. As Table 4 shows, contrast in meaning is achieved based only on nasality differences between word pairs like /kʰõdʒa/ - /kʰodʒa/, which is a clear indication that the nasal vowel is phonemically contrastive with the oral vowel.

Table 4: Minimal pairs for /õ/ vs. /o/

With /õ/	Gloss	With /o/	Gloss
/kʰõdʒa/	to seek	/kʰodʒa/	castrated
/pʰõʈa/	droplet (water)	/pʰoʈa/	to bloom
/gõɽa/	bigoted	/goɽa/	base
/d̪ʰõa/	smoke	/d̪ʰoa/	to wash

There were, however, some instances which posed a more complex scenario. The word /tʃʰoɽa/ "to throw" can form a minimal pair with /tʃʰõɽa/ if the intended meaning of /tʃʰõɽa/ is "lad/boy;" however, the same word meaning "lad/boy" can be achieved with the oral vowel too (/tʃʰoɽa/) (Huq, Lahiri, & Sarker, 2000, p. 446). Thus, the contrastiveness of /õ/ vs. /o/ is context dependent in such cases. Similar examples included /kʰõta-kʰota/ "to mention someone's negative points," /khõpa-khopa/ "hair bun," /põṯa-poṯa/ "to plant/bury something in the ground," /phõɽa-phoɽa/ "to pierce through something," etc. where nasality did not contribute to meaning differences indicating phonetic vairations.

4.4   Vowel /u/

There was a total of 827 word-types that had the nasal vowel /ũ/; and, there were only 4 minimal pairs based on /ũ/-/u/ contrast. Table 5 provides the list, which shows that lexical differences are caused by the difference of nasality alone in the vowel /u/; and, this works as a clear indication that /ũ/ is phonemically contrastive with /u/ in Bangla.

Table 5: Minimal pairs for /ũ/ vs. /u/

With /ũ/	Gloss	With /u/	Gloss
/kũɽi/	bud	/kuɽi/	twenty
/kũɽa/	husk of paddy	/kuɽa/	to collect from ground (2p.imp)
/kʰũʈi/	piller	/kʰuʈi/	to pick something up (1p)
/kũtʃi/	ruffle in dress	/kutʃi/	slices

Like the vowel /o/, the nasal /ũ/ was also found to be in free variation with an oral /u/, too. Table 6 lists such instances found in the corpus.

Table 6: Nasal vowels as phonetic variations in vowel /u/

Word	Gloss
/kũtʃki/ or /kutʃki/	groin
/ũtʃu/ or /utʃu/	high
/ḏʰũka/ or /ḏʰuka/	to suffer
/ḏʰũa/ or /ḏʰua/	smoke
/pũʈli/ or /puʈli/	small bag
/pũṯʰi/ or /puṯʰi/	verse

4.5   Vowel /i/

In the /i/ vowel category, the corpus had 196 word-types that had the nasal /ĩ/ in them; but, interestingly, none of these word-types had any counterpart minimally contrastive in terms of nasality. The corpus did have orthographic minimal pairs like /tʃiɾa/ vs. /tʃiɾa/ "flattened rice," but these were the variants of the same lexicon with the same meaning. Therefore, in the absence of true minimal pairs, it was necessary to look for near-minimal pairs.

Table 7 provides a subset of the near-minimal pairs for /ĩ/-/i/ contrast in the corpus. As Table 7 indicates, the pairs are not exactly minimal pairs because they differ by more than one segment. But, the environments they two vowels (nasal vs. oral) occur are the same within pairs. For example, in /pĩpɾa/ "ant" and /pipaʃa/ "thirst," both /ĩ/ and /i/ occur in the same phonological environment [p __ p]; therefore, the positions of occurrence of the nasal and oral vowels are not predictable. This serves as an indication that these two vowels are in contrastive distribution.

Table 7: Near-minimal pairs for /ĩ/ vs. /i/

With /ĩ/	Gloss	With /i/	Gloss
/ʃĩd̪ur/	vermillion	/onʃid̪ar/	partner
/kʰĩtʃ/	to pull	/kʰitʃuɾi/	mixed rice
/pĩpɾa/	ant	/pipaʃa/	thirst
/bĩd̪ʰa/	to drill	/bid̪ʰan/	rules

4.6   Vowel /e/

The corpus had 478 word-types for the nasal vowel /ẽ/; however, only 4 minimal pairs could be established with the oral vowel (Table 8). All the other words with nasal /ẽ/ were either the phonetic variants or just inherently nasal vowels. Nevertheless, the minimal pairs in Table 7 provides evidence that nasality is still contrastive for vowel /e/.

Table 8: Minimal pairs for /ẽ/ vs. /e/

With /ũ/	Gloss	With /u/	Gloss
/bẽtʃe/	to live	/betʃe/	to sell
/kẽɾe/	to mix	/keɾe/	to snatch
/gẽje/	rural	/geje/	to sing
/tʃʰẽɾe/	to tear (3p)	/tʃʰeɾe/	without

4.7   Vowel /a/

The occurrence of nasality was the highest for the vowel /a/ in the corpus with 2555 word-types. Of these, about 120 minimal pairs could be established (Table 9 provides a few examples). The nasal vowel /ã/, as Table 9 shows, clearly creates contrastive meaning from the oral vowel /a/ generating minimal pairs, which is a solid evidence for /ã/ and /a/ to create phonemic contrastiveness. This is consistent with the data from Thompson (2012) in Table 3.

Table 9: Minimal pairs for /ã/ vs. /a/

With /ũ/	Gloss	With /u/	Gloss
/kãʈa/	thorn	/kaʈa/	to cut
/bãd̪ʰa/	to tie	/bad̪ʰa/	obstacle
/kãd̪a/	to cry	/kad̪a/	mud
/pãʈʰa/	goat	/paʈha/	send (2P.Imp.)

5   Conclusion

This study concludes that nasality is phonemically contrastive for a subset of the seven oral vowels in Bangla, and not for all the vowels, as it has been consistently and widely claimed in existing literature. The evidence from minimal and near-minimal pairs from a Bangla corpus strongly suggests that only five (/i, e, a, o, u/) of the seven oral vowels have phonemically contrastive nasal counterparts. On the other hand, /æ/ and /ɔ/ are argued to be not phonemically contrastive with their nasal counterparts /æ̃/ and /ɔ̃/ since the study could not find any evidence, in the forms of minimal or near-minimal pairs, to establish the claim. Therefore, the study suggests that nasality is not a phonemically contrastive feature for /æ/ and /ɔ/ in Bangla, and so, only five out of the seven Bangla monophthongs have contrastive nasal vowel counterparts.

It should be noted that the vowels participating in nasal contrastiveness may vary depending on the specific dialect of Bangla, as implicitly indicated by Khan (2008). This study focused on the Standard Colloquial Bangla, as used Bangladesh; reports from other dialects might be help in establishing a bigger picture of the vowel nasality scenario.

An interesting trend revealed in the study was that the frequency of nasal vowels in Bangla is very low in comparison to the oral ones; this is consistent with Sarkar's (2004) account of Bangla vowel frequency. Even more is the fact that many of the nasal vowels were, in fact, mere phonetic variation of the oral ones, and, therefore, did not contribute to any difference in lexical meaning. It might be possible that the variations

are still conditioned by sociolinguistic factors. Along with this, it might also be an indication of diachronic changes in Bangla where contrasts based on nasality are diminishing; future studies should explore such possibilities.

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HOKKAIDO PUMPKINS AND HUAWEI PHONES: ANTI-HIATUS TENDENCIES IN SLOVENE[*]

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Abstract

In Slovene, sound shapes of Japanese and Chinese words undergoing the process of assimilation may be quite different from their origins, which in the end should not come as a surprise as it is so in many other languages. However, the fact that there are many cases with two slightly different Slovene pronunciations of the same Japanese or Chinese word, of which one is closer to the original sound shape than the other, calls for a more comprehensive investigation on the factors that contributed to such a result. This research pays attention to vowel sequences in Japanese and Chinese, and how they appear in Slovene as the so called visiting lexica. Though the two languages carry out vowel sequences in different ways, similarities can be found in the way Slovene detects and resolves their vowel hiatuses. Authors stress the importance of metrical aspects of the original sound shapes, which Latin script includes inconsistently or does not express at all. Phonological approach to vowel sequences solution to vowel hiatus and offers systematic guidelines on pronunciation of the Latin script. Besides, it may further bring some new insights into possible solution on conjugation and declination forms of Japanese and Chinese loanwords in Slovene.

Keywords: Japanese; Chinese; visiting lexicon in Slovene; hiatus-avoiding mechanisms

Povzetek

V slovenščini je lahko glasovna podoba besed iz japonščine in kitajščine, ki so v procesu prevzemanja v jezik, precej drugačna od tiste v izvornem jeziku. To navsezadnje niti ni tako presenetljivo; spremenjeno glasovno podobo je moč opaziti tudi v drugih jezikih. Z vidika jezikoslovja je bolj zanimivo dejstvo, da v ciljnem jeziku, tj. slovenščini, obstajata dve nekoliko različni glasovni podobi iste izvorne besede, kar kliče k podrobnejši raziskavi o razlogih zanj. V tem delu obravnavamo samoglasniška zaporedja v t.i. gostujočem besedju, ki naj bi pri tem igrala pomembno vlogo. Japonščina in kitajščina sicer samoglasniška zaporedja realizirata na precej drugačen način, vendar je ob poznavanju izvorne glasovne podobe obravnava precej podobna. Avtorja poudarita pomen metrične stukture besed v

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izvornem jeziku, ki je v latiničnem zapisu pogosto obravnavana nekonsistentno ali pa je celo neizražena. Fonološki pristop k samoglasniškim zaporedjem v slovenskih prevzetih besedah omogoča zadovoljivo reševanje samoglasniških hiatov in ponuja sistematične smernice o izgovarjavi takšnih besed. Takšne rešitve so lahko osnova nadaljnim diskusijam o možnih sklonskih in spregativnih oblikah japonskih in kitajskih besed v procesu prevzemanja.

Ključne besede: japonščina; kitajščina; gostujoče besedje v slovenščini; antihiatski mehanizmi

1   Introduction: a visiting lexicon

Vocabularies of world's languages are built of words of different origin, and phonologically that makes words form the so-called phonological lexical classes of those vocabularies (Ito & Mester, 1999). Besides the etymologically prime lexicon, most languages consist of one or more borrowed lexica, which have already implemented a certain degree of assimilation.

A language may at particular events import foreign words for a single use. Such events are relatively sudden compared to a natural process of borrowing, and generally influence the spoken form only—and even that to the extent of unavoidable adjustments only—, while the written form is kept foreign. We will call such words "a visiting lexicon". It is characteristic for a visiting lexicon that its words either have an important status on the international stage and therefore keep their internationally recognized written forms for practical purposes, or else have little or no long-term significance and very low frequency of appearance in a particular language and therefore assimilation does not occur. The level of assimilation for a visiting lexicon is similar to that of an early-stage borrowed lexicon named "non-assimilated foreign" by Ito and Mester (1999).

Not all languages implement all three stages in borrowing words, and some do not accept or recognize a visiting lexicon. In Slovene, a visiting lexicon generally represents foreign proper names or foreign naming expressions though it must be noted that not all foreign proper names or foreign naming expressions necessarily belong to it.

1.1   Orthography of a visiting lexicon in Slovene

Not much is to be written about those foreign proper names and foreign naming expressions that originate from languages with Latin, Arabic, Cyrillic and Greek scripts. Some of such proper names have in the past been slovenized due to historical, grammatical or other reasons (Chicago → Čikago; Bruxelles/Brussel → Bruselj; Paris → Pariz; Kyōto → Kjoto; Beijing → Peking; etc.)[1]. Apart from those, original foreign orthographic form has been used in case of a Latin script, and a Latin transliteration

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[1] For detailed guidelines see *Seznam tujih zemljepisnih imen v slovenskem jeziku (List of foreign geographical names in Slovene).*

was conducted for proper names from Arabic, Cyrillic and Greek scripts (e.g. Београд → Beograd; Панчево → Pančevo; Δάφνη → Dafni; Σαλαμίνα > Salamina).[2]

On the other hand, orthographic rules for a visiting lexicon from languages with non-alphabetic writing systems, including Japanese and Chinese visiting lexicon have been treated much more ambiguously. Decades ago when more and more slovenization of such words was thought to be the right and the best way to handle them. Recently, such thinking is facing changes, and internationally recognized Latin scripts for Japanese and Chinese are gradually getting into use. Still, in the Slovenian Orthography they are not recognized as the official Latin scripts of Japanese and Chinese yet (see Section 1.2 for more details).

While recognizing official Latin scripts also for the languages of logographic and syllabic writing systems for Slovene visiting lexicon certainly systematizes and simplifies orthographic rules in Slovene, it on the other hand adds to the confusion concerning the readings. Different languages' orthographies offer different degrees of correspondence between spelling and pronunciation[3], and this is also the case for Latin scripts that non-alphabetic languages utilize. Let us look at the following sentence that includes several city names from all over the world.

(1)   Medtem ko je glavni kandidat za izvedbo naslednjega prvenstva francoski Toulouse, so kandidaturo vložila tudi mesta Seville (Španija), Nyíregyháza (Madžarska), Kyzyl-Oi (Kirgistan), Hai Phong (Vietnam), Daejeon (Koreja) in Växjö (Švedska).

'While the main candidate to host the next championship is the French Toulouse, candidacy was also filed by Seville (Spain), Nyíregyháza (Hungary), Kyzyl-Oi (Kyrgyzia), Hai Phong (Vietnam), Daejeon (Korea) and Växjö (Sweden).'

The process of recognizing the words origin to read them accordingly can be very difficult or sometimes even impossible. In case a reader is not familiar with the sound shape of a visiting word, a mismatching between a written and spoken form is unavoidable. The following name George exemplifies how different pronunciations of the same written word can get among languages:

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[2] Original orthographic form has recently been in use even with some historical names that have in the past been assimilated (ex. Galileo Galilej → Galileo Galilei). (Dobrovoljc, 2013)

[3] International Phonetic Alphabeth (IPA) was devised as a standardized representation of the sounds of spoken language. With it the relationship between sign and sound is the same no matter the language.

(2) /dʒˈɔrdʒə/   (Italian)
    /ʒɔʁʒ/   (French)
    /geːɔrtə/   (German)
    /dʒorč/   (Indian language Karnataka)
    /dʒordʒe/   (Romanian)
    /gjorgi/   (Russian)
    /ˈdʒɔrdʒ/   (American English)
    /dʒɔːdʒ/   (British English)
    /xeˈor.xe/   (Spanish)

1.2   Official Latin script for Japanese and Chinese

About a century ago, the problem of how to write proper names from languages other than Slovene was first mentioned in the manual Slovenian Orthography (1920) by Breznik (Pogačnik, 2012). His brief note on the importance of keeping the written word "as it is" (Breznik, 1920, §1-1-5) was dedicated to foreign languages of Latin script, however, it is thought to be a breaking point in the awareness and inclusion of something foreign into Slovene, cf. what we now call a visiting lexicon. It took nearly another half a century to include the guidelines for writing proper names from languages of non-alphabetical writing systems. At the time it was suggested that such words be written phonetically (Slovenian Orthography, 1962), which corresponds to a fully assimilated form.

There are no linguistic grounds for categorizing words in Slovene to those of Latin and non-Latin script, further treating the latter as either alphabetical or not with the purpose to decide on whether a foreign word in the borrowing process would undergo slovenization or not. Categorization above all produces discussions on how to treat border cases such as the name of the Nobel prize winner Ishiguro Kazuo, an Englishman of a Japanese descent, whose name can be found slovenized due to his Japanese roots (Kazuo Išiguro) or written with its original Latin spelling (Ishiguro Kazuo) (Lengar Verovnik, 2017).

The tendency to keep a visiting lexicon from languages of non-alphabetical writing systems in their internationally recognized Latin script is gaining importance though the guidelines from 1962 (and their revised versions from 1991 and 2001) have not been abandoned fully yet.

Several possible reasons—leaving aside their justifications—could be thought of for the present situation; with the existence of more than one international Latin script for one language it is difficult to choose and adopt one representative; adopting different international scripts for all non-Latin non-alphabetical writing systems would be confusing for a Slovene reader; general Slovene readers are neither used to the sound shapes of Japanese and Chinese neither to their Latin scripts, and besides instructions on how to read such scripts would get long and complicated, etc.

Let us have a brief look at the official Latin script for both Japanese and Chinese, and their status in Slovene.

Romanization of Japanese dates centuries and resulted in the existence of several different styles, among which Hepburn Latin script was most widely known. To unify the styles the former Ministry of Education compiled and send out Kunrei Latin script, which was in 1954 recognized as the correct style of romanization. In the same Cabinet notice, Hepburn system was allowed to be used as well, and consequently there are now two Latin scripts for Japanese; internationally standardized Kunrei Latin script (ISO 3602), and the widely used Hepburn Latin script for writing names and geographical locations.[4] Though well-established, the two Latin script for Japanese have not been recognized by the Slovene Orthography (*Slovenski pravopis*) yet despite the professional proposals to do so (Mlakar & Ilc, 2009).

Similar is the situation with Chinese. Discussions about how to write Chinese words (and proper names names within that) in Slovene date back to 1974 when the sinology scholar Mitja Saje presented Hanyu Pinyin to Slovene professional public, and have been a subject of debate since then (Toporišič, 2011). The role of Hanyu Pinyin as the official Latin script for Standard Chinese has been repeatedly rejected by Slovene scholars till recently. The fact that Hanyu Pinyin was adopted by The International Organization for Standardization (ISO) as an international standard in 1982, followed by the United Nations in 1986, was not convincing enough. Majority of publications followed the standard prescriptive orthography defined in Slovene Orthography, ignoring arguments from the sinological perspective.

In 2009, an entire issue of the Asian and African Studies (Volume 8, Issue 2) scholarly journal was devoted to the problem of writing Japanese and Chinese words in Slovene. Its clear message that proper names should not be forced into slovenization argued against paragraph §180 in the Slovene Orthography stating that both languages had already had their own Latin scripts and should therefore not be forced into slovenization" any further.[5]

Introducing internationally recognized Japanese Hepburn romanization and Chinese Hanyu Pinyin into Slovene with no doubt brings about the need to equip Slovene readers with information on the optimal pronunciation of the two scripts. It is therefore important to come to the solution which thoroughly considers characteristics of Slovene, Japanese and Chinese phonological systems.

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[4] Very recent movements try to unify the two (The Mainichi, 2017).

[5] For the exact proposals regarding Chinese, see Petrovčič 2009a, 2009b, 2009c.

2   Research question

With the process of borrowing words a language sometimes has to deal with new sound sequences. Among them are sequences of vowels which may express different types of interrelationship and consequently different syllable structures.

Previous studies have shown that speakers have a very clear intuitions about the number of syllables in a word (Blevins, 1996), and that such intuitions are used for perceiving syllables of a foreign language (Carlisle, 2001; Zárate-Sández, 2011). In addition, a visiting lexicon with its foreign orthographic forms from different languages may further complicate the situation for a reader or speaker, as it is known that orthography also influences syllabic segmentation of a foreign language (Detey & Nesouplous, 2008).

A gap between writing and pronunciation of vowel sequences is observed in many of the world's languages. Pay attention to the pronunciation of the vowel sequence "ie" in the following example.[6]

(3) Pyeongchang 2018 Olympic Winter Games hosted many athletes, including:
Francesco Fr**ie**drich (Germany, bobsleigh)[7]   /i:/
Emil**ie**n Jacquelin (France, biathlon)   /i.ja/
Yur**ie** Watabe (Japan, freestyle skiing)   /i.e/
X**ie** Jiaxuan (China, speed skating)   /je/

Based on the above, the main interest of this study is first to make an overview of the possible vowel sequences and their Latin scripts for Japanese and Chinese respectively, and look at how they get shaped when entering into Slovene. Focusing on the so-called visiting lexicon, for which in Slovene it is suggested to keep the internationally recognized Latin script, the study discusses those vowel letter sequences that are less familiar to the Slovene reader or seem problematic.

3   Vowel sequences: diphthong and hiatus

Two vowels in a sequence can appear either as a diphthong or a vowel hiatus. A diphthong refers to two vowels of different qualities[8] that represent a tautosyllabic sequence, cf. belong to the same syllable. On the other hand, vowel sequence in hiatus is heterosyllabic with the two vowels occuring across syllable boundary.

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[6] The example itself is fictitious, however information about athletes are real.

[7] https://www.pronouncenames.com/search?name=friedrich (name to be typed in the last part of URL)

[8] Catford (1977, p. 215) treats a diphthong as "a sequence of perceptually two different vowel sounds within one and the same syllable", and Ladefoged (1982, p. 171) defines it as "a single vowel with continuously changing qualities".

There are morphological and phonological criteria that are used for the definition of the vowel sequence type. The morphological criterion is that two vocalic elements must appear within a morpheme rather than across two morphemes in order to form a diphthong. The phonological criterion concerns the sonority of the two vowels; the preceeding vowel must be at least as sonorous as the following one to form a diphthong, and at the same time, vowels in sequence belong to different syllables if the following vowel is more sonorous than the preceeding one. Potential exceptions to this are cases where proceeding vowel becomes a glide, e.g. [ia] → [ja], [ua] → [wa], and cases where the following vowel becomes a schwa, e.g. [ia] → [iə]. And for a hiatus, vowels may come to meet at word or morpheme boundaries, or may arise due to an intervocalic consonant deletion in the middle of phonological word (Picard, 2003).

Slovene contains diphthongs and hiatuses. Diphthongs are relatively common (summarized in Šuštaršič, Komar & Petek, 1999), while hiatus may appear on morphemic boundaries in derivatives and in loanwords[9] (Jurgec 2004a).

Though vowel hiatus is not a rare phenomenon—there are languages such as Portugese, Japanese, Bantu languages, and Polynesian languages having no or very few diphthongs but they perform vowel sequences that appear in hiatus—, it is interesting that languages are generally quite intolerant of hiatus, it being "phonologically unstable" (Kenstowicz, 1994, p. 23) and "apparently uncomfortable" (Trask, 1996, p. 65). Such languages employ several different anti-hiatus or hiatus-avoiding mechanisms.

3.1   Hiatus resolution

Languages that do not permit vowel hiatus may employ any of several processes that eliminate it in cases where it would otherwise arise. One of the most common means of avoiding hiatuses, resolving potential hiatuses, or breaking up actual ones is the elision of one of the two vowels. Other common pattern cross-linguistically are diphthong formation or glide formation, vowel coalescence, and epenthesis of a default consonant, while capturing a 'floating' consonantal melody or the spread of some (consonantal) melody from one of the vowel positions flanking the empty onset position are also observed (for details see Casali, 1997, 2011).

3.2   Anti-hiatus tendencies in Slovene

Jurgec (2004b) has shown that hiatus in standard Slovene attract cross-linguistically common hiatus-avoiding tendencies, with the epenthesis of [j] and the diphthongization of Vu̯ on the level of general phonological system, and glide formation and elision for individual cases. Phonetically, reductive processes such as

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[9] Hiatuses are very rare though.

diphthongization, elision and coalescence, and dissimilation also occur. Let us look at the prevalent ones through examples.

(4) **Epenthesis of [j]: i + V → ijV**
biologija /bijologija/ 'biology'
Vietnam /vijetnam/ 'Vietnam'

(5) **Glide formation: i [-stress] + V → jV**
bianko /bjanko/ 'blank'
bonboniera /bonbonjera/ 'box of chocolates'

(6) **Epenthesis or glide formation**
riviera /rivijera/ or /rivjera/ 'riviera'
premier /premijer/ or /premje/ 'premier'

(7) **Diphthongization: V + u [-stress] → Vu̯, rarely V + i [-stress] → Vi̯, V + o → Vu̯**
nauk /nau̯k/ 'lesson'
čoln /t͡ʃou̯n/ 'boat'
aids /ai̯t͡s/ 'aids'

(8) **Elision: V1 + V2 → V1, V1 + V2 → V2**
laringealen /laringalen/ 'laryngeal'
poizkus /poskus/ 'try'

4   Hiatus in Japanese and Chinese: its appearance in the Latin scripts

Both Japanese and Chinese possess a variety of vowel sequences. In this section we will look at such possible vowel sequences, examine they syllabic constitution, and look into how they are represented by the official Latin scripts for the two languages respectively.

4.1   Hiatus and Japanese

According to Lindau, Nolin and Svantesson (1990), standard (Tokyo) Japanese can be classified into one of two thirds of the world's languages that lack phonemic diphthongs. There is a vivid debate on the topic.

Japanese has five monophthong vowels that can be combined freely with one another to form a vowel sequence. Across morpheme or lexeme boundaries such vowel sequences always form a hiatus. Vowel sequences within a morpheme/lexeme are, on the other hand, highly limited (Takayama, 2003) but among those V + i sequence makes the potential for a diphthong (Kubozono, 2015). Many scholars disagree with the interpretation that Japanese has diphthongs (Labrune, 2012; and others). Kawahara (2003) researched on hiatus resolutions in Japanese. He reports that epenthesis of [j] or [w] is the representative hiatus-avoiding mechanism but reductive

processes such as coalescence[10] can also be found. Concerning the diphthong debates, phonetic diphthongization on tautomorphemic V + i sequence could be thought of.

In any case, discrepancies in phonological and phonetic interpretation of vowel sequences do not concern official Latin scripts for Japanese. In the discussion on Japanese we will use the Hepburn Latin script as this script is proposed for proper names (for details on the official Latin scripts for Japanese see Section 1.2). It should be noted that spelling of vowels sequences is the same for Hepburn and Kunrei Latin script.

With Hepburn romanization[11], all vowel sequences of different vowels are in fact transliterations from the *kana* syllabic orthography, and are treated as heterosyllabic. In other words, each monopthong has its own vowel letter and vowel sequences are represented by the corresponding vowel letter sequences, all being treated as hiatus.[12]

(9) /sa.so.u/   sasou   'to invite'
     /ka.ru.i/   karui   'light (for weight)'
     /ma.e/   mae   'ahead'
     /o.i/   oi   'nephew'
     /o.bo.e.ru/   oboeru   'to remember'
     * The period (.) marks a syllable break.

Therefore, there is no need to distinguish between vowels sequences that occur within or across morpheme boundaries in compounds.

(10) ha + isha   /ha.i.ɕa/   haisha   'out of service vehicle'
      hai + sha   /ha.i.ɕa/   haisha   'dentist'
      * The plus (+) marks a morpheme boundary.

Perhaps a special note should be made for a sequence of vowels of the same quality[13]. Such a sequence is, as any other vowel sequence, generally referred to as hiatus. Except for the /ii/ vowel sequence which is always written with two successive vowel letters because the visual distinction between "i" and "ī" is miniscule, sequences

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[10] A paper on Japanese vowel coalescence in Tokyo Japanese was published by Kubozono (2015).

[11] In the history of romanization, the first established Hepburn system was "traditional Hepburn romanization", which underwent slight changes and was renamed to the "modified" or "standard" Hepburn Latin script.

[12] Not counting sequences of the same vowels, there are twenty vowel combinations possible.

[13] First, there is a dispute whether it can be called a sequence of two vowels or whether it is one long vowel. In this research we will distance from this, and treat them phonologically as two vowels. Second, in some Hepburn variations the same vowel sequence is not indicated, e.g. *Tokyo*. That is common for Japanese words that have been adopted into English and is also the convention used in the *de facto* Hepburn used in signs and other English-language information around Japan, mentioned in the paragraph on legal status (Hadamitzky, 2005). Third, a sequence of the same vowel that spread across morpheme boundary is marked by a prime (') in Kunrei Latin script, e.g. sato'oya 'foster parents'.

of other vowels are written with one vowel letter with a macron in case they appear within a morpheme.[14]

(11) chuui   /tɕu.u.i/   chūi   'attention'
      mizu + umi /mizu.u.mi/   mizuumi 'lake'

Separate attention is usually dedicated to the sequence of two /o/ and /e/ vowels. Besides the regular vowel letter sequence in the *kana* syllabic writing, they also exibit diachronically evoked sound changes from /o/ + /u/ and /e/ + /i/[15] respectively (see Frellesvig (2010) and Labrune (2012) for details). Hepburn Latin script is consistent with /oo/ when tautomorphemic, being 'ō' or 'ou', while for the /ee/ sequence, which is very unstable and with weak dialectal support, 'ei' transliteration is (still?) commonly in use[16].

(12)   /ko.o.ri/   kōri   'ice'
      ko + odori /ko.o.do.ri/   koodori 'dance'
                  /ga.k.ko.o/   gakkō   'school'
      ko + ushi   /ko.u.ɕi/   koushi   'calf'

(13)   /o.ne.e.sa.n/   onēsan   'older sister'
      nure + en   /nu.re.e.n/   nureen   'open veranda'
                  /ke.i.ke.n/   keiken   'experience'
      tame + ike /ta.me.i.ke/   tameike   'pond'

Finally, Japanese contains glides [j] and [w] that always take a pre-vowel position and may either represent an independent consonant or a means for palatalization of the proceeding consonant. In both cases the two glides are written with letters 'y' and 'w' respectively.

(14) /ki.o.ku/   kioku   'memory'
      /kyo.ku/   kyoku   'song'
      /ki.yo.ku/   kiyoku   'cleanly'

4.2   Hiatus and Chinese

In Chinese, vowel sequences may appear within a syllable or across syllable boundary as shown in example (15).

(15) /ai̯/   ai   'love'
      /wai̯/   wai   'outside'
      /wu.ai̯/   wuˈai   'loveless'
      /tɕjau̯.aʊ̯/   jiaoˈao   'pride'

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[14] This distinction was made in the "modified" Hepburn Latin script and is not followed consistently.

[15] Kindaichi (1976) notes that diachronic changes into /oo/ and /ee/ show a time difference, with /o/+/u/ undergoing coalescence before /e/+/i/ did.

[16] In second language teaching material it is usually written as 'ee' though.

As described in Section 3, vowel sequences that cross syllable boundary are called hiatus, whereas those within a syllable are diphthongs.

Toneless Hanyu Pinyin distinguishes 410 syllables with different structure. The target of this research are open syllables which are candidates as V1 in a hiatus structure, and those syllables that begin with a vowel and can represent V2 in the same hiatus structure. Monophthongs and diphthongs are possible in both, V1 and V2 position. Such vowel sequences are marked clearly in Hanyu Pinyin.

When vowels /a/, /ə/, /o/ appear after a syllable break, i.e. at the beginning of syllable, there is an apostrophe before it, unless there are any other visual clues that indicate the break, such as a hyphen or a space.

(16) /tʂʰaʊ̯.ɤ/   chāo'é   'to exceed a quota'
      /pwo.ai̯/   Bo'ai   'Bo'ai county in Jiaozuo, Henan'
      /oṷ.an.xwei̯/   Ōu-Ān-Huì   'Organisation for Security and Co-operation in Europe, OSCE'
      /wo.tɤ.aɚ̯.tsɨ/ wode erzi   'my son'

There are only four possible diphtongs, and they all begin from the position of either /a/ or /o/. The apostrophe rule applies to them as well (i.e. Bo'ai above).

(17) ai   /ai̯/   'love'
      ei   /ei̯/   'hey'[17]
      ao   /aʊ̯/   'proud'
      ou   /oṷ/   'surname Ou'

According to the above, vowel letter sequences in Hanyu Pinyin with no apostrophe (or other visual clues) demonstrate monosyllabic sound sequences. They can be either a diphthong or a glide + vowel sequences.

Diphthongs are vowel sequences that start with a vowel quality of higher sonority and end with a vowel of lower sonority. Examples thereof include:

(18) mai   /mai̯/   'to buy'
      lei   /lei̯/   'tired'
      dao   /taʊ̯/   'to arrive'
      dou   /toṷ/   'beans'

All other vowel sequences within a syllabus are a glide + vowel (GV) sequences. In Standard Chinese, glides are found when high vowels /i/ and /u/, which become realized as [j, ɥ, w], occur before another vowel. Consonant-glide combinations occur before nuclear vowels (Duanmu, 2007, p. 23).

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[17] Diphtong /ei̯/ at the syllable initial position does not appear in any word and is limited to the character 诶, denoting an exclamation *hey*.

(19) l**ie**   /l**je**/   'woodpecker'
      x**ue**   /ɕ**ɥe**/   'to learn'
      h**uo**   /x**wo**/   'fire'
      → In CGV syllables, glides are written with letters 'i' and 'u'.

Glides do not contrast with the corresponding high vowels [i, u, y], and the two sets can be treated as variants of each other. (Qiang, 2016, p. 100)

When GV sequences appear at the syllable initial position, Hanyu Pinyin writes the glides with with letters 'y' and 'w'. Graphically speaking, Hanyu Pinyin visually indicates the hiatus with the presence of a consonant letter. A reader therefore understands the written sequence of letters as belonging to different syllables, as demonstrated in example (21).

(20) **y**e   /**j**e/   'also'
      yue   /**ɥ**e/   'moon'
      wo   /**w**o/   'I'
      → In GV syllables, glides are written with letters 'y', 'yu' and 'w'.

According to the above described details about hiatus in Chinese, the following conclusions can be drawn. All vowel sequences that appear in hiatus are graphically marked in Hanyu Pinyin with punctuation marks, therefore we would expect a Slovene reader to naturally produce hiatus on the right places, without any explicit guidelines. Moreover, in line with the hiatus resolving tendencies in Slovene, we would also expect all other sequences of vowel letters to be pronounced as a diphthong or a glide + vowel.

5   Discussion: predicted and actual reading

Several factors motivated this research. They all concern existing Slovene pronunciation of Japanese or Chinese proper names, which can be surprisingly different from what a scholar on the languages would expect, sometimes with two different pronunciations for the same word. In this respect, we have limited our research to vowel sequences that either form a hiatus or look like a hiatus in their written forms. This section will compare phonologies of the source and the borrowing language, and based on the examples discuss the reasons for a discrepancy in pronunciation.

5.1   Hiatus resolutions involving second vowel

Consider visiting lexicon *Asai Chu*, a famous oil master from Japan, and Chinese female name *Sai Jinhua.* In this case, Slovene reading better approximates Chinese than Japanese reading.

(22) a. As**ai** Chu
          Japanese reading: /sa.i/
          Slovene reading: /sai̯/

      b. S**ai** Jinhua
          Chinese reading: /sai̯/
          Slovene reading: /sai̯/

5.1.1   Japanese

Let us first look at the following sentence that contains visiting words from Japanese.

(23) Slovenski smučarski skakalci odhajajo na poletne priprave na japonski
      Hokkaidō, kjer se jima bosta pridružila japonska kolega, domačina Noriaki Kasai
      in Daiki Itō.

      'Ski jumpers from Slovenia are leaving for their summer camp to Hokkaido,
      Japan. Their colleagues and a locals there, Noriaki Kasai and Daiki Itō will join
      them.'

Pronunciation of the northernmost prefecture and the second largest island in Japan, Hokkaidō, which is sometimes slovenized into 'Hokaido', has two pronunciation variants, first one with a diphthong (like Slovene words 'aids') and second one with a hiatus resolved with an epenthetic /j/ and stress on the third syllable, i.e. vowel /i/ (like Slovene word 'kokain'). The same description for /a/ + /i/ vowel sequence can be applied to the first name Daiki[18] and to all such sequences in a non-final word position. Cases of a /a/ + /i/ vowel sequence with which a word ends, as the family name Kasai in the above example, fail the heterosyllabic realization due to stress accent position rules in Slovene.

The solution with an epenthetic glide is also undesirable otherwise[19] because it forms a syllable with a glide + vowel /i/ that is, according to the Japanese phonotactic rules, impossible in Japanese. In addition, by placing stress onto the vowel /i/ in Slovene makes the word's sound shape much different from the original. In the end, there is another simple solution with a diphthong.

(24) Hokk**ai**dō, Kas**ai**, D**ai**ki
      Japanese pronunciation: /a.i/, [ai̯]
      Slovene pronunciation in use:
      a + i → ai̯ or *a + i (word non-final) → a.i [a.'ji]

Other examples include: Send**ai** (city), D**ai**ki (first name), **Ai**ko (first name), S**ai**tō (family name), etc.

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[18] Also with common nouns 'haiku', 'aikido', 'bonsai' or slovenized 'bonsaj' etc.

[19] Therefore marked with an asterisk in the below description.

Interestingly, this simple rule can be applied to all Japanese vowel sequences with /i/ as the second vowel.

(25)   Diphthongization of Japanese V + i sequence:
   a + i → ai̯   ex. Aichi (prefecture), Saiki (city), Imai (family name), Kaito (first name)
   e + i → ei̯   ex. Shiseidō (company name), Keiyō line (railway line), Ryūhei (first name)
   i + i → ii̯   ex. Niigata (prefecture), Miike (family name), Fujii (family name)
   o + i → oi̯   ex. Oita (city), Aoi (first name)
   u + i → ui̯   ex. Fukui (prefecture), Matsui (family name), Yui (first name)

A note should be made for a rather unusual sequence ii̯, which could be compared to a Slovene pronunciation of spelling 'ij', such as in in 'akvarij' (aquarius) or 'baterijska reja' (battery cage). All other sequence of the same vowels are very often marked unsystematically in the Hepburn Latin script (see section 1.2) but when they are, they may get reduced to a single vowel, or else may undergo epenthesis under the condition that the second of the vowels does not receive stress. Possible outcomes need further investigations.

Diphthongization is a possible solution for a vowel + /u/ sequence in Japanese, besides glide epenthesis. However, due to diachronic sound changes, examples with such a sequence within a phonological word are very rare when we exclude dictionary forms of verbs, which fall out of the scope of visiting lexicon. Most representative is the following sequence.

(26)   i + u → iu̯ or i + u → i.ju   ex. Miu (first name)

Finally, all other vowel sequences in Japanese would keep heterosyllabicity by epenthesis of some kind. Such sequences are not new in Slovene; they appear in loanwords from various languages.

(27)   Jōetsu shinkansen (bullet train line)   /dʒo.e.tsu/
        Maebashi (city)   /ma.e.ba.ʃi/
        Hayao (first name)   /ha.ja.o/

5.1.2   Chinese

There is no difference in the predicted and the actual Slovene reading of the family name *Sai.* As described in Section 4.2, Hanyu Pinyin clearly graphically marks hiatus. All other vowel sequences are monosyllabic. Moreover, because of the hiatus resolving tendencies, we do expect a Slovene speaker to pronounce them correctly.

On the other hand, Slovene speakers pronounce the word *laoma* 'mum' counter to expectations, as a hiatus.

(28) written form: laoma   /laȣ̯.ma/
      expected reading in Slovene: lao.ma   /lau̯.ma/
      actual reading in Slovene: la.o.ma   /la.ˈo.ma/

One might choose either the first or the second vowel for the word stress (aórta, káos), however the preliminary testing group of Slovene speakers uniformly decided to stress the letter "o".

In Chinese, the sonority scale plays a key role in relation to the proper pronunciation. The syllable core is a vowel that is, compared to the surrounding vowels, most sonorous and in writing appears ahead according to the order of the letters a-o-e-i-u-ü. These orthographic guidelines are a reflection of the phonetically grounded sonority scale (Parker 2002, p. 236), which lists the vowels from highest to lowest in the following order:

(29) Sonority scale (more sonorous → less sonorous)
      low (open vowels)   [a]
      mid vowels   [e o]
      high vowels (close vowels)   [i u]
      schwa   [ə]
      glides (semivowels)   [j w]

5.2 Hiatus resolutions involving first vowel

Consider different vowel sequences in the following sentence.

(30) Moja kitajska prijateljica **Mie** se je ravnokar vrnila z Japonske, kjer je dva tedna preživela v prefekturi **Mie**.

'My Chinese friend **Mie** has just returned from Japan, where she spent two weeks in **Mie** prefecture.'

In the above example hints on how to read the two proper names 'Mie' are given (e.g. Chinese friend, Japan), however, without understanding the interrelationships between written and spoken form for each language separately, a Slovene reader will pronounce both as /mi.je/, as in Slovene loanwords 'Vietnam', 'pacient', 'siesta' and others. The pronunciation is thus closer to the proper Japanese reading, and not in line with the Chinese reading /mje/.

Languages employ different hiatus-avoiding mechanisms and the basic difference between Japanese and Chinese is that only the latter language uses glide formation.

5.2.1 Japanese

Previous example shows that Japanese is not fond of changing the first vowel of a hiatus into a glide to make the vowel sequence tautosyllabic. Glide formation does not

happen neither on phonological nor on phonetic level, and this relates to all potential vowel sequences. Instead, epenthesis is applied. What is interesting though is the accent placement because either of the two vowels may carry accent after the hiatus is resolved. The topic calls for further investigation.

(31)   Uemura (family name)   /u.e.mu.ra/
        Mie prefecture   /mi.je/
        Shizuoka prefecture   /ʃi.zu.o.ka/
        Noriaki (first name)   /no.ri.ja.ki/

5.2.2   Chinese

In Hanyu Pinyin, sequences of vowel letters within a syllable that are not diphthongs are GV sequences. According to the sonority principle, family name *Mie* from example (30) above is pronounced as /mje/. However, the written form i+e leads a Slovene reader to hiatus.

An interesting "wrong" choice also appears in the proper name *Huawei*. The GV sequence in the syllable *hua* /xwa/ is for a Slovene speaker understood as hiatus.

(32)   written form: huawei   /xwa.wei̯/
        expected reading in Slovene: hua.wei   /xwa.wei̯/
        actual reading in Slovene: hu.a.wei   /ˈxu.a.wei̯/

Mass media with its frequent advertising can often be the source of a mispronunciation, as in the case of brand name Huawei. The speakers follow the pattern that appears in Slovene word *aktualen*, rather than *donhuan*. GV sequences are not foreign to Slovene language, therefore the discrepancy between predicted and actual reading should be overcome easily with suitable pronunciation guidelines.

6   Conclusion

Languages of the world differ in the way and in the extent at which their writing systems reflect actual spoken forms; they generally insert all the information they presume would well reflects relevant information. In this respect, Latin scripts of the languages that otherwise use (at least primarily) other writing systems may be more imprecise. Vowel letter sequences in Japanese and Chinese are yet another such example.

This research focused on vowel sequences in Japanese and Chinese and examined their representation in the Japanese and Chinese official Latin scripts. It placed special attention to the appearance of vowel hiatus in the two languages, on vowel letter sequences that suggest vowel hiatus, and on how each language treats the cases. As Slovene tends to avoid vowel hiatus, the research reviewed hiatus-avoiding mechanisms in Slovene, and discussed the reasons for deviances in the pronunciation

of a visiting lexicon. In the end, the research offered some guidelines on the pronunciation on vowel sequences in words of a visiting lexicon from Japanese and Chinese.

In Japanese, all vowel sequences phonologically function in hiatus, with each monophthong vowel functioning as a syllable core. Hepburn Latin script is consistent with this in case of two different vowels. Entering Slovene as a visiting lexicon, such vowel letter sequences will certainly undergo hiatus-avoiding changes. It is suggested that they follow basic tendencies in the source language that can be summarized as follows.

a) Diphthongization for V + /i/ → Vi̯, V + u → Vu̯
b) Epenthesis for all the other vowel sequences

Phonetic reduction into one syllable is already observed in Japanese but is limited to the second of the two vowels under the condition that it is either of the two high vowels, e. g. /i/ or /u/. Hiatus resolution that would make a glide + vowel combination is thus not possible because Japanese already has such a sequence. Any other vowel sequence is advised to keep its heterosyllabic property, cf. with an epenthesis of some kind. This kind of solution does not sound strange in Slovene, and could also be applied to the sequences of two equal vowels.

Quite on the contrary, Chinese favors monosyllabic vowel sequences based on the sonority principle. Sonority scale is also incorporated into the Hanyu Pinyin script in the sense that pre-vowel glides /j/ and /w/ are represented by letters 'i' and 'u' respectively in the CGV combinations, which may wrongly lead to the idea of a hiatus. On the other hand, the difference between diphthongs and vowel hiatus in a script is stated clearly. Vowel sequences in Chinese can thus be summarized as follows.

a) Monosyllabic vowel sequences: diphthong, glide + vowel (/j, w/ + V)
b) Heterosyllabic vowel sequences: hiatus (graphically marked)

Except for the glide + vowel sequence, which in Hanyu Pinyin falsly gives an impression of a hiatus, there is not much to be careful about hiatus vowel sequences in Chinese. There are some other discrepancies between the written and spoken form of Hanyu Pinyin, which may cause additional disputes in relation to the visiting lexicon in Slovene. For example, in the notation consonant + ui, e.g. *gui,* the vowel sequence of this syllable is phonologically /uei/, not */ui/. As we can see, the main vowel /e/ is left out in standard orthography (Třísková, 2011, p. 99).[20]

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[20] Note, however, that some Latin scripts are similar in this respect. The same sequence 'ui' is pronounced differently in French words *acquiers* [akjɛʀ], *huit* [ˈɥi(t)], *taquin* [takɛ̃], etc. Not being able to produce "proper reading" of foreign words should not be the main argument for slovenization of any Latin script.

Whether a diphthong, a glide before a vowel, or a hiatus, the decision for a metrical organization in Slovene influences word stress placement, and consequently conjugation and declination forms of the visiting lexicon. This calls for a similar investigation on Japanese and Chinese consonants, and the overall examination before final recommendations about the "proper" pronunciation of Japanese and Chinese visiting lexicon are offered.

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THE CHINESE NOTIONAL PASSIVE CONSTRUCTION UNDER THE VIEW OF COGNITIVE CONSTRUCTION GRAMMAR

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Abstract

The notional passive construction (NPC, henceforth) is claimed to be the most common form of passive and the earliest mode of passive expression in Chinese. However, under the view of cognitive construction grammar, NPC remains a mystery with its form not clearly defined and its function not particularly discussed. Taking a character-based historical approach, this paper studies the form designated by NPC, that is the 'theme + verbal phrase' structure on corpus data. Results show that the 'theme + verbal phrase' structure has been extremely stable in the history of the Chinese language, denoting change of state. In conjunction with some cross-linguistic findings, a change-of-state construction can thereby be proposed for the form 'theme + verbal phrase'. Accordingly, the idea of the so-called "notional passive construction" is challenged in the way that it essentially refers to a special situation of the change-of-state construction when the event expressed by the verbal phrase is not likely to occur spontaneously- it is not a construction itself, yet plausibly passive.

Keywords: Chinese; the notional passive construction; change of state; cognitive construction grammar

Povzetek

Namišljena oblika trpnika (*notional passive construction*, NPC) je poznana kot najpojavnejša oblika trpnika in tudi kot najzgodnejši način izražanja trpnika v kitajščini. Ne glede na to pa v kognitivni konstrukcijski slovnici ostaja pod velikim vprašajem, saj je njena struktura nejasna in njena vloga slabo raziskana. Članek s pomočjo korpusa obravnava namišljeno obliko trpnika, tj. strukturo tema + glagolska fraza in sicer po tradicionalni metodi, ki postavlja znak kot osnovo. Rezultati raziskave kažejo, da je bila omenjena slovnična struktura v kitajskem jeziku vedno zelo stabilna ter da izraža spremembo stanja. V navezavi na že obstoječe raziskave o drugih jezikih tako predlagamo ustreznik strukturi tema + glagolska fraza ustreza ideji spremembe stanja. S tem se porajajo pomisleki o obstoju namišljene oblike trpnika, saj se le-ta povečini nanaša na posebne primere sprememb stanja, ko pojavnost dejanja, izraženega z glagolsko frazo, ni spontana. Ravno zato je težko reči, da je to oblika trpnika, čeprav to najverjetneje je.

Ključne besede: kitajščina; fiktivni trpnik; sprememba stanja; kognitivna konstrukcijska slovnica

1   Introduction

In Chinese, the commonly recognized passive markers include 被 *bei*, 叫 *jiao*, and 让 *rang*. It has also been noticed that unlike English, where most transitive active clauses can be turned into a passive form (Wang, 1958/2004), in Mandarin Chinese the 被 *bei*/ 叫 *jiao*/让 *rang* passive is not a productive construction, as it is only available with certain verbs and in limited environments. Keenan (1985) pointed out that Mandarin Chinese is relatively low on the scale of productivity of marked passive, although it is not at the bottom, as there are languages (e.g., Chadic languages and many languages in New Guinea) do not allow passive at all.

McEnery & Xiao (2010, p. 85) studied a parallel corpus composed of 250,000 English words and over 400,000 Chinese words, and found that only about 20% of *be* passives are translated into Chinese using syntactically marked passive constructions, with the majority being translated using so-called notional passives, subjectless sentences, sentences with vague subjects (e.g., 有人 *youren* 'someone', 人们 *renmen* 'people', 大家 *dajia* 'all'), and special sentences (e.g., the disposal 把 *ba* construction and the predicative 是…的 *shi … de* structure). Researchers have also noticed some cases where English passive sentences definitely cannot be translated into the 被 *bei* construction. For example:

(1)   a. * 你   的   信   已经   被   收到了。
         * Ni   de   xin   yijing   bei shou-dao-le.
           2   DE   letter   already BEI receive-LE

      b.   你   的   信   已经   收到了。
           Ni   de   xin   yijing   shou-dao-le.
           2   DE   letter   already receive- LE
           'Your letter has already been received.'

                                          (from Cheung, Liu, & Shih, 1994, p. 494)

(2)   a. * 饭   被   烧好了。
         * Fan   bei shao-hao-le.
           meal BEI cook-ready-LE

      b.   饭   烧好了。
           Fan   shao-hao-le.
           meal cook-ready-LE
           'The meal is ready.'   (from Zhou & Jin, 2004, p. 61)

Researchers claim that the notional passive construction (NPC, henceforth, sometimes also referred to as the unmarked passive construction or the pseudo-passive construction) as shown in (1b) and (2b) is "the most common form of passive in Chinese" (Yip & Don, 2004, p. 210) and the earliest mode of passive expression in Chinese (Wang, 1957, 1958/2004, p. 418).

Despite the literature discussing the constraints of NPC (e.g., C. Wang, 1998; Z. Wang, 2004) and the derivation of it (e.g., Cheng & Huang, 1994; Li, 1994; Li & Thompson, 1981, p. 85; Ting, 2006), NPC is yet to be clearly defined in language use, especially regarding its distinction from the so-called inchoative/unaccusative/ergative/anticausative structure. Among the following examples, it is still open to question whether they can be treated as NPC.

(3)   物　以　类　　聚。
　　　Wu　yi　lei　　ju.
　　　thing　by　category　accumulate
　　　'Things accumulate by category.'

(4)   电影　　完了。
　　　Dianying　wan-le.
　　　movie　　finish-LE
　　　'The movie finished.'

(5)   门　开了。
　　　Men　kai-le.
　　　door　open-LE
　　　'The door opened./ The door is open.'

(6)   蛋糕　　吃了。
　　　Dangao　chi-le.
　　　cake　　eat-LE
　　　'The cake is eaten.'

The confusion regarding the definition of NPC motivated this study.

2   Framework and Methodologies

2.1   Cognitive construction grammar and its basic tenets

Set within the framework of cognitive construction grammar (Goldberg, 1995, 2003, 2006; Langacker, 2008), this study assumes that language is usage-based, and grammatical constructions are the fundamental building blocks of language. In this view, all levels of grammatical analysis involve constructions: learned pairings of form with semantic or discourse function, including morphemes or words, idioms, partially filled and fully lexical patterns (Boas, 2013). The architecture of a construction, coupling a particular form with a specific (conventional) meaning, is illustrated as follows:
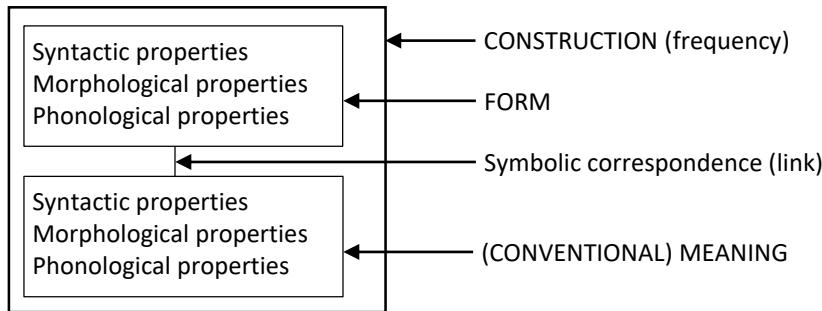
Figure 1: The symbolic structure of a construction (Croft, 2001, p.18)

According to Goldberg (1995, p. 4, 2003, 2006, p. 6), whenever some aspects of a form-function pair is not fully predictable from its components or from other previously established constructions, it may become necessary to propose another construction. Correspondingly, a "what you see is what you get" approach to syntactic form is adopted, which means no underlying levels of syntax or any phonologically empty elements are posited.

In addition, cognitive construction grammar attaches special importance to the relationship between human language and cognition, as Tyler (2012, p. 28) puts it, "language is best understood as a reflection of humans' multiple, dynamic, interacting cognitive processes and cognitive structures". Assuming that language describes our experiences of the world, linguistic constructions (corresponding to basic sentence types) encode as their prototypical senses event types that are basic to human experience – those of something moving, something being in a state, someone causing a change of possession, something undergoing a change of state or location, something having an effect on someone, *etc*. (cf. Croft, 2001, 2012; Ellis et al., 2015; Goldberg, 1995; Levin, 1993). Such events are conceptualized by human mind, and experimentally grounded gestalts are thus formed, which further constitute the conceptual schemas of linguistic constructions.

In sharp contrast to formal linguistics, cognitive construction grammar maintains that language is usage-based instead of rule-generated: We learn linguistic constructions while engaging in communication (Bybee, 2010), and contextualized exposure to input and frequency has an effect on language learning, processing, and novel use of language (Langacker, 1988; Bybee, 2012). Therefore, this study will not rely on discrete examples (which is typically the approach adopted by previous studies) to talk about NPC. Instead, a bottom-up corpus-based approach will be employed. Discussion will be built upon statistical analysis of corpus data.

To my knowledge, with the hierarchical structures of syntax abandoned, NPC remains a mystery under the view of cognitive construction grammar, with its form not

clearly defined in language use and its function not particularly discussed albeit assumed as "passive".

2.2   Methodologies

Although a distinct construction is defined to exist as long as some of its form or function is not strictly predictable from its components, this does not necessarily mean that functions of different levels of constructions are mutually independent of each other. Constructionists note that at least verb meanings interact with abstract argument structure constructions in non-trivial ways (cf. Goldberg, 2003). For example, there are always some verbs closely associated to a particular construction (e.g., *give* is highly indicative of the ditransitive construction, whereas *leave*, although it can form a ditransitive, occurs in other constructions more frequently) (Ellis et al., 2015). The proportion of tokens of total verb usage that appear in this particular construction is called "faithfulness" (e.g., the faithfulness of *give* to the ditransitive is approximately 0.40; that of *leave* is 0.01), and is taken as one measure of verb-construction contingency (Ellis et al., 2011). It has been shown that semantically prototypic verbs are "pathbreakers" in that they seed the growth of verb-argument constructions (cf. Goldberg et al., 2004; Ninio, 1999), and they also appear to be the most faithful to those constructions in corpus data (e.g., Ellis & Cadierno, 2009; Ellis et al., 2014). In light of these theories, this paper approaches NPC by investigating the semantic prototypes of the verbs therein, and quantifying the verb-construction contingency through faithfulness.

In an attempt to apply cognitive construction grammar to the study of Chinese, a character-based diachronic approach is employed. Despite the fact that synchronic analysis had become the mainstream of linguistics ever since Saussure's *Course in General Linguistics* (1916/1959, pp. 25-26), the importance of diachronic study is reestablished by cognitive construction with the assumption that structures emerge from use (cf. Langacker, 1987). Applied to Chinese, the diachronic approach essentially has to be accompanied by the character-based approach because Chinese has been documented in characters and there is technically no way to know for sure how characters are pronounced in a particular period of time. For example, some historical linguists posit phonetic contrast of verbs in Old Chinese when used transitively versus intransitively (e.g., Mei, 1991; Yu, 1984). However, with no systematic rules but only a conjecture drawn on a very limited number of discrete examples, this paper will stick to the characters without considering the possibility of phonetic contrast.

Applying the character-based diachronic approach to corpus, a problem arises as to how to identify NPC since it is not marked and its form is not clearly defined. In this paper, all possible tokens of NPC, which take the form of 'theme + verbal', will be analyzed in the initial step. To make sure there is a corresponding 'active' construction to the passive construction, the verbals in the collected tokens must be used

transitively at least once in that historical period. The 'theme + verbal' structures, with the transitive use of the verbal confirmed in corpus, will be referred to as TVS thereafter, to distinguish from NPC.

Analysis starts with a relatively small corpus comprising of some literary works with the intention of exhaustively finding all tokens of TVS, and verbs that frequently occur in TVS can thereby be singled out, with the semantic prototypes instantiated by them further identified. Literary works selected to form the small corpus of each historical period are shown below:

Table 1: Literary works selected for small corpora of different historical periods

Historical period	Selected literal works	Character Count
The pre-Qin period (Old Chinese)	《孟子》 '*Mencius*'	38,125
The Tang dynasty (Middle Chinese)	Ten *Chuanqi* stories (i.e. 《任氏传》 '*The Story of Ren*', 《南柯太守传》 '*The Story of the Governor of Nanke*', 《李娃传》 '*The Story of Li Wa*', 《枕中记》 '*Record within a Pillow*', 《柳毅传》 '*The Story of Liu Yi*', 《柳氏传》 '*The Story of Liu*', 《聂隐娘传》 '*The Story of Nie Yinniang*', 《莺莺传》 '*The Story of Yingying*', 《虬髯客传》 '*The Legend of the Curly-whiskered Guest*', and 《霍小玉传》 '*The Story of Huo Xiaoyu*')	31,614
The Ming dynasty (Early Mandarin)	Four *Sanyan* stories (i.e. 《蒋兴哥重会珍珠衫》 '*Jiang Xingge Reencounters His Pearl Shirt*', 《杜十娘怒沉百宝箱》 '*Du Shiniang Sinks Her Jewel Box in Anger*', 《卖油郎独占花魁》 '*The Oil-Peddler Wins the Queen of Flowers*', and 《施润泽滩阙遇友》 '*Shi Fu Encounters a Friend at Tanque*')	69,139
Modern Mandarin	Wang Shuo's novel 《过把瘾就死》 '*Die Satisfied*'	59,212

Then, a few target verbs are picked that are diverse and relatively stable in verbal semantics, not too polysemous and do not have homonyms. The faithfulness of the selected target verbs to TVS in all available texts of that historical period are quantified. The corpus I am using is Cncorpus (语料库在线 *Yuliaoku Zaixian*), administered by the State Language Work Committee of P. R. China (国家语言文字工作委员会 *Guojia Yuyan Wenzi Gongzuo Weiyuanhui*).

3   Semantic Prototypes of the Predicates in TVS

3.1   TVS in Old Chinese

According to Wang (1958/2004, p. 35), features of Old Chinese include: (1) scarce copular use in judging sentences; (2) pronominal objects in questions and negative sentences placed before the verb. As a deterministic distinction from Middle Chinese, the 被 *bei* construction, the particle 了 *le* and 着 *zhe* have not been fully grammaticalized in Old Chinese. In Old Chinese, about 80% of words are monosyllabic (Baxter & Sagart, 1998).

With special sentence patterns (e.g., questions/negative sentences with pronominal objects, structures containing 可 *ke* 'can'/足 *zu* 'suffice'/难 *nan* 'be difficult to', etc.) excluded, for Old Chinese, 37 tokens of TVS are collected from *Mencius*, and the subjects are inanimate in 20 of them (54.05%). 29 of the tokens are positive sentences, seven negative sentences, and one question. The type frequencies of the verbs in these 37 tokens are aggregately shown in Table 2.

Table 2: Type frequencies of the verbs in TVS in Mencius

Verb	Meaning	Frequency	Verb	Meaning	Frequency
举	raise	5	亡	die	1
见	appear/see	3	备	prepare	1
闻	hear	3	弑	slay (the King)	1
卒	die	3	聚	accumulate	1
行	implement	2	蔽	cover	1
听	listen	2	助	help	1
定	pacify	2	驾	harness	1
辟	avoid	2	削	cut down	1
用	use	1	税	tax	1
成	complete	1	溢	overflow	1
食	eat	1	絜	(used as 洁) clean	1
治	govern	1	Total		37

Note. All the meanings for verbs displayed in this table are the meanings in the contexts of the collected tokens, same below.

Some TVS tokens of Old Chinese are as follows, with the verbs bolded:

(7) 牲   杀、   器皿、 衣服   不   **备，**   不   敢   以 祭。
     Sheng   sha   qi min   yifu   bu   **bei**   bu   gan   yi   ji.
     victims for slaughter vessel garment NEG prepare NEG dare to sacrifice
     'The victims for slaughter, the vessels, and the garments, not being all complete, he does not presume to sacrifice.'

(8) 耳　目　之　官　不　思，　而　**蔽**　于　物。
Er　mu　zhi　guan　bu　si,　er　**bi**　yu　wu.
ear　eye　ZHI　rgan　NEG　think　CONJ　cover　by　thing
'The organs of ears and eyes do not think but covered by things.'

(9) 谏　　**行**　　言　　**听**,　膏泽　下　　于　民。
Jian　　**xing**　　yan　　**ting**,　gao ze　xia　　yu　min.
admonishment　implement　suggestion　listen　benefit　down　to　people
'If admonishments can be implemented and suggestions can be listened to, the benefit will be able to go down to people.'

Besides, adverbs indicating perfective are observed from three tokens:

(10) 牺牲　既　**成,**　　粢　　盛　　既　　**絜。**
Xi sheng　ji　**cheng**　zi　　cheng　　ji　　**jie.**
sacrifice　already　complete　rice grains　(in the vessel)　already　clean
'The sacrifice is ready. The rice and the grains have already been cleaned in the vessel.'

(11) 今　　乘　　舆　　已　　**驾**　　矣。
Jin　cheng　yu　　yi　　**jia**　yi.
now　horse　carriage　already　harness　SFP
'The horse and carriage have already been harnessed (are ready now).'

3.2　TVS in Middle Chinese

The following characteristics distinguish Middle Chinese from Old Chinese (Wang, 1958/2004, p. 35): (1) mandatory copulars in judging sentences; (2) the emergence of the disposal structure; (3) frequent use of the 被 *bei* construction; (4) the emergence of the aspect particles 了 *le* and 着 *zhe*.

When it comes to the corpus analysis, 214 tokens of TVS, formed by 114 verbs, are collected from ten *Chuanqi* stories, with special sentence patterns excluded. Among 214 tokens, themes are inanimate in 135 tokens (63.08%), animate in 79 tokens (36.92%). Positive sentences account for 154 tokens (71.96%), 52 are negative sentences (24.30%), and the rest are questions or double negative sentences. 41 verbs occur more than once in the collected tokens. Their frequencies are listed in Table 3.

Table 3: Type frequencies of the verbs in TVS in Chuanqi stories

Verb	Meaning	Frequency	Verb	Meaning	Frequency
断	cut off	5	爱	love	3
讫	complete	4	生	appear	3
举	raise	3	立	establish	3
发	let off	3	终	complete	3
授	confer	3	聚	accumulate	3
毕	finish	3	解	untie	3

Verb	Meaning	Frequency		Verb	Meaning	Frequency
转	transfer	3		得	get	2
迁	move	3		忘	forget	2
通	dredge	3		持	hold	2
闻	hear	3		攀	draw	2
下	down	2		数	count	2
买	buy	2		激	surge	2
以	use	2		税	rent, buy	2
保	protect	2		给	give	2
动	break out	2		绝	cut off	2
化	turn; change	2		署	dispose	2
合	unite	2		胜	can bear	2
定	pacify	2		谪	exile	2
尽	finish	2		载	record	2
居	live	2		销	melt	2
彰	cite	2		**Total**		**101**

Some TVS tokens of Middle Chinese are as follows, with the verbs bolded:

(12) 幽　　会　　未　**终**，　惊　　　魂　　已　　**断**。
　　You　hui　wei　**zhong**, jing　　hun　yi　**duan**.
　　secret meeting not finish　frightened spirit already　cut off
　　'Even before the secret meeting (with my lover) finishes, my frightened feeling
　　has already been cut off.'

　　　　　　　　　　　　　　　　　　　　　　　　　　　　(《莺莺传》)

(13) 信　　问　　　不　　**绝**。
　　Xin　wen　　bu　**jue**.
　　letter greeting NEG finish
　　'Letters and greetings never end.'

　　　　　　　　　　　　　　　　　　　　　　　　　　　　(《南柯太守传》)

(14) 男　女　　之　际，　　大　欲　　**存**　焉。
　　Nan　nü　zhi　ji,　　da　yu　**cun**　yan.
　　man　woman ZHI between big passion exist SFP
　　'There is strong passion between men and women.'

　　　　　　　　　　　　　　　　　　　　　　　　　　　　(《李娃传》)

(15) 有　一　仙人，　　**谪**　在　下界。
　　You　yi　xianren,　**zhe**　zai　xiajie.
　　TOP　one immortal　exile at　the world of man
　　'There is an immortal exiled at the world of man.'

　　　　　　　　　　　　　　　　　　　　　　　　　　　　(《霍小玉传》)

In parallel with the continuous disyllabification of the Chinese language, disyllabic elements began to be found in the verb position, including 流连 *liulian* 'linger', 温习 *wenxi* 'review' and 罗列 *luolie* 'arrange for show'. In addition, 已 *Yi* 'already', an adverb indicating perfective, occurs before the verb in six tokens.

3.3   TVS in Early Mandarin

Early Mandarin is primarily defined by phonetic features such as the disappearance of the entering tone (入声 *rusheng*), and disappearance of the three-way contrast between voiceless unaspirated, voiceless aspirated and voiced consonants of the initial stops and affricates (Wang, 1958/2004, p. 35). In terms of vocabulary and grammar, Early Mandarin inherited and promoted the traits developed by Middle Chinese. More disyllabic words are observed, and the disposal structure, the 被 *bei* construction, and the particles 了 *le* and 着 *zhe* become more commonly used.

With special sentence patterns (e.g., questions/negative sentences with pronominal objects, the 被 *bei* construction, *etc*.) excluded, 618 tokens of TVS are collected from four *Sanyan* stories. Compound verbals[1] occur in 292 tokens. As for those TVS tokens structured around monosyllabic verbs, inanimate themes occur in 254 tokens (77.91%), and 238 tokens (73.00%) are positive sentences. 171 monosyllabic verbs are seen in these tokens, with 57 of them occurring in more than one token, as presented in Table 4.

Table 4: Type frequencies of monosyllabic verbs in TVS in Sanyan stories

Verb	Meaning	Frequency	Verb	Meaning	Frequency
成	accomplish	10	开	open	5
来	come	10	有	have	5
落	fall	10	动	touch	4
去	go	10	合	converge	4
罢	finish	9	生	subsist	4
绝	cut off	9	会	meet; know	3
尽	finish	7	报	recompense	3
毕	finish	7	备	prepare	3
说	say	6	出	go out	3
吃	eat; drink	5	断	cut off	3
发	let off	5	集	gather	3
见	see	5	了	end	3
接	pick up	5	起	start	3

---

[1] The term 'compound verbal' is used in this paper to refer to both compound verbs and verb compounds. Because language is assumed to be usage-based, there is no clear-cut border between syntactic patterns and words. The difference between compound verbs and verb compounds is understood to lie mainly in frequency.

Verb	Meaning	Frequency	Verb	Meaning	Frequency
失	lose	3	明	light	2
要	want	3	暖	warm	2
止	stop	3	认	recognize	2
至	arrive	3	舍	abandon	2
坐	sit	3	同	same	2
与	give	3	忘	forget	2
过	pass	2	下	fall	2
从	follow	2	想	think	2
闭	close	2	醒	awake	2
荡	swing	2	虚	empty	2
到	arrive	2	许	approve	2
定	pacify	2	愈	recover	2
飞	fly	2	葬	bury	2
空	empty	2	沾	touch (water)	2
卖	sell	2	醉	drunk	2
迷	infatuate	2	Total		212

TVS tokens of Early Mandarin structured around monosyllabic verbs are exemplified below:

(16)　一　　块　　鳖鱼　　　　　　落　地。
Yi　　kuai　bieyu　　　　　**luo**　di.
one　piece　soft-shelled turtle　fall　ground
'A piece of soft-shelled turtle fell onto the ground.'

(《卖油郎独占花魁》)

(17)　十四岁　　　谓　之 开花，　　此时　　天癸　　　　　已　　**至**。
Shisi sui　　wei zhi kai hua,　ci shi　　tiangui　　　yi　　**zhi**.
14 years' old　call　3　open flower　this time　Tiangui (period)　already　arrive
'Fourteen is called bloom. Period has already arrived at this time.'

(《卖油郎独占花魁》)

(18)　滩阙　　巧　　　　逢　恩　义　　　　　报。
Tanque　qiao　　　feng　en　yi　　　　**bao**.
Tanque　coincidentally　meet　favor　friendly feelings　recompense
'All favor and friendly feelings were recompensed in the coincident meeting at
Tanque.'　　　　　　　　　　　　　　　　　(《施润泽滩阙遇友》)

In terms of the 292 tokens with compound verbals as the predicates, if we represent the structure of the predicates as 'XY', the elements in the X position are various in verbal semantics, and the most frequent elements in the Y positon include 得 *de* 'get' (seen in ten tokens), 来 *lai* 'come' (nine tokens), 成 *cheng* 'accomplish' (eight tokens), 去 *qu* 'go'

(eight tokens), 下 *xia* 'go down' (eight tokens), 出 *chu* 'exit' (seven tokens), 尽 *jin* 'finish' (five tokens) and 完 *wan* 'finish' (four tokens). Examples are as follows:

(19) 那边　　还　放下　　许多　客　　　账，　　不　　曾　　**取得**。
　　　Na bian hai   fang-xia xuduo ke   zhang   bu   ceng   **qu-de**.
　　　that side still put-down many   customer account NEG yet   get-get
　　　'There are still many customer account loans there that have not been paid back.'

　　　　　　　　　　　　　　　　　　　　　　　　　　　　（《施润泽滩阙遇友》）

(20) 方才　　箱子　　可　暂　　　**发来**。
　　　Fangcai xiangzi ke   zan   **fa-lai**.
　　　just now suitcase can for now send-come
　　　'The suitcase that you saw before can be sent here for now.'

　　　　　　　　　　　　　　　　　　　　　　　　　　　（《杜十娘怒称百宝箱》）

(21) 美娘　　十二岁　到　　王家，　　　锦绣　　中　　**养成**。
　　　Meiniang shi'er sui dao   Wang jia,   jinxiu   - zhong **yang-cheng**.
　　　Meiniang 12 years get to House Wang, brocade -in   cultivate-accomplish
　　　'Meiniang came to the House of Wang at the at the age of 12, and was raised up in beautiful brocade.'　　　　　　　　　　　　　　　（《卖油郎独占花魁》）

The verbals co-occur with 了 *le*, 过 *guo,* or 已 *yi* in 70 tokens, expressing a perfective aspect, as in the following examples:

(22) 当下　　三　杯　两　盏，　吃了　一　回。
　　　Dangxia san bei liang zhan, chi-le yi   hui.
　　　that point three cup two cup   eat-LE one time
　　　'At that point, (they) drank some cups of wine.'

　　　　　　　　　　　　　　　　　　　　　　　　　　　　（《施润泽滩阙遇友》）

(23) 身边　　藏下　些　散碎　　银两，　都　用尽了。
　　　Shenbian cang-xia xie sansui   yinliang, dou yong-jin-le.
　　　by one's side save   some piecemeal money   all   use-finish-LE
　　　'As for the piecemeal money that have been saved by his side, it is all used up.'

　　　　　　　　　　　　　　　　　　　　　　　　　　　　（《卖油郎独占花魁》）

3.4   TVS in Modern Mandarin

With the continuous process of disyllabification, the proportion of disyllabic words is reported to be 62.79% and 75.18% in *Modern Chinese Dictionary* (《现代汉语词典》) and *Chinese New Word Dictionary* (《汉语新词词典》) respectively (cf. Xu, 1997). In terms of the grammar of Modern Mandarin, because of the self-conscious Europeanization of scholars, Modern Mandarin internalized some Indo-European grammatical features (Wang, 1958/2004, p. 35), instantiated by the systematic use of subjects, pronouns and copulas, the increased length of Chinese sentences, especially

in the modifiers, the expansion of the function of BEIC, the Europeanization of coordination strategy of nouns, the emergence of indefinite articles, and so forth.

In my corpus analysis, a sample of 614 tokens of TVS was collected from Wang Shuo's novel *Die Satisfied* (《过把瘾就死》). 237 tokens (38.60%) therein start with animate themes, and 377 (61.40%) with inanimate ones. Positive sentences account for 76.22% of the total (468 tokens), with the remainder comprising negative sentences (118 tokens/ 19.22%), double-negative sentences (2 tokens/0.33%), and questions (26 tokens/4.23%). In terms of the verbals in the collected tokens, 260 (42.35%) are monosyllabic; 308 (50.16%) are compound verbals; and 46 (7.49%) are other verbal structures such as VP, V+PP, V+VP and V+得 *de* + descriptive complement.

Focusing on the monosyllabic verbs in TVS, 37 of them occur in more than one token. Their type frequencies in TVS are presented in Table 5.

Table 5: Type frequencies of monosyllabic verbs in TVS in Die Satisfied

Verb	Meaning	Frequency	Verb	Meaning	Frequency
去	go	22	吃	eat	2
来	come	21	出	exist	2
说	say	15	倒	collapse	2
醒	wake up	7	到	arrive	2
开	open	6	掉	fall	2
变	change	5	烦	annoy	2
有	have	5	放	put	2
动	move	4	甘	reconcile	2
回	return	4	换	change	2
滚	roll	3	活	live	2
红	red	3	尽	finish	2
见	see	3	忍	endure	2
流	flow	3	如	be like	2
扭	twist	3	算	count	2
起	rise	3	锁	lock	2
散	disperse	3	提	bring up	2
退	retreat	3	停	stop	2
要	want	3	粘	stick to	2
做	do	3	Total		212

TVS tokens of Modern Mandarin structured around monosyllabic verbs are exemplified below:

(24) 我   屁股   纹丝   不   **动**。
     Wo   pigu   wensi   bu   **dong**.
     1   butt   bit   NEG   move
     'My butt did not move a little bit.'

(25) 我   腰   **扭**了。
      Wo   yao   **niu**-le.
      1   waist   twist-LE
      'I twisted my waist.'

(26) 我   **吓**了   一跳。
      Wo **xia**-le   yi-tiao.
      1   frighten-LE   one-jump
      'I was so frightened that I jumped up.'

With regard to the compound verbals seen in TVS tokens, again if represented as "XY" structures, the most frequent elements in the Y slot include 来 *lai* 'come' (in 40 tokens), 去 *qu* 'go' (18 tokens), 出 *chu* 'go out' (seven tokens), 过 *guo* 'pass' (six tokens), 入 *ru* 'enter' (five tokens), 开 *kai* 'open; turn on' (five tokens), 完 *wan* 'finish' (four tokens) and 生 *sheng* 'grow; accrue' (three tokens). Examples are as follows:

(27) 她   的   眼泪   刷   地   **下来**了。
      Ta   de   yanlei   shua   de **xia-lai**-le.
      3Fem   DE   tears   'shua' (the sound of tears)   DE   go down-come-LE
      'Her tears suddenly fell.'

(28) 青春期   穿着   军装   **度过**。
      Qingchunqi   chuan-zhe   junzhuang   **du-guo**.
      puberty   wear-ZHE   military uniform   spend-pass
      '(His) puberty was spent wearing military uniforms.'

(29) 他   的   手   也   无   力   地   **松开**。
      Ta   de   shou   ye   wu   li   de   **song-kai**.
      3Masc DE   hand   also no   power   DE   loose-open
      'His hands were loosened powerlessly.'

In addition, complex verbal structures such as VP, V+PP, and V+VP are also seen in TVS, among which 'V + 得 *de* + descriptive complement' displays a considerable type frequency (seen in 19 tokens), for example:

(30) 我   的   伤口   **愈合**   得   不错。
      Wo   de   shangkou   **yuhe**   de   bucuo.
      1   DE   wound   heal   DE   not bad
      'My wound heals very well.'

(31) 事情   **办**   得   非常   顺利。
      Shiqing   **ban**   de   feichang   shunli.
      matter   deal with   DE   very   smoothly
      'The matter is dealt with so well that it runs smoothly.'

3.5   Summary

It can be noticed that TVS is extremely ancient and stable in Chinese. Besides our data, the earliest example can actually date back to oracle bone scripts:

(32) 辛丑   卜，…   黍   登。
     Xinchou   bu   shu   **zheng**
     (day) Xinchou divine   millet   steam
     'Day Xinchou's divine said that millet should be steamed …'

(《殷虚文字缀合》62)

The verbal semantics of the monosyllabic verbs in TVS is also very consistent. On the presented monosyllabic verb lists of different historical periods (i.e. Table 2, Table 3, Table 4 and Table 5), some verbs occur on more than one list, such as 定 *ding* 'pacify' (three lists), 动 *dong* 'break out/move' (three lists), 举 *ju* 'raise' (two lists), 成 *cheng* 'complete' (two lists), 备 *bei* 'prepare; ready' (two lists), 聚 *ju* 'accumulate' (two lists), 断 *duan* 'cut off' (two lists), 绝 *jue* 'cut off' (two lists), 毕 *bi* 'finish/end' (two lists), 发 *fa* 'let off' (two lists), 下 *xia* 'down' (two lists), 合 *he* 'converge/unite' (two lists), 起 *qi* 'rise/ start' (two lists) and 开 *kai* 'open' (two lists). There are also some concepts instantiated by multiple synonyms on the lists across different historical periods, i.e., 讫 *qi*, 毕 *bi*, 终 *zhong*, 成 *cheng*, 罢 *ba*, 尽 *jin* and 了 *liao* for 'finish/complete/end'; 断 *duan* and 绝 *jue* for 'cut off'; 变 *bian* and 化 *hua* for 'change'; 落 *luo* and 下 *xia* for 'fall'; 见 *xian* and 生 *sheng* for 'appear'; 聚 *ju* and 集 *ji* for 'gather/accumulate'; 空 *kong* and 虚 *xu* for 'empty'. Antonyms are also seen, such as 聚 *ju*/集 *ji* 'gather/accumulate' and 散 *san* 'disperse'; 起 *qi* 'start' and 止 *zhi* 'stop'; 举 *ju* 'raise' and 谪 *zhe* 'exile'; 来 *lai* 'come' and 去 *qu* 'go'. Importantly, all the above verbs invariably denote a change of state, and other change-of-state verbs include 解 *jie* 'untie', 通 *tong* 'dredge', 销 *xiao* 'melt', 失 *shi* 'lose', 荡 *dang* 'swing', 飞 *fei* 'fly', 迷 *mi* 'infatuate', 明 *ming* 'light', 暖 *nuan* 'warm', 醒 *xing* 'wake', 愈 *yu* 'recover', 醉 *zui* 'drunk', 滚 *gun* 'roll', 扭 *niu* 'twist', 散 *san* 'disperse', *etc*.

Besides monosyllabic verbs, since Chinese has undergone a massive process of disyllabification (Arcodia, 2007; Dong, 2002), compound verbals have been dramatically gaining momentum in TVS, especially since Early Mandarin. In a widely-cited work, Li & Thompson (1981, pp. 54-72) classified Chinese verb compounds into two types – the resultative verb compound (RVC) and the parallel verb compound – based on the semantic relations between their constituents. An RVC is always composed of two elements, although each element may itself be a compound. A two-element verb compound is considered an RVC if the second element signals some result of the action or process conveyed by the first element. In a parallel verb compound, on the other hand, the two verbs are either synonymous or signal the same type of predicative notions. Based on this classification, it can be noticed that compound verbals in TVS are predominantly resultative instead of parallel. As is presented before,

if the structure of two-element predicative compound verbals is represented as "XY", X can be various types of verbs, and the most frequent elements in the Y positon include 来 *lai* 'come', 去 *qu* 'go', 得 *de* 'get', 出 *chu* 'go out', 过 *guo* 'pass', 入 *ru* 'enter', 开 *kai* 'open; turn on', 完 *wan* 'finish', *etc.* Remarkably, these verbal elements invariably imply a resultative state, which means the most common structure of predicative compound verbals in TVS can be represented as "X – resultative state", matching the structure of RVC. As for the complex verbal structures seen in TVS, following the head verb, PP, VP or the '得 *de* + descriptive complement' structure typically expresses a resultative state.

To summarize, the semantic prototype of the predicates in TVS is change of state. This claim does not necessarily exclude other verbals from TVS, and indeed, there are quite a few action verbs (e.g., 说 *shuo* 'say', 拔 *ba* 'pull out', and 吃 *chi* 'eat') and cognition/ perception/emotion verbs (e.g., 看 *kan* 'look', 听 *ting* 'listen', 爱 *ai* 'love', 要 *yao* 'want') captured in our data. By 'semantic prototype' it is just to say change-of-state verbs claim the lion's share of the verbals in TVS.

4   Faithfulness of Verbs to TVS

To select verbs for contingency analysis, factors of overall frequency, polysemy, homonym, stability of verbal semantics, and semantic diversity need to be taken into consideration. On the one hand, target verbs should ideally be frequent in language use to guarantee the applicability of this study. On the other hand, many verbs with high frequency are polysemies or homonyms. For example, the character 行 *xing/hang* has always been frequently used in the history of Chinese, but despite the verbal sense of 'go; implement', the original meaning of 行 *xing/hang* is 'road', alongside 'line; row; army' and many other meanings. In addition, with the motive of revealing the function of TVS, any historical change of target verbs' verbal semantics will add another layer to discussion. With these factors considered, I narrowed my study down to six verbs, specifically 助 *zhu* 'help', 听 *ting* 'listen', 备 *bei* 'prepare', 弑 *shi* 'kill', 聚 *ju* 'accumulate', 完 *wan* 'finish' and 弃 *qi* 'discard'. These six verbs present an diversity in terms of verbal semantics, with 完 *wan* 'finish' and 聚 *ju* 'accumulate' inherently encoding change of state, 备 *bei* 'prepare' and 弃 *qi* 'discard' implying change of state in certain contexts, and 助 *zhu* 'help' and 听 *ting* 'listen' not changing state whatsoever.

I searched these six target verbs in the corpora of different historical periods (i.e. the pre-Qin period for Old Chinese, the Tang dynasty for Middle Chinese, the Ming dynasty for Early Mandarin, and Modern Mandarin after 1949), and coded the tokens to identify TVS. If more than 500 tokens are attained for a historical period, only 500 tokens are coded. For each target verb of each historical period, its faithfulness to TVS is estimated by the proportion of total tokens that appear in this construction. Results are shown in Table 6.

Table 6: Faithfulness of target verbs to TVS in different historical periods

	Pre-Qin	Tang	Ming	Modern	Average
助 *zhu* 'help'	0.0122	0.0095	0.0020	0.0000	0.0059
听 *ting* 'listen'	0.1487	0.1434	0.0129	0.0270	0.0830
弃 *qi* 'discard'	0.1092	0.2542	0.0900	0.1594	0.1532
备 *bei* 'prepare'	0.2608	0.4483	0.1549	0.2247	0.2722
聚 *ju* 'accumulate'	0.3176	0.5426	0.4765	0.4403	0.4443
完 *wan* 'finish'	0.3333	0.5116	0.4146	0.6111	0.4677

Note. Data presented in this table are all based on target verbs functioning independently as the predicates. Tokens are not included if target verbs serve as elements of compound verbals.

Data can be plotted in the following figure:
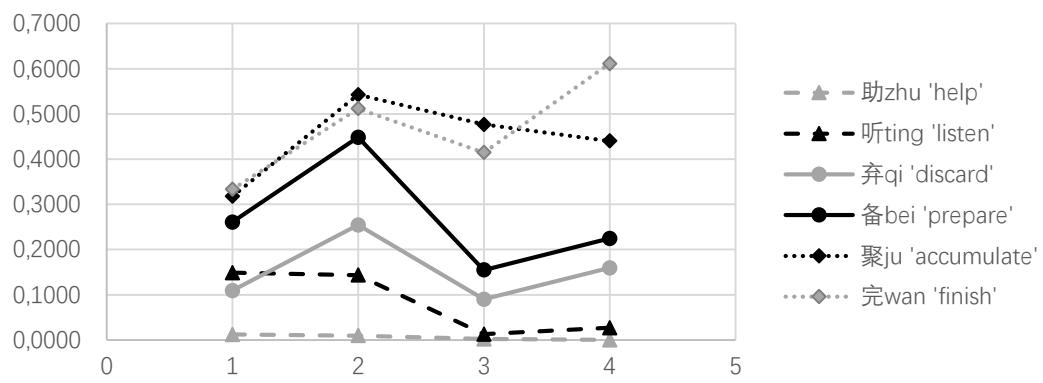
Figure 2: Faithfulness of target verbs to TVS in different historical periods

Despite the diachronic variations, the overall correlation between verbal semantics and verbs' faithfulness to TVS is clearly demonstrated. Inherent change-of-state verbs, i.e., 聚 *ju* 'accumulate' and 完 *wan* 'finish', are consistently the most faithful to TVS, followed by verbs that can imply change of state in certain contexts, such as 备 *bei* 'prepare' and 弃 *qi* 'discard'. 助 *Zhu* 'help' and 听 *ting* 'listen' are the least likely to change the state of the theme, and correspondingly, they rarely occur in TVS.

It is noteworthy that I am not trying to demarcate the boundary between change-of-state verbs and non-change-of-state verbs. Essentially, cognitive construction grammar holds a prototype view towards semantics: (Semantic) categories are not always well-delineated but structured around prototypes, with degrees of membership (Goldberg, 1995, pp. 13-14; Langacker, 2008, p. 13). In this discussion, the transition from change of state to non-change of state is better perceived as a continuum, which is, as can be observed from Figure 2, also reflected in verbs' faithfulness to TVS.

5 TVS and NPC

5.1 The change-of-state construction

The above analysis has shown that the semantic prototype of the verbals in TVS has constantly been change of state, and change-of-state verbs are also the most faithful to TVS than other verbs. Therefore, it can be conjectured that the function of TVS is related to change of state. This conjecture is supported by some cross-linguistic findings. TVS is short for the 'theme + verbal' structure with the transitive use of the verbal also confirmed from corpus data, and thus demonstrates the phenomenon of transitivity alternation. With regard to transitivity alternation, Haspelmath (1993) extrapolated that three large classes of situations are excluded from it (he used 'inchoative/causative alternation' to refer to transitivity alternation, to be discussed in the following section):

> (33) First, a state cannot be the inchoative member of an inchoative/causative alternation. Second, an action that does not express a change of state (e.g. 'help', 'invite', 'cite', 'criticize', 'read') cannot be the causative member of such an alternation. Third, agentive intransitive verbs like 'talk', 'dance', 'work', etc. cannot be the inchoative member of an inchoative/causative pair because they are not conceived of as occurring spontaneously. This still leaves us with a large class of transitive verbs such as 'wash', 'build', 'cut', 'dig', 'paint', etc., which do express a change of state. (Haspelmath, 1993)

This opinion coincides with the causal approach to lexical semantics (cf. Croft, 1991; Leven & Rappaport Hovav, 2005), which was introduced to account for transitivity alternation in English. According to Levin & Rappaport Hovav (2005, p. 117), the causal approach to lexical semantics "takes the facets of verb meaning relevant to argument realization to involve the causal structure of the events denoted". Tsunoda's (1981, 1985) simplified hierarchy, which originally organized the semantic classes of two-place verbs according to the likelihood of their members' transitivity, was adopted by Levin (2009) in the following form:

> (34) Change of state > Surface contact > Perception/cognition

As shown in example (35), below, change-of-state verbs (including change-of-location verbs) are perceived as inherently causative, and identify force recipients; whereas surface-contact verbs (including exertion-of-force verbs) identify force recipients, but do not entail changes of state. Perception/cognition verbs, meanwhile, involve neither force recipients nor changes of state.

> (35) Change-of-state verbs: break, open, close, warm, dim, cool, flatten, …
> Surface-contact verbs: hit, kick, shoot, slap, beat, wipe, rub, scratch, sweep, …
> Perception/cognition verbs: hear, see, smell, know, enjoy, fear, hate, …
>
> (adapted from Levin, 2009)

Citing Croft (1991, 1994, 1998), DeLancey (1984), Langacker (1987) and Talmy (1976), Levin (2009) concluded that "one instantiation of the causal approach models events in terms of individuals acting on individuals, thus involving causal chains, consisting of a series of segments (or 'atomic events'), each relating two participants in the event" and that "a single participant may be involved in more than one segment". It should be noted that change-of-state verbs encode this causal chain by definition. The transitive form of 'break' has been used as an example to illustrate the causal chain, as follows:

(36) *Harry broke the vase.* Modelled with a three-segment causal chain:
　　(i) Harry acts on the vase
　　(ii) the vase changes state
　　(iii) the vase is in a result state (i.e., broken)

<div align="right">(Croft, 1994, p. 38)</div>

Complex event structures can be observed for this kind of verbs.

(37) break: [[x ACT] CAUSE [BECOME [y <BROKEN>]]]

<div align="right">(Levin & Rappaport Hovav, 2005, p. 113)</div>

Connecting the findings about transitivity alternation in Chinese with other languages, a cross-linguistic change-of-state construction can be proposed for the form TVS:

Table 7: The architecture of the change-of-state construction

Form	theme + verbal	
	Constituents	theme: prototypically inanimate
		verbal: prototypically encoding change of state
	Constraints	prototypically in the perfective aspect
Function	Change of state	

5.2 The factor of spontaneity

Given the recognition of the change-of-state construction (taking the form of TVS, analyzed from corpus data), a question arises as to whether it can be equated with NPC. As is mentioned in the beginning, the form of NPC is not clearly defined except for "no overt passive marker", and it is still open to question whether the following TVS can be treated as NPC. Examples (3)-(6) are repeated as (38)-(41) for the reader's convenience.

(38) 物　　以　类　　　聚。
　　Wu　yi　lei　　ju.
　　thing　by　category　accumulate
　　'Things accumulate by category.'

(39) 电影　　完了。
     Dianying wan-le
     movie   finish-LE
     'The movie finished.'

(40) 门　　开了。
     Men   kai-le.
     door open-LE
     'The door opened./ The door is opened.'

(41) 蛋糕　　吃了
     Dangao chi-le.
     cake   eat-LE
     'The cake is eaten.'

In previous studies, (41) is undoubtedly cited as an example of NPC and (40) is occasionally also treated as NPC, but (38) and (39) are clearly not discussed. As for what is the difference between them, relevant discussions are seen from Haspelmath (1987) and Huang (1989). They both hold that there must be an implied agent in passive, as explained in the following quote:

> (42) In the passive, the actor is not in the subject position, but it can often be expressed in an actor phrase, and in any case the existence of an actor is implied in a passive clause. In the anticausative, however, the actor is completely eliminated, not only syntactically, but also semantically. And the process is presented as going on spontaneously. This semantic distinction is often quite subtle, but it is decisive. (Haspelmath, 1987)

Based on this principle, it can be extrapolated that NPC is the TVS wherein lies an applied agent, and if there is not, the TVS is called anticaustive[1], indicating the process occurs spontaneously. In the discussion of the famous Chinese ambiguous sentence 鸡不吃了 *ji bu chi-le* 'the chick will not be eaten', Huang (1989) used exactly the same standard to exclude this example from ergative. This opinion is primarily based on verbal semantics. Indeed, the action 'eat' involves two participants of the event. However, out of context, both interpretations are possible for (40): the door may open itself or be opened by somebody else. Essentially, the events expressed by many words allow both possibilities, and the spontaneity of verbal semantics is not binary. Nedjalkov & Sil'nickij (1969/1973) presented the following scale of spontaneity in their discussion of inchoative/causative alternations, which was later reaffirmed by Haspelmath (1993):

---

[1] In studies of Chinese linguistics, probably due to the lack of inflectional morphology, the use of the term "anticausative" has been extensively mingled together with "ergative", "unaccusative" and "inchoative", despite their distinct origins.

(43) Scale of increasing likelihood of spontaneous occurrence

'wash'	'close'	'melt'	'laugh'
	inchoative/causative alternations		
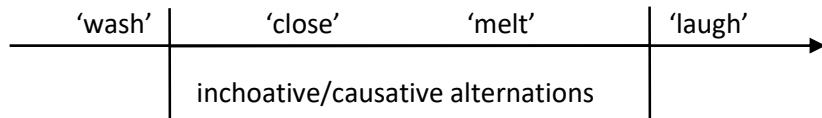
(Nedjalkov & Sil'nickij, 1969/1973; Haspelmath, 1993)

Zooming in on the section that can participate in inchoative/causative alternations (change-of-state events), Haspelmath (1993) expanded the scope of this analysis and thus derived a scale with more nodes. Selected nodes are presented below in Figure 3, in conjunction with the distinction of change/non-change of state discussed in the prior section.
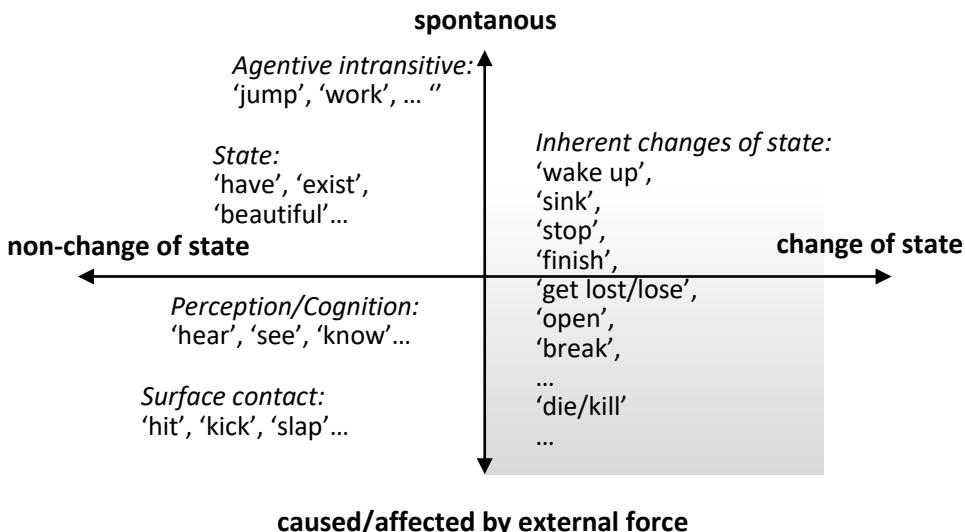
Figure 3: Four types of events based on two factors

If NPC is understood to be the TVS containing an implied agent, then the grey area covers the events expressed by NPC. The darker the grey is, the less likely the event is to occur spontaneously, and thus better fits the defined characteristic of passive, i.e., there is an agent. In this sense, NPC refers to a special situation of the change-of-state construction when the event expressed by the verbal semantics is not likely to occur spontaneously. This explains why example (41) sounds more like passive than (40).

In many languages including English, events represented in the dark grey area cannot be expressed by TVS without a passive marker. Haspelmath (1987, 1993) noted the contrast between English verbs 'cut' and 'tear' to demonstrate that concepts of actions involving agent-oriented meaning components, such as tools or methods, virtually never alternate between transitive and intransitive use. The situation is obviously different in Chinese as in corpus data, we have seen quite a few action verbs, including 说 *shuo* 'say', 拔 *ba* 'pull out', and 吃 *chi* 'eat', in TVS tokens. It is this

difference that makes NPC a special phenomenon and the distinction between NPC and inchoative/unaccusative/ergative/anticausative a special problem in Chinese. If verbs involving agent-oriented meaning components cannot form TVS whatsoever, there will definitely not be an implied agent, and thus TVS cannot be called 'passive'. But as in Chinese, the verbals in TVS may involve agent-oriented meaning components or not, and the likelihood of spontaneous occurrence encoded in verbal semantics is a continuous scale instead of binary, there is essentially no way to tear apart NPC and inchoative/ unaccusative/ergative/anticausative.

5.3   The cognitive base the change-of-state construction

As previously discussed, cognitive construction grammar is built upon the relationship between linguistic constructions and human cognition, explicated below in the *Scene Encoding Hypothesis* (Goldberg, 2005).

(44)   *Scene Encoding Hypothesis*: Constructions which correspond to basic sentence
types encode as their central senses event types that are basic to human
experience. (Goldberg, 2005)

In light of this basic tenet of cognitive construction grammar, the event expressed by the change-of-state construction can be represented by the following diagram, in which 'AG' signifies agent, and 'TH', theme:

Figure 4: The complex event structure of change-of-state verbs

This complex event structure automatically gives way to two competing strategies of profiling in human construal: **agent orientation** and **theme orientation**. According to Langacker (2008, p. 355), since it is difficult to attend to a complex occurrence in a global and wholly neutral fashion, attention, as a limited resource, has to be allocated. As a matter of focal prominence, **trajector** and **landmark** are the primary and secondary focal participants in a profiled relationship, and subject/object relations are grammatical manifestations of trajector/landmark alignment. A subject is a nominal that codes the trajector of a profiled relationship, and an object is one that codes the landmark. It should be noted, however, that (i) different allocations are possible for a given structure, and (ii) the choice of trajector is a pivotal factor in canonical alignment. The key difference between the two major profiling strategies is that one aligns the trajector with the agent, and the other aligns it with the theme.

(45)   Agent and theme attract focal prominence because each has a kind of cognitive
salience that sets it apart from other semantic roles in its experiential realm.
Agents belong to the "active" realm – that of action, change, and force, of mobile

creatures acting on the world. Here a willful human actor stands out as a paragon with respect to other active roles (like instrument, experiencer, or natural force). On the other hand, themes belong to the "passive" realm of settings, locations, and stable situations, where objects with particular properties are arranged in certain ways. The world thus constituted defines our circumstances, presents both problems and opportunities, and serves as the platform for human activity. (Langacker, 2008, p. 370)

In the complex event structure of a change of state, both participants have a chance of being profiled as the trajector, which means that each of them can be the subject of a clause: transitivity alternation is thus made possible.

A fundamental spirit underlying this view is that the same event can be profiled in different ways and further realized as distinct constructions in language. Bearing this in mind, it becomes questionable that whether the "notional passive construction" is passive at all. Even if we acknowledge that NPC refers to the change-of-state constructions in which the event expressed by verbal semantics is not likely to occur spontaneously, the actual conceptualization of this event may be a different story: involving an agent-oriented meaning component in verbal semantics does not mean this event is necessarily profiled so when realized in language. An alternative possibility certainly exists that the agent is simply not attended to when we use TVS. If so, this TVS can no longer be treated as "passive" according to the standard of the "implied agent".

5.4 Summary: the challenges of the idea of "notional passive"

TVS, as the form designated by NPC, inherently hinges on change of state. Taken as the change-of-state construction, our finding about TVS can be situated in a cross-linguistic context. The recognition of the cross-linguistic change-of-state construction casts doubt on NPC's status as a construction. Under the view of cognitive construction grammar, a construction is defined as a pairing of form and function, but in the case of NPC, the real function of its form is change of state. If a transitive verb does not encode change of state, e.g., 助 *zhu* 'help', it seldom occurs in TVS. Therefore, NPC can only be understood as a special situation of the change-of-state construction in which the event expressed by the verbal is not likely to occur spontaneously. In this sense, the use of the term 'construction' is groundless in the so-called "notional passive construction".

Moreover, from the perspective of verbal semantics, events' likelihood of spontaneous occurrence is not binary but falls on a continuum, making it impossible to distinguish NPC (which is argued to imply an agent) from inchoative/unaccusative/ergative/anticausative (which is understood to happen spontaneously) in Chinese.

Most importantly, within the framework of cognitive construction grammar, the event itself cannot be equated with human conceptualization of it encoded in

constructions, because one event can be profiled in multiple ways. Therefore, even if the event expressed by verbal semantics is not likely to occur spontaneously, we still do not know whether an agent is implied when we use this verbal in the change-of-state construction. In this sense, the use of the term "passive" is rather arbitrary in the so-called "notional passive construction", albeit plausible.

6   Conclusions and future directions

With the motive of revealing the form, function and conceptual schema of the notional passive construction under the framework of cognitive construction grammar, this study employs a diachronic character-based approach to investigate the 'theme + verbal' structure in corpus data. Results show that the semantic prototype of the verbal in the 'theme + verbal' structure is change of state, and change-of-state verbs are also the most faithful to this structure. In conjunction with the finding about transitivity alternation in other languages, a change-of-state construction can be proposed. With the use the terms "passive" and "construction" questionable, the so-called "notional passive construction" virtually refers to a special situation of the change-of-state construction in which the event expressed by verbal semantics is not likely to occur spontaneously.

That being said, how could the concept "notional passive construction" emerge and become commonly used in Chinese linguistics? A possible reason pertains to the difference between Chinese and other languages discussed at the end of section 5.2. In many languages, verbs involving agent-oriented meaning components cannot be used intransitively without a passive marker, but that is possible in Chinese, making some Chinese change-of-state constructions not translatable in other languages without a passive marker. If this is the case, the idea of "notional passive construction" is the outcome of an attempt trying to align Chinese with other languages, and the distinction between the notional passive construction and inchoative/ unaccusative/ ergative/anticausative is radically meaningless because these notions are originally imposed on Chinese.

Last but not least, there are a few points that call for further discussion. First, in the diachronic analysis, this paper focuses pretty much merely on the consistency across different historical periods, but we do see considerable diachronic variations, especially with the increasing occurrence of verb compounds and compound verbs. So, it is of interest to see the interrelationship between compounding and the evolution of the verbals in the change-of-state construction. Second, although currently we do not know whether an agent is implied when we use the change-of-state construction, it can probably be found out through experiments testing native speakers' online processing. This is certainly worth doing since semantically, the verbal in the Chinese change-of-state construction may involve agent-oriented components, which entails a

potential existence of an implied agent in the Chinese change-of-state construction. Third, as is mentioned in the beginning of this paper, besides the "notional passive", Chinese does have a commonly recognized passive marker, 被 *bei*. If the idea of "notional passive construction" is dubious, how about the 被 *bei* construction? What is the relationship between them? These are all questions worthy of exploration.

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GRAMMATICALIZATION AND LEXICALIZATION: SUGGESTIONS REGARDING THE DEVELOPMENT OF THE CHINESE CHANGE-OF-STATE VERB

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Abstract

This paper discusses the evolution of the Chinese verb 斷 (*duàn* 'break'), exploring how the lexicon has transformed from being a substantive transitive verb in the past to the various functions it fulfils in contemporary Chinese: i.e. a resultative complement, an adjective, an adverb and a noun. Findings reveal that *duàn* was initially transitive and its intransitive function was derived during the Spring and Autumn period (772–476 BC). The two functions co-existed for the rest of the Pre-Qin period (before 221 BC). *Duàn*'s transition into a resultative complement began during the Eastern Han dynasty (AD 25–220), and its noun function was shaped in the Warring State period (475–221 BC). Finally, *Duàn*'s adjective and adverb functions are noted to begin in Middle Chinese (AD 420–1279). Although some of these transitions took place more or less simultaneously during overlapping periods, they developed via two separate paths: the process by which *duàn* developed into a resultative complement, an adverb, and an adjective is that of grammaticalization, while on the other hand, the process by which *duàn* developed into a noun is that of lexicalization. Essentially, it is the intransitive function that is subject to grammaticalization and it is the transitive function that is subject to lexicalization. In this paper it is therefore proposed that the above diachronic change is taken as a cline, and is put forward as follows: (a) grammaticalization and lexicalization are not distinct processes but rather happen to a lexeme more or less simultaneously; and (b) interrelationship between the two processes is orthogonal.

Keywords: grammaticalization; lexicalization; diachronic approach; Chinese

Povzetek

Članek razpravlja o razvoju kitajskega glagola 'zlomiti' 斷 *duàn* in razvoju njegovih funkcij skozi čas. Medtem ko je najprej deloval le kot prehodni glagol, se lahko v sodobni kitajščini pojavlja kot rezultativno dopolnilo, pridevnik, prislov in celo kot samostalnik. Rezultati raziskave kažejo, da je prvotno prehodni glagol svojo neprehodno vlogo dobil v obdobju Pomladi in jeseni (772–476 pr.n.št.). Ti dve vlogi je vzporedno obdržal vse do obdobja Qin (221 pr.n.št.). Njegova preobrazba v rezultatsko dopolnilo se je pričela v obdobju Dinastije Vzhodni Han, še pred tem se je oblikovala tudi njegova samostalniška vloga (obdobje Vojskujočih se držav, 475–221 pr.n.št.). Njegovi najnovejši dve vlogi, tj. pridevniška in prislovna, sta se začeli pojavljati v srednji kitajščini (420–1279). Kljub temu, da so se nekateri izmed teh prehodov zgodili bolj ali manj vzporedno, je bila njihova pot sprememb precej različna; proces, preko katerega se je glagol 'zlomiti' 斷 *duàn* izpopolnil v rezultatsko dopolnilo, pridevnik in prislov, je slovnični (gramatikalizacija), medtem ko je proces njegovega razvoja v

samostalnik leksikalni (leksikalizacija). Poleg tega smo prišli do ugotovitev, da je slovnični proces sprožil neprehodni glagol 'zlomiti' 断 *duàn*, njegova prehodna različica pa je bila osnova leksikalizaciji. V članku predlagamo, da omenjeno spremembo skozi čas dojememo kot skalarno spremembo, ki jo zaznamujeta naslednji dve značilnosti: (a) gramatikalizacija in leksikalizacija se pojavljata istočasno in nista povsem neodvisna procesa ter (b) odnos med procesoma je ortogonalen.

Ključne besede: gramatikalizacija; leksikalizacija; diahroni pristop; kitajščina

1   Introduction

Chinese vocabulary has undergone a lengthy evolution. In the Pre-Qin period, the Chinese language consisted of monosyllabic roots, to which affixes were attached (Sagart, 1999). During the Early Han dynasty, disyllabic word roots occurred, with verb compounds established in the Middle Han dynasty. The change-of-state verb 断[1] *duàn* 'break' is a typical instance. In contemporary Chinese, *duàn* is usually used as a resultative complement. It forms syntactic verb compounds (V-V) with action verbs such as 切 *qiē* 'cut', 剪 *jiǎn* 'cut', etc. (1) provides an illustration of V-V 切断 *qiē-duàn* 'cut-broken'.

(1)   **Resultative complement**

    a. 张三   切断   了   电源。   (Transitive)
       Zhāng-sān   qiē-**duàn**   le   diàn-yuán.
       Zhangsan   cut-**off**   PERF   power
       'Zhangsan cut off the power.'

    b. 电源   切断   了。   (Intransitive)
       Diàn-yuán   qiē-**duàn**   le.
       power   cut-**off**   PERF
       'The power was cut off.'

In (1), *duàn* is a resultative complement. The V-V form 切断 *qiē-duàn* 'cut-broken' can be either transitive or intransitive. About 3,000 years ago *duàn* was a substantive transitive verb, meaning 'to cut/break'. Although semantically *duàn* in (1) still retains the original meaning, i.e. 'broken', syntactically it no longer bears the initial function, i.e. that of a transitive verb.

Another illustration comes from 打断 *dǎ-duàn* 'hit-broken', but this presents a different picture. 打断 *dǎ-duàn* can have two meanings. The first meaning is 'hit-broken', where 打 *dǎ* is an action verb and *duàn* a resultative complement (such use resembles 切断 *qiē-duàn* 'cut-broken' in (1)). The second meaning of 打断 *dǎ-duàn* is 'to interrupt'. More interestingly, when 打断 *dǎ-duàn* has the first meaning, i.e. 'hit-broken', it may either be transitive (e.g. 打断了树枝 *dǎ-duàn le shù-zhī* '*The branch*

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[1] Throughout the paper, the discussions use the simplified Chinese character (e.g. 断) while the illustrations use the traditional Chinese characters (e.g. 斷).

was hit and it broke.') or intransitive (e.g. 树枝打断了 *shù-zhī dǎ-duàn le* '*The branch broke*'). However, when 打断 *dǎ-duàn* has the second meaning, i.e. 'to interrupt', it only bears transitivity, as shown in (2):

(2)　a. 打断谈话 *dǎ-duàn tán-huà* 'interrupt the discussion'
　　　b. *谈话打断 *tán-huà dǎ-duàn* 'the discussion interrupts'

The ill-formed (2b) can be improved by turning the sentence into a passive voice, thus (2b) becomes 谈话被打断了 *tán-huà bèi dǎ-duàn le* 'the discussion was interrupted.'[2]

This having been said, we can not say that *duàn* has absolutely lost its substantive function. In the following compound nouns, *duàn* retains the transitive function:

(3)　**Transitive use in compound verbs**
　　　a. 断水 *duàn-shuǐ* 'water break'
　　　b. 断电 *duàn-diàn* 'power off'
　　　c. 断粮 *duàn-liáng* 'run out of food'
　　　d. 断炊 *duàn-chuī* 'run out of rice and fuel'
　　　e. 断档 *duàn-dàng* 'out of stock'
　　　f. 断种 *duàn-zhǒng* 'heirless'

The objects of *duàn* in this respect are limited to 水 *shuǐ* 'water', 电 *diàn* 'electricity', 种 *zhǒng* 'heir', etc. The following compound nouns shows a more idiomaticised 断 *duàn*:

(4)　**Transitive use in compound nouns**
　　　a. 断头台 *duàn-tóu-tái* 'cut-head-platform (scaffold)'
　　　b. 粘滞性断裂 *zhān zhì xìng duàn liè* 'glutinous fracture'

Duàn also plays a role as an adjective, which is exemplified by (5).

(5)　**Adjectival use in compounds**
　　　a. 断枝 *duàn-zhī* 'broken-branch'
　　　b. 断绳 *duàn-shéng* 'broken-string'

One may argue that a verb may modify a noun, and is as such translated into English with an adjective or a past participle. A representative example is *duàn-zhī* (break-branch) 'broken branch' (5a), however, but this does not yet prove that Chinese 断 *duàn* is to be analysed as an adjective.

Trying to eliminate the impossible roles, we can first say that in *duàn-zhī* (5a), 断 *duàn* can not be analysed as a verb. There are two reasons for it. The first reason is that the NP *duàn-zhī* (break-branch) is composed by *duàn* + a noun (*zhī* (branch). If *duàn* was an intransitive verb, the word order would have to be a noun (branch) + *duàn*.

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[2] 被 *bèi* is an auxiliary verb, denoting the passive voice.

Furthermore, to function as a transitive verb, *duàn* must appear with a light verb 弄 *nòng* or 打 *dǎ*, which correspond to the verb *do* in English and する *suru* in Japanese.

(5) a'. 弄断　　　了　　树枝
　　　nòng **duàn**　le　　shù-zhī
　　　do-**break**　PERF　branch

　　a." 打断　　　了　　树枝
　　　dǎ **duàn**　le　　shù-zhī
　　　do-**break**　PERF　branch

The second reason is that when a verb modifies a noun, the verb *duàn* must either be in the past participle form or, an aspect marker gets necessary. See the example below.

(5) a'''. 断　　了　　的　　枝
　　　duàn　le　　de　　zhī
　　　broken　PERF　NOM　branch
　　　'the branch that was broken'.
　　　(的 is a nominalizer)

With this in mind, it is reasonable to deem 断 *duàn* as an adjective. Another similar example is 断椅 *duàn yǐ* (broken-chair).

However, example (6) shows that duàn can also function as an adverb.

(6) **Adverbial** use in compound nouns/verbs[3] or phrases
　　a. 断言 *duàn-yán* 'absolutely assert'
　　b. 断定 duàn-dìng 'absolutely judge'
　　c. 断不能相信 duàn bú néng xiàng xìn 'absolutely unreliable'
　　d. 断不能接受 duàn bú néng jiē shòu 'absolutely unacceptable'

In the corpus of contemporary Chinese[4], there are 199,742 tokens of contemporary *duàn*. We took 800 tokens at random, and found the following distribution of different functions[5].

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[3] Due to the lack of morphological marker, the Chinese category is hard to identify. It seems that 断言 *duàn-yán* 'absolutely assert' and 断定 *duàn-dìng* 'absolutely judge' can be a compound noun or a compound verb according to different syntactic environments.

[4] The corpus of Modern Chinese (http://ccl.pku.edu.cn/) is constructed by the Center for Chinese Linguistics at Beijing University.

[5] *Duàn*'s noun use is mostly seen in Old and Middle Chinese. It appears to have declined in Modern Chinese.

Table 1: Function distribution of *duan* in The corpus of Modern Chinese (sample)

Category	Type	Token
Transitive verb	20	93
Intransitive verb	15	175
Adjective	10	89
Adverb	9	76
Resultative complement	21	210

The functions that 断 *duàn* presents in contemporary Chinese significantly differ from those it fulfilled 3,000 years ago. In *Odes* (1046–771 BC, Western Zhou dynasty), 断 *duàn* is a substantive transitive verb, meaning 'cut/break'. We detected three tokens of the transitive use in the *Odes*, eight tokens in the *Book of Change* (1046 BC–771 BC, West Zhou dynasty) and three tokens in *The Classic of History* (772–476 BC, Spring and Autumn). Illustrations are provided in (7)–(8).

(7) 七　　月　　食　瓜，　八　　月　　**断**　　壺。
　　Qī　　yuè　shí　guā,　bā　　yuè　**duàn**　hú.
　　Seventh month eat melon, eighth month **cut.down** bottle-gourd
　　'In the seventh month, they eat the melons; and in the eighth, they cut down
　　the bottle-gourds.'　　　　　　　　　　　　　　　　　(Odes)

(8) 繫　　辭　　　　焉，以　**断**　　其　吉凶。
　　Jì　　cí　　　yān，yǐ　**duàn**　qí　jí-xiōng.
　　Append explanation PART PREP **determine** PART good evil
　　'He then appended his explanation (to each line of the diagrams), to determine
　　the good or evil indicated by it.'　　　　　　　　　(Book of Change)

This study explores the evolution of the Chinese verb 断 *duàn* in an effort to understand how it has transformed from a substantive transitive verb to the various forms it takes in contemporary Chinese: i.e. a resultative complement, an adjective and an adverb.

Categorisation of the development of the Chinese language basically follows the insights suggested by the linguist Karlgren (1918):

(a) Old Chinese: Shang dynasty, Zhou dynasty, Spring and Autumn and Warring State period (1200 BC–221 BC);
(b) Pre-Middle Chinese: Qin dynasty and Han dynasty (221 BC to AD 220);
(c) Middle Chinese: Southern and Northern dynasties (AD 420–589), Sui, Tang (AD 618–907), Song dynasties (AD 220–1279); and
(d) Pre-Modern Chinese: Yuan, Ming and Qing dynasties (AD 1271–1912).

The data are predominantly drawn from the Chinese Text Project corpus (http://ctext.org/). The scope of the investigation of Old Chinese is confined to the period BC 1200 to the first few centuries AD. The Pre-Qin period is relatively long and therefore the number oftargeted sources for this period is higher than that for the other two periods. A list of documents used in the study is provided at the end of the article.

This paper is organised as follows: Section 1 gives a brief introduction to the various functions of *duàn* in contemporary Chinese. Section 2 touches upon two concepts that are relevant to this study, i.e. grammaticalization and lexicalization. Section 3 explores the function of *duàn* in Old Chinese. Section 4 focuses on Pre-Middle and Middle Chinese, and Section 5 on Pre-Modern Chinese. Section 6 highlights the results and further addresses theoretical implications of this study.

2   Grammaticalization and lexicalization

The central point of this study is to uncover how *duàn* moved from functioning as a transitive verb in Old Chinese to functioning as a resultative complement, an adverb, and an adjective in contemporary Chinese. This obliges us to touch upon some general issues regarding the concepts of grammaticalization and lexicalization.

Grammaticalization deals with the question of how a lexical item develops into a marker of a grammatical category or how a marker representing a less grammatical function takes on a more grammatical one (Kuryłowicz, 1965, Bisang, 2011). The concept *grammaticalization* was first put forward by Zhou Boqi, a Chinese scholar of the Yuan dynasty (1279–1368). He stated: 'Today's function words are all former full words (今之虛字皆古之實字 *jīn-zhī-xū-zì-jiē-gǔ-zhī shí-zì*)'. Such a process was known as 'voiding (虛化 *xūhuà*)'. About 500 years after Zhou Boqi, German linguist Bopp (1816, 1833) conducted a pioneering study on grammaticalization evolution, with a particular focus on the affixes of Germanic languages. The boom of modern studies of grammaticalization was inspired by the publications of Givón (1971, 1979). The point of departure for cross-linguistic studies is Givón's note that 'today's morphology is yesterday's syntax'. Later on, Christian Lehmann (1982) established a milestone with his publication *Thoughts on Grammaticalization*. Since then, grammaticalization has been studied intensively in different linguistic fields (Narrog and Heine 2011) such as e.g. *functional linguistics* (Croft, 2000, Harder & Boye, 2011), *cognitive grammar* (Langacker, 1987, 1991, 2011), *pragmatics* (Traugott, 2002), *construction grammar* (Trousdale, 2008, Gisborne & Patten, 2011), *language acquisition* (Diessel, 2011) and *social linguistics* (Nevalainen & Palander-Collin, 2011).

The definition of grammaticalization has been revised. In earlier times, focusing only on lexicons was most common. One classical definition comes from Kurylowiczs (1965, p. 69), according to whom, grammaticalization consists of increasing the range

of a morpheme from a lexical to a grammatical (or from a less grammatical to a more grammatical) status. For instance, the English *will* was originally a substantive verb, meaning 'want', but was grammaticalized as an auxiliary verb, expressing the future of 'to be' (Himmelmann, 2004). Traugott and Heine (1991) argue that, when discussing how substantive lexicons move into function words, the important factor of construction can not be neglected, as the development of grammatical items is shaped by the constructions in which these items occur. Therefore, they refine grammaticalization as 'the development of constructions […] via discourse practices into more grammatical material', e.g. lexical items transit into morphological formatives. This view was welcomed by many linguists, including Bybee, Perkins, Pagliuca, Lehmann, and Himmelmann. Bybee, Perkins and Pagliuca (1994, p. 4) demonstrate that the entire construction (not simply the lexical meaning of the stem) is the precursor, and hence the source, of the grammatical meaning. Lehmann (1992, p. 406) notes that lexical items alone do not grammaticalize. They do so only in specific contexts. Himmelmann (2004, p. 31) contends that 'it is the grammaticizing element in its syntagmatic context which is grammaticized'. Most crucially, grammaticalization involves a number of correlated changes, which leads to another concept: lexicalization.

Lexicalization is considered to require the following conditions: phonetic reduction, morphological demotivation, and the loss of semantic compositionality. Himmelmann's (2004) account of lexicalization is introduced below.

Lexicalization represents:

(a) creating a new lexeme out of two or more existing ones, which may continue to exist independently, e.g. collocations.

(b) creating a formative that can be used productively for the formation of new lexemes, e.g. compounds, inflectional formatives;

(c) deriving a new lexeme from a single existing one, which may continue to exist independently, e.g. individual lexical items, grammatical formatives; and

(d) patterns of semantic features that are systematically encoded in the lexicon, e.g. semantic/cognitive features.

Himmelmann's (2004) account of lexicalization is elegant, but handling 'compounds' as a result of lexicalization appears problematic. Take Chinese verb compounds (V-V) for instance. The predicate-complement type of Chinese V-V consists of an action V1 + a resultative complement V2. Crucially, V2 was originally a substantive change-of-state verb that was grammaticalized into a complement. Grammaticalization is also seen in the V-V motion, where the second constituents, i.e. directional complements, are derived from substantive motion verbs.

Due to the lack of morphological change, it is difficult to tackle the issue where the function of *duàn* is transferred via grammaticalization manipulation, and which comes from lexicalization device. This study assumes that *duàn*'s various functions develop via

two separate paths. The process by which *duàn* developed into a resultative complement, an adverb, and an adjective is the case of grammaticalization, while the process by which *duàn* developed into a noun is the case of lexicalization.

Another issue is the interrelationship between grammaticalization and lexicalization in case of *duàn*, given the co-occurrence of multiple transitions. Regarding this interrelationship, previous research falls into two main streams. One such stream conceives the two processes as a constant change leading from lexicalization to grammaticalization and the other way around (Himmelmann, 2004). The other stream deems the two processes to be opposite (Heine, 1993); in other words, lexicalization is the reverse process of grammaticalization (Kuryłowicz, 1965). Alternatively, the two processes are in an orthogonal or parallel relationship (Himmelmann, 2004). This study introduces data from Chinese, in particular the change-of-state verb *duàn*. It explores how the verb is grammaticalized and lexicalized, and how the two processes relate.

In addition, it is hypothessed that the change always happens in the direction content words to empty words, from lexical items to grammatical elements, or from less grammatical to more grammatical, and never in the opposite direction. This leads to the assumption that grammaticalization is unidirectional. In *language evolution*, Heine and Kuteva (2007) claim that nouns are transformed regularly into adverbs, yet the reverse is exceedingly uncommon. Incorporating this insight, they produce an 'evolutionary network', which describes the developmental layers of commonly recognised grammatical categories, c.f. Figure 1.
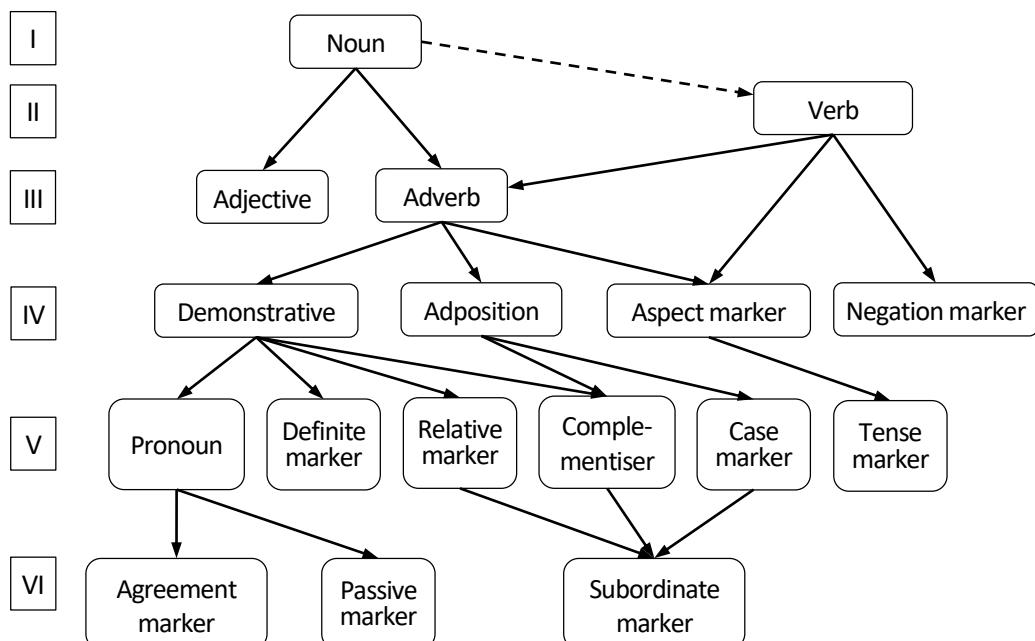
Figure 1: Layers of grammatical evolution via pathways of grammaticalization
(Heine & Kuteva, 2007, p. 111)

This view, however, is challenged by scholars such as Newmeyer (1998) and Norde (2001). Consequently, another concept, 'degrammaticalization', has been posited. Degrammaticalization refers to a change from a grammatical element to a lexical item, or from a more grammatical element to a less grammatical one. This study makes a further step forward in investigating whether the transformation of the multiple functions of *duàn* is unidirectional or reversible.

3 断 *duàn* in Old Chinese

We begin by looking at the function of 断 *duàn* in Old Chinese.

3.1 断 *duàn* as transitive verb

In the Pre-Qin period (before 221 BC), 断 *duàn* is mostly employed for its transitivity. The following illustration comes from 詩經 *Odes* (1046 BC–771 BC, Western Zhou dynasty):

(9) 是 **斷** 是 度。
Shì **duàn** shì dù.
PRON **cut.down**, PRON convey
'We cut them down, and conveyed them here.' (Odes)

是 *shì* is a pronoun, denoting 'this/them', followed by the transitive verb 断 *duàn*. This SOV word order is not unfamiliar in Old Chinese and somewhat resembles Modern Japanese, which is alleged to be an Altaic language.

The following illustration comes from 莊子 *Zhuang Zi* (350 BC - 250 BC), completed in the Warring State period, 500–600 years after the Western Zhou dynasty:

(10) 越 人 **斷** 髮 文 身。
Yuè rén **duàn** fà wén shēn.
Yue people **cut** hair tattoo body
'The people of Yue cut their hair and tattooed their bodies.' (Zhuang Zi)

断 *duàn* is employed in a transitive way, taking 髮 *fà* 'hair' as its object. The option of itstransitive role is further detected (eight tokens) in *Xun Zi* (Warring State: 475 BC–221 BC), 14 tokens in *Mo Zi* (Spring and Autumn – Warring State).

3.2 断 as intransitive verb

The following is from 尚书 *The Classic of History* (Spring and Autumn period: 772–476 BC), where 断 *duàn* functions as an intransitive verb. Intriguingly, 断 *duàn* here denotes a metaphorical meaning, i.e. 'make decision':

(11)　惟　　克　果　　**斷**，　　　　　乃　　罔　　后　　艰。
　　　　Wéi　kè　guǒ　**duàn**，　　　nǎi　wǎng　hòu　jiān.
　　　　Only can quickly **make.decision**, CONJ avoid future difficulty
　　　　'If one can make a bold decision, he may avoid future difficulties.'

　　　　　　　　　　　　　　　　　　　　　　　　　　　　(The Classic of History)

Another instance of intransitive use (metaphorical) is found in 墨子 *Mo Zi* (490–221 BC), vol. 2:

(12)　政令　　　　不　**斷**　　則　　民　　　不　　畏。
　　　　Zhèng lìng　bú　**duàn**　zé　mín　　bú　wèi.
　　　　Orders　　NEG　**stop**,　CONJ　people　NEG　stand in awe
　　　　'If his orders do not stop, people would not stand in awe before him.'

　　　　　　　　　　　　　　　　　　　　　　　　　　　　(Mo Zi)

In (12), 斷 *duàn* means 'to stop'; it is modified by the negation word 不 *bú*. In *Mo Zi,* vol. 6, 斷 *duàn* is also found to function as a substantive intransitive verb, as in (13):

(13)　於是　教　　民…　　日　　　帶　　劍…　　擊　　則　　**斷**。
　　　　Yú shì jiāo　mín …　rì　　dài　jiàn …　jī　zé　**duàn.**
　　　　CONJ　teach people… daytime carry weapons, attack CONJ **break**
　　　　'(The ancient sage-kings) taught the people to carry weapons in the daytime.
　　　　When assaulted by the animal, people attack it, then the head of the animal
　　　　will break.'　　　　　　　　　　　　　　　　　　　(Mo Zi)

斷 *duàn* as an intransitive verb, is found 13 times in *Mo Zi*. Among them, nine tokens are in a substantive intransitive form, i.e. 'break (intr.)', while four tokens render a metaphorical meaning, i.e. 'stop'. Heine, Claudi and Hünnemeyer (1991) propose that the grammatical structure of the development of lexemes runs as follows: person > object > activity > space > time > quality. The metaphorical function seen in (11) and (12) suggests that the lexicalization of 斷 *duàn* probably began as early as the Spring and Autumn period. We look for more evidence of this by looking at data in Middle Chinese and Pre-Modern Chinese.

3.3 斷 as adjective

The following illustration is taken from 荀子 *Xun Zi* (Warring State: 475 BC–221 BC), where 斷 *duàn* plays an adjective role:

(14)　周　　公　　之　　狀，　　身　　如　　**斷**　　薔。
　　　　Zhōu gong　zhī　zhuàng，shēn　rú　**duàn**　zī.
　　　　Zhou Duke GEN shape,　body　like　**broken**　dry tree
　　　　'The shape of Duke Zhou is like a broken dry tree.'　　　　　(Xun Zi)

However, adjective use is only detected once in all Pre-Qin sources. As a result, it may not be appropriate to propose that the adjective function appears in the Warring State period. We leave this point for now and return to it in Section 4.

3.4　斷 *duàn* as a noun

Apart from its transitive and intransitive characters, some noun uses are found in Old Chinese, meaning 'judgement'. (15) is an illustration from 荀子 *Xun Zi.*

(15)	履		天子	之	籍，	聽	天下	之	**斷**。
	Lǔ		tiān zǐ	zhī	jí，	tīng	tiān xià	zhī	**duàn.**
	Undertake	King		GEN	duty,	listen	people	GEN	**advice**

'Undertake the duties as a king and take advice from the people.'　　(Xun Zi)

In *Zhuang Zi* (350–250 BC), there are four tokens of noun use.

(16)	是	以	一	人	之	**斷**		制	利	天下。
	Shì	yǐ	yī	rén	zhī	**duàn**		zhì	lì	tiān xià.
	Be	PREP	one	man	GEN	**judgement**		rule	benefit	world

'In all this one man is seeking to benefit the world by his judgement and enactments (of such a nature).'　　(Zhuang Zi)

Table 2 lists types and tokens for different functions of 斷 *duàn* in Old Chinese.

Table 2: Types and tokens of 斷 ***duàn***'s functions in Old Chinese

Source	Period	Trans. verb	Intrans. verb	Result. compl.	Adj.	Adv.	Noun
周易 Book of Changes	Western Zhou	8 (8)[6]	0	0	0	0	0
詩經 Odes	Western Zhou	2 (3)	0	0	0	0	0
尚书 The Classic of History	Spring and Autumn	3 (3)	1 (1)	0	0	0	0
孫子兵法 Military Science of Sun Zi	Spring and Autumn	0	0	0	0	0	0
墨子 Mo Zi	Spring and Autumn – Warring Sate	28 (42)	8 (13)	0	0	0	0
論語 Analects	Spring and Autumn – Warring Sate	0	0	0	0	0	0
荀子 Xun Zi	Warring State	7 (8)	10 (11)	0	1 (1)	0	1 (1)
莊子 Zhuang Zi	Warring State	3 (3)	3 (3)	0	0	0	4 (4)
孟子 Mencius	Warring State	2 (2)	2 (2)	0	0	0	0
管子 Guan Zi	Warring State	14 (15)	17 (20)	0	0	0	1 (1)

Perhaps we can pause here and draw a preliminary conclusion: 斷 *duàn* was initially transitive and obtained its intransitive function during the Spring and Autumn

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[6] The number outside of the brackets, ( ), is the type and the number inside of the brackets is the token.

period (772 BC–476 BC). The two functions co-existed for the rest of the Pre-Qin period. Moreover, by the Warring State period, the intransitive use seems to be employed in abundance.

Furthermore, it is assumed that in the Warring State period the transitive 断 *duàn* 'break' was lexicalized and developed the metaphorical meaning of 'judge'. The appearance of adjectival use is only found once in a source written in the period 475 BC–221 BC, therefore it is not yet possible to conclude that it occurred as early as the Warring State period. However, the upcoming discussion of Middle Chinese (Section 4) might provide an answer. The adverb function is not detected in the Pre-Qin period, nor is the resultative complement use.

4   断 in Pre-Middle and Middle Chinese

Having drawn a picture of 断 *duàn*'s evolution in Old Chinese, this section engages in an analysis of Middle Chinese data. Pre-Middle Chinese is a significant period with regard to Chinese linguistics. With the occurrence of disyllabic words (e.g. disyllabic nouns, disyllabic particles and disyllabic verbs), serial verb constructions gradually declined and verb compounds appeared.

There is an ongoing debate on whether serial verb construction (SVC) exists in Chinese. In earlier times, domestic linguists such as Lü (1958) and Ma (1961) argued that the multiple verb constructions in contemporary Chinese are not SVCs but 'complex-predicate constructions'. Lü (1979), Hu and Wen (1990), Chao (1980) welcomed the terminology 'SVC' in modifying multiple verb constructions in contemporary Chinese. Lü (1979) defines SVC as follows: V1 and V2 are carried out by the same agent; the two must be strictly successive; there could be a conjunction between V1 and V2. Yang and He (1992) discussed the relationship between V1 and V2 from a sematic point of view. They offered the following definition. 'The two verbs share the same subject. They must be assigned to the successive relation. Essentially, the two constituents are not syntactically equal, there must be a core constituent, and the other plays the role as a modifier'. This study argues that SVC started declining in Middle Chinese and totally disappeared in contemporary Chinese. The instances that SVC supporters often bring about are 跑上来 'pǎo shàng lái' (run-asend-come), 跑下去 'pǎo xià qù' (run-decend-go), 走进来 'zǒu jìn lái' (walk-enter-come), 爬出去 'pá chū qù' (creep-exit-go). We do not deem them SVCs because syntactically the three constituents are not equal. Third constituents, i.e. 来, 去, are grammaticalized into deictic, merely indicting the direction.

This section first looks back to the devolvement of V-V and then moves on to see *duàn*'s other functions in this period.

4.1   A brief quest to identify the development of Chinese verb compounds

Instances of 斷 *duàn* following an action verb can be traced back as far as the Warring State period. The following piece of data is drawn from *Xun Zi* (475 BC–221 BC).

(17) 斬   **斷**   枯   磔。
　　 Zhǎn   **duàn**   kū   zhé.
　　 Cut   **break** wither dismember
　　 'Behead someone as a warning to others and tear a person asunder by five
　　 carts.'[7]   (Xun Zi)

斬斷枯磔 *zhǎn duàn kū zhé* indicates a punishment in ancient China. Grammaticalization of *duàn* has not yet started; *duàn* functions as a substantive intransitive verb. The combination of the two constituents, i.e. 斬 *zhǎn* and 斷 *duàn*, is rather loose. Their location can be reversed (see *duan-zhan* (18) vs. *zhan-duan* (19)). Four tokens of 斷斬 *duàn-zhǎn* are found in the *History of the Han dynasty* (Eastern Han dynasty AD 36–111).

(18) 衣   繡   杖   斧，   **斷斬**   於   郡國。
　　 Yī   xiù   zhàng fǔ,   **duàn-zhǎn** yú   jùn guó.
　　 Wear splendid clothes hold axe,   **break-cut** DAT   prefecture
　　 'Those who wear splendid clothes and with high status are beheaded in that
　　 prefecture.'   (History of the Han dynasty)

This leads us to contend that the two constituents received equal syntactic weight, and to refer to constructions such as 斬斷枯磔 *zhǎn duàn kū zhé* and 斷斬 *zhǎn duàn* as serial verb constructions (SVCs). Such data were not detected in the Spring and Autumn period, and were only found once in the Warring State period. However, this suggests that atthis time the use of verb compounds in the Chinese language was at an embryonic stage.

In Pre-Middle Chinese it is observed that the main function of *duàn* remained that of a verb (in the Western Han dynasty, transitive verb: 65%; intransitive verb: 33%. In the Eastern Han dynasty, transitive verb: 74%; intransitive verb: 23%). Below is an illustration drawn from 漢書 *History of the Han dynasty*, where *duàn* appears in a coordinate V-V.

(19) 殷   紂   **斷棄**   先祖   之   樂。
　　 Yīn   zhòu **duàn-qì**   xiān-zǔ zhī   lè.
　　 Yin   Zhou **cut.off-abandon** patriarch GEN   enjoyment
　　 'Yin Zhou abandoned the enjoyment that the patriarch had.'
　　 (History of the Han dynasty)

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[7] Legal interpretation: an ancient punishment.

The two constituents, i.e. V1 斷 *duàn* 'break' and V2 棄 *qì* 'abandon', have the same meanings and share equal syntactic status. Similar types of verb compounds are found in *Records of the Three Kingdoms* (Western Jin dynasty AD 265–300), i.e. 斷絕 *duàn-jué* 'cut-off'.

(20) 紹　　　令　　　周昂　　盜居　其　　位，　　**斷絕**　　堅糧。
　　　Shào　　lìng　　zhōu-áng　dào jū　qí　　wèi,　　**duàn jué**　jiān liáng.
　　　Yuan-shao　command　Zhou-ang　usurp　PRON　stronghold,　**cut-off**　　food
　　　'Yuan-shao commanded Zhou-ang to usurp the stronghold and to cut off the food
　　　supply.'　　　　　　　　　　　　　　　　　　　(Records of the Three Kingdoms)

斷絕 *duàn-jué* 'cut-off' is a coordinate V-V, i.e. the two constituents are transitive and have exactly the same meaning, which is 'cut off'. There are 23 tokens of 斷絕 in *Records of the Three Kingdoms*. During the Tang dynasty, coordinate V-V was more common. For instance, there are three tokens of 禁斷 *jìn-duàn* 'forbid-break' found from the Sui dynasty period, but 25 from the Tang dynasty period.

Moreover, 斷 *duàn* in coordinate V-Vs can have the following variations:

(21)　a.　**斷定 *duàn-dìng* 'judge-assert'**
　　　　　Context: 劉端臨、王引之斷定正文之「鄉大夫」亦當作「卿大夫」[8]
　　　　　Translation: 'Liu Duanlin and Wang Yinzhi assert that [Xiang Daifu] refers to
　　　　　[Qing daifu]'

　　　b.　**判斷 *pàn-duàn* 'judge-decide'**
　　　　　Context: 假設甲乙，令其判斷[9]
　　　　　Translation: 'Suppose there are Part A and Part B, we let him/her judge.'

　　　c.　**斷決 *duàn-jué* 'pronounce-sentence'**
　　　　　Context: 判者，斷決百事[10]
　　　　　Translation: 'The judge, is supposed to make judgement on everything.'

To note, *duàn* is transitive in all circumstances (19–21). However, there is a salient distinction between *duàn* in (21) and *duàn* in (19–20): 斷 in (19–20) retains the substantive transitive function and semantically conserves the original meaning 'to

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[8] Detailed explanation:
劉端臨,　　王引之　　**斷定**　　正文　　之　　「鄉大夫」　亦　　當作　　　「卿大夫」
Liú Duānlín,　Wáng Yǐnzhī　**duàn-dìng**　zhèng-wén　zhī　xiāng dàfū　yì　　dāng-zuò　qīng dàfū
Liú Duānlín,　Wáng Yǐnzhī　assert　　text　　GEN　xiāng dàfū　also　interpreted　qīng dàfū

[9] Detailed explanation:
假設　　甲　　乙，　　令　　其　　　**判斷**.
jiǎ shè　jiǎ　yǐ,　　lìng　qí　　**pàn duàn**
suppose　Part A　Part B,　let　him/her　judge

[10] Detailed explanation:
判者，　　**斷決**　　　　百事。
pàn zhě,　**duàn-jué**　bǎi shì
judge,　　make judgement　everything

break'. On the other hand, *duàn* in (21) behaves as a transitive verb at the syntactic level but renders a different semantic properties. We thus assume such *duàn* is lexicalized and conveys a metaphorical meaning, i.e. 'judge'. This suggests that it is the transitive function that is subject to lexicalization.

4.2 斷 *duàn* as a resultative complement

Having briefly touched upon the development of verb compounds, the following sections focus on how 斷 *duàn* developed into a resultative complement. As confirmed in a search of the Pre-Middle Chinese database, by the time of 史記 *The Historical Record* (the Western Han dynasty 109–91 BC), 斷 *duàn* was not yet a resultative complement. It was in 漢書 *History of the Han dynasty* (AD 36–111) that *duàn* was first found to function as such.

(22) 亡　　非　　同類，　　割**斷**　　歷　　久。
　　Wáng　fēi　tong-lèi,　gē-**duàn**　lì　jiǔ.
　　the dead　NEG　same kind,　cut-**broken**　history　long
　　'The dead are not the same kind as us; the relation has been cut off for a long
　　time.'　　　　　　　　　　　　　　　　　　　　　　(History of the Han dynasty)

In the compound 割斷 *gē-duàn* 'cut-down', V1 割 *gē* 'cut' denotes an action and V2 contributes to the result of the action, i.e. 'broken'. A verb weakening is seen in the constituent duàn. The lexical conceptual structure of (22) is as follows:

(23) [x ACT ON y]　CAUSE　[*y* BECOME [*y* BE AT-*z*]]
　　割 *gē* 'cut'　　　　　　　斷 *duàn* 'broken'

This inspires us to see *duàn* as a resultative complement and to further deduce that *duàn* started being grammaticalized in Eastern Han dynasty. Crucially, it is the grammaticalization that turned the intransitive use into the resultative complement. In fact, apart from change-of-state verbs, motion verbs have also revived grammaticalization. Intransitive motion verbs were grammaticalized and turned into directional complement. For instance, 入 *rù* 'enter' originated with both transitive and intransitive uses, as shown by data from *Odes*. The grammaticalization of 入 into a directional complement started in Western Han and continued during the Southern & Northern dynasties. The directional complement 入 *rù* 'enter' may build a predicate-complement V-V with several manners of motion verbs, such as 走 *zǒu* 'walk' (走入 *zǒu rù* 'walk-into': 145 tokens). Intriguingly, the combination of [manner of motion V + directional complement] can be rather productive, i.e. the manner verb may form predicate-complement V-Vs with a number of directional complements, such as 出 *chū* 'exit' (c.f. 走出 *zǒu chū* 'walk-exit') for example. On the other hand, directional complements may also form a number of predicate-complement V-Vs in combination with any manner verb. For instance, 跑 *pǎo* 'run', cf. 跑出 *pǎo chū* 'run-out'.

The following data provide another illustration of a case where *duàn* plays the role of a complement:

(24) 已　　捕　　斬　　**斷**　　信　二子　　穀鄉侯章，　　　德廣侯鮪。
　　　Yǐ　bǔ　　zhǎn　**duàn**　xìn　èr zǐ　　yù xiāng hóu zhāng, dé guǎng hóu wěi
　　　ADV　arrest　behead　**broken**　Xin　2 sons　Yuxianghouyhang　　Deguanghouwei
　　　'Have arrested and beheaded Xin's two sons, Yuxianghouzhang and
　　　Deguanghouwei.'　　　　　　　　　　　　　　　　(History of the Han dynasty)

The first two constituents, i.e. 捕 *bǔ* 'arrest' and 斬 *zhǎn* 'behead', are in a successive relation, and convey action while 斷 *duàn* renders the result 'broken'. Morphologically, the first two constituents carry equal weigh and the third constituent, 斷 *duàn*, renders the result of an action. In another work from the Eastern Han dynasty period, i.e. 釋名 *The Book of Title Explanation* (AD 19–210), 断 *duàn* is found playing the complement role in V-V 斬斷 *zhǎn-duàn*:

(25) 斧　以　　斬**斷**，　　　見　者　皆　感懼　　　也。
　　　Fǔ　yǐ　　zhǎn-**duàn**, jiàn zhě jiē qì-jù　　yě.
　　　Axe post cut-**broken**, see PRON all frightened EXCL
　　　'Beheaded by axe. Everyone saw the execution. They were all frightened.'
　　　　　　　　　　　　　　　　　　　　　　(The Book of Title Explanation)

Note that the semantic role of the particle 以 *yǐ* here is that of a *tool*: it appears after the noun and forms a postpositional phrase '斧以 *fǔ yǐ* N+POST', which in contemporary Chinese would be prepositional phrase '以斧 *yǐ fǔ* PREP + N (by axe)'. Moreover, 感懼 *qì-jù* is a coordinate intransitive V-V, meaning 'be frightened of'.

In 後漢書 *Book of the Later Han* (AD 420–445), two tokens of 斷 *duàn* are found functioning as a resultative complement in 斬斷 *zhǎn duàn*:

(26) 執　　足　　斬　**斷**。
　　　Zhí　zú　　zhǎn　**duàn**.
　　　twine feet cut **break**
　　　'His twine feet were chopped off.'　　　　　　　　　　(Book of the Later Han)

During the Western Jin dynasty (AD 266–316), *duàn*'s function as a resultative complement became very productive. An illustration is given in (27):

(27) 有　　龍淵[11]　　之　利,　　乃　可以　　議於　割**斷**。
　　　Yǒu　long-yuān zhī lì,　　nǎi kě-yǐ　yì yú　gē-**duàn.**
　　　Have Long-Yuan gen keenness, CONJ be able to　sever-**broken**
　　　'It seems to be as keen as the Long-Yuan sword and therefore capable of cutting
　　　down everything.'　　　　　　　　　　　　(Records of the Three Kingdoms)

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[11] 龍淵 *long-yuān* 'Long Yuan' refers to a famous sword made in the Spring and Autumn period.

Only two tokens of a resultative complement use are detected in the database of Pre-Middle Chinese. The chief function of *duàn* remains verbal, of which 135 tokens represent a transitive verb and 51 tokens an intransitive verb. In Middle Chinese, the use of the resultative complement increased, i.e. 54 tokens are detected. This suggests that *duàn*'s transition to a resultative complement began in Pre-Middle Chinese, specifically during the Eastern Han dynasty. Essentially, it is in regard to the intransitive function of *duàn* that grammaticalization took place. Figure 2 summarises the grammaticalization path during Middle Chinese:

Transitive use	→	preserved
Intransitive use	→	(i) retained
		(iii) grammaticalized as a *resultative complement*

Figure 2: The grammaticalization path of the Chinese verb 斷

4.3 斷 *duàn* as a noun

Recall that in Pre-Qin works, i.e. *Xun Zi*, *Guan Zi* and *Zhuang Zi*, six tokens of *duàn* being used as a noun were detected. It was during the Western Han dynasty that *duàn* started to function as a noun. The transition continues in Middle Chinese. There are 14 tokens in *Records of the Three Kingdoms* (Western Jin dynasty: AD 265–300); 40 tokens in *Tong Dian* (Tang dynasty AD 801); 11 tokens in *The Analects of Four Confucian Classics* (Southern Song dynasty AD 1150–1200). Below is an illustration from *Records of the Three Kingdoms*:

(28) 袁術　　勇　　而　　無　　**斷。**
　　　Yuán-shù　yǒng　ér　　wú　　**duàn.**
　　　Yuan Shu　brave　CONJ　lack　**decisiveness**
　　　'Yuan Shu is brave but lacks decisiveness.'　　　　(Records of the Three Kingdoms)

The following is taken from 四書章句集注 *The Analects of Four Confucian Classics*, where 斷 *duàn* is found in a compound noun 間斷 *jiān-duàn*, meaning 'interruption'. Six tokens of 間斷 *jiàn-duàn* is found in *The Analects of Four Confucian Classics*.

(29) 不　　可　　略　　有　　間**斷**　　也。
　　　Bú　　kě　　luè　　yǒu　　jiān-**duàn**　yě.
　　　NEG　possible　slightly　have　**interruption**　EXCL
　　　'Even a slight interruption is disallowed.'
　　　　　　　　　　　　　　　　　(The Analects of Four Confucian Classics)

In fact, *duàn* as an individual morpheme and functioning as noun is mostly seen in Old Chinese and Middle Chinese. In its function as a noun it appears rather rarely in Contemporary Chinese. In the Modern Chinese (http://ccl.pku.edu.cn/) corpus, 300

tokens of individual *duàn* were detected, however, not a token is found behaving as a noun.

4.4 断 *duàn* as an adverb

The adverbial function of 断 *duàn* is not detected until Middle Chinese. Its first appearance was found in 容斋三笔 *The Three Writings in RongZhai* (Southern Song dynasty: AD 1123–1202) in the form of a compound adverb, 断然 *duan-ran* 'absolutely'. An illustration is provided in (30):

(30) 后汉　　　　　　　中　　所　　载　　固¹² 　之　　文章，
　　　Hòu-hàn　　　　　zhōng　suǒ　zǎi　gù　　zhī　wénzhāng.
　　　Book of the Later Han　inside　PART　record　Bangu　GEN　paper,

　　　断然¹³　　　　　如　　出　　两　　手。
　　　duàn-rán　　rú　　chū　liǎng　shǒu
　　　absolutely　like　from　two　source

　　　'The papers in the *Book of the Later Han* are entirely different from those (in the Book of Han).'　　　　　　　　　　(The Three Writings in Rong Zhai)

In *Tong Dian* (Tang dynasty 801) *duàn* as an adverb is often found combined with a modal auxiliary 可 'could'. They together render the meaning of 'definitely could'.

(31) 以　　此　　徵　　之，　　断　　　可　　識　　　矣。
　　　Yǐ　　cǐ　　zhēng　zhī,　**duàn**　kě　　shí　　yǐ.
　　　Use　this　detect　PRON,　**absolutely**　could　recognize　EXCL

　　　'From this, we shall absolutely recognise it.'　　　　　　　　(Tong Dian)

There are nine tokens of the adverbial use in *Tong Dian* and one in *The Analects of Four Confucian Classics.* It seems that the *duàn*'s adverbial function was not very productive in the Middle Chinese period. In fact, it is in Pre-Modern Chinese, specifically during the Qing dynasty, that *duàn* was mostly employed as an adverb. Section 5 will delve into this in detail.

4.5 断 *duàn* as an adjective

The following data present a further aspect, illustrating cases of 断 *duàn* being employed as an adjective:

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[12] 固 *gù* refers to 班固 *Bān Gù*, a historian during the Eastern Han Dynasty.

[13] Here 斷然 *duànrán* together forms an adverb. 然 *rán* functions as a suffix in this sentence, indicating the state. 然 *rán* originally is a pronoun, meaning 'this'. It is a result of grammaticalization, which took place in Early Middle Chinese. Other illustrations of this use are: 猝然 *cù-rán* 'suddenly'，陡然 *dǒu-rán* 'unexpectedly'，猛然 *měng-rán* 'abruptly'，骤然 *zhòu-rán* 'suddenly'.

(32) 腸　皆　寸寸[14] **斷**。

    Cháng   jiē   cùn cùn   **duàn.**

    Intestines all   very short   **broken**

    'The intestines are all broken.'

    (A New Account of the Tales of the World: AD 420–581)

(33) 以　剛　**斷**　稱。

    Yǐ   gang   **duàn**   chēng

    PREP manful **decisive** known

    'Be known as tough and decisive.'   (Records of the Three Kingdoms)

Nine tokens were found in Records of the Three Kingdoms, 12 tokens in Tong Dian, and six tokens in The Analects of Four Confucian Classics. Table 3 summarises the types and tokens of the various functions of *duàn* in Pre-Middle and Middle Chinese.

Table 3: The type and (token) of *duàn*'s various functions in Pre-Middle and Middle Chinese

Source	Period	Tran. verb	Intran. verb	Result. compl.	Adj.	Adv.	Noun
史記 *The Historical Records*	Western Han	38 (43)	10 (22)	0	0	0	1 (1)
漢書 *History of the Han dynasty*	Eastern Han	63 (92)	13 (29)	2 (2)	0	0	1 (1)
世説新語 *A New Account of the Tales of the World*	Southern and Northern dynasties	8 (8)	4 (5)	2 (2)	1 (1)	0	1 (1)
三國志 *Records of the Three Kingdoms*	Western Jin	78 (110)	14 (33)	16 (20)	6 (9)	0	8 (14)
通典 *Tong dian*	Tang	122 (213)	89 (149)	7 (31)	8 (12)	7 (9)	19 (40)
四書章句集注 *The Analects of four Confucian Classics*	Southern Song	8 (10)	6 (9)	1 (1)	5 (6)	1 (1)	6 (11)

5 Pre-Modern Chinese

Pre-Modern Chinese period is the time when the resultative complement, noun, adjective, adverb significantly developed. 红楼梦 *Dream of Red Mansions* is a long novel, completed during the Qing dynasty (AD 1350–1400). Among the 145 斷 *duàn* tokens in the novel, transitive use is found 17 types, 24 tokens; and the intransitive use is 14 types, 16 tokens. The following sections particularly address *duàn*'s functions of resultative complement, noun, adjective and adverb.

5.1 斷 *duàn* as a resultative complement

斷 *duàn*'s function as a resultative complement in this period is productive. There are 47 tokens found in 三國演義 *Romance of the Three Kingdoms* (Ming dynasty AD 1780–

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[14] 寸: 1/3 decimetre. It used to describe the degree of brokenness.

1792). On the other hand, there are only 14 tokens found in 红楼梦 *Dream of the Red Chamber*, a novel completed in Qing dynasty. A typical example is provided in (34):

(34)　一　　　戟　　　砍斷　　　安國　　　手腕。
　　　Yī　　jǐ　　　kǎn-**duàn** ān-guó　shǒu-wàn.
　　　One　halberd　cut-down　An-Guo　wrist
　　　'Cut down the wrist of General An Guo with one halberd.'

<div align="right">(Romance of the Three Kingdoms)</div>

Apart from the above verbs, the database further reveals 斷 *duàn's* forming V-Vs with the following action verbs: 射斷 *shè-duàn* 'shoot-broken', 剖斷 *pōu-duàn* 'dissect-broken', 截斷 *jié-duàn* 'sever-broken'; 拗斷 *niù-duàn* 'bend-broken', 絕斷 *jué-duàn* 'sever-broken'; 遮斷 *zhē-duàn* 'intercept-broken', 燒斷 *shāo-duàn* 'burn-broken', 塞斷 *sè-duàn* 'stuff-broken', 拆斷 *chāi-duàn* 'dismantle-broken', 隔斷 *gé-duàn* 'separate-broken'. These V-Vs have the following features:

First, they may be transitive or intransitive, e.g. (35).

(35)　a. 拆斷 **as transitive V-V**
　　　待　　我　引　張任　　　過　橋，　你　便　將　　橋　　　拆斷。
　　　Dài　wǒ　yǐn　zhāng-rèn　guò　qiáo，nǐ　biàn　jiāng　qiáo　chāi-**duàn.**
　　　after　I　guide　Zhangren　cross　bridge，you　then　AUX　bridge　dismantle-**broken**
　　　'After I guide Zhang Ren across the bridge, please dismantle the bridge.'

　　　b. 拆斷 **as intransitive V-V**
　　　急　　回　　軍　　時，　橋　　已　　　拆斷　　　　　了。
　　　Jí　　huí　jūn　shí，　qiáo　yǐ　　chāi-**duàn**　　le.
　　　Hurry　return　army　time，bridge　already　dismantle-**broken**　PERF
　　　'When I hurried back to the army, I found the bridge already dismantled.'

<div align="right">(Romance of the Three Kingdoms)</div>

Second, they are very productive and can be subcategorised into the cause-effect syntactic V-V. As we can see from the above instances, V1s denote the cause and are conveyed by an agentive verb, e.g. *jie* 'sever', *shao* 'burn'. V2s contribute to the change of state and entail an endpoint of a change-of-state event, and would, in the light of scalar structure (c.f. Kennedy and McNally 2005), be regarded as closed-scale morphemes. As a result, this study considers V2 to be the head of this type of V-V. A thorough analysis of the development of Chinese verb compounds seems necessary. However, in this paper, this issue will not be pursued any further. We leave this for future study.

5.2　斷 *duàn* as a noun

In the database, there are 12 tokens found in *Romance of the Three Kingdoms* (AD 1350–1400) and four in *Dream of Red Mansions* (AD 1780–1792). Typical examples are (36) and (37):

(36) 袁紹　　好　　謀　　無　**斷,**　　　不　足　　為　　慮。

Yuán-Shào hào móu wú **duàn,** bú zú wéi lǜ.

Yuan Shao fond of strategy lack **decisiveness**, NEG deserve PERP worry

'Yuan Shao is good at planning but can not make decisions, therefore he is not to be worried about.' (Romance of the Three Kingdoms)

(37) 以　　十　尺　　為　**斷**。

Yǐ shí chǐ wéi **duàn.**

post ten feet as **measure**

'Make ten feet as a measure.' (Annotation on Mo-tse)

5.3 斷 *duàn* as an adverb

In *Romance of the Three Kingdoms*, three tokens of adverb use were detected.

(38) 三者　　　　缺一，　**斷**　　　不　肯　　降。

Sān zhě quē yī, **duàn** bú kěn jiàng.

Three conditions lack one, **absolutely** NEG agree capitulate

'(They) won't capitulate unless the three demands are met.'

(Romance of the Three Kingdoms)

In *Dream of Red Mansions* 74 tokens of an adverbial use were found. (39) is an illustration:

(39) 因　叫　我　回　大爺，今日　**斷**　　不　能　　來　　了。

Yīn jiào wǒ huí dà-yé, jīn-rì **duàn** bú néng lái le.

CONJ ask me reply lord, today **definitely** NEG AUX come EXCL

'(He) asked me to reply to the lord that today he is definitely unable to come over.'

Duàn here modifies the negative modal auxiliary 不能 *bú-néng* 'can not' meaning 'definitely'. We also observed that by the time of the Qing dynasty (AD 1644–1912), disyllabic roots (e.g. 大爺 *dà-yé* 'lord', 今日 *jīn-rì* 'today') seem to have entirely replaced the monosyllabic word roots that were used around 1200 BC.

5.4 斷 *duàn* as an adjective

Adjective use was detected for 12 types (13 tokens) in *Dream of Red Mansions*, as exemplified by (40):

(40) 你　看　　這　斷紋，　　　不　是　牛旄　似　　　的　麼？

Nǐ kàn zhè **duàn**-wén, bú shì niú-máo sì de me.

You look at this **broken**-line, NEG COP yak resemble PART EXCL

'Look at these lines, don't they resemble the yaks?'

Duàn modifies the noun 紋 *wén* 'line'. The relative marker 的 *de* may be added after *duàn*, i.e. 断的紋 *duàn-de-wén* 'the broken line'.

The foregoing discussion is based upon the findings provided in Table 4.

Table 4: The type and (token) of 断's various functions in Pre-Modern Chinese

Source	Period	Trans. verb	Intrans. verb	Result. compl.	Adj.	Adv.	Noun
三國演義 *Romance of the Three Kingdoms*	Ming dynasty	10 (70)	19 (79)	24 (47)	0	3 (3)	8 (12)
红楼梦 Dream of Red Mansions	Qing dynasty	17 (24)	14 (16)	9 (14)	12 (13)	22 (74)	2 (4)

Table 5 presents the percentage of each function of *duàn* from Old Chinese to Pre-Middle and Middle Chinese.

Table 5: The percentage of each function of duàn from Old Chinese to Pre-Middle and Middle Chinese

Period	Tran. verb	Intran. verb	Result. compl.	Adj.	Adv.	Noun	Total (token)
Western Zhou	100%	0	0	0	0	0	11
Spring and Autumn - Warring State	56%	38%	0	1%	0	5%	130
Western Han	65%	33%	0	0	0	2%	66
Eastern Han	74%	23%	2%	0	0	1%	124
Southern and Northern dynasties	47%	29%	12%	6%	0	6%	17
Western Jin	59%	18%	11%	5%	0	8%	186
Tang	47%	33%	7%	2%	2%	9%	454
Southern Song	26%	23%	3%	16%	3%	29%	38
Ming dynasty	33%	37%	22%	0	1%	6%	211
Qing dynasty	16%	11%	10%	9%	51%	3%	145

At the stage of Pre-Modern Chinese, *duàn* has grown into a polysemous lexeme, combining transitive, intransitive, resultative complement, adjectival, adverbial, and nominal function together. We may contend that the rudiment *duàn* in contemporary Chinese was shaped during the Pre-Modern Chinese period.

6   Conclusion

This paper discussed the evolution of the Chinese verb *duàn*, exploring how it transformed from being a substantive transitive verb to the verb of various functions in contemporary Chinese (i.e. a resultative complement, an adjective and an adverb). Findings reveal that *duàn* was initially transitive and took on its intransitive function during the Spring and Autumn period (772–476 BC). The two functions co-existed for the rest of the Pre-Qin period and they remained so in Middle Chinese. *Duàn*'s

transition into a resultative complement began during the Eastern Han dynasty and became productive in Middle Chinese. *Duàn* developed functioning as a noun in the Warring State period, while its adjectival and adverbial functions began in Middle Chinese.

Although some transitions took place during overlapping periods, they developed via two separate paths: the process by which the intransitive verb *duàn* developed into a resultative complement, an adverb, and an adjective was grammaticalization; the process by which *duàn* developed into a noun was a case of lexicalization. Essentially, it was the intransitive function that became the subject to grammaticalization; it was the transitive function that was subject to lexicalization. Table 6 presents a summary of the two evolutions. Path A indicates the trajectory of grammaticalization and Path B denotes the trajectory of lexicalization.

Table 6: Stages of development for *duàn*

	Timetable	Path A Lexicalization	Path B Grammaticalization
i	Western Zhou	**Transitive use**	
ii	Spring and Autumn		**Intransitive use**
iii	Warring State	*semantic change:* lexicalized, meaning 'judge'	
iv	Western Han	*syntactic change:* lexicalized as a noun (judgement)	
v	Eastern Han and Southern and Northern dynasties		*syntactic change:* grammaticalized as a resultative complement
vi	Southern Song dynasty		*syntactic change:* grammaticalized as an adverb
vii	Middle Chinese		*syntactic change:* grammaticalized as an adjective

A proposal to treat the diachronic change as a cline is put forward as follows: (a) grammaticalization and lexicalization are not distinct processes but rather happen to a lexeme at the same point; and (b) the interrelationship of the two processes is orthogonal.

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Sturgeon, D. (n.d.). Chinese Text Project. Retrieved from https://ctext.org/

Old Chinese (The texts are listed according in chronological order)			approx. word count
周易	*The Book of Change*	1046–771 BC, Western Zhou	5,000
詩經	*Odes*	1046–771 BC, Western Zhou	39,234
尚書	*The Classic of History*	772–476 BC, Spring and Autumn	25,700
孫子兵法	*Military Science of Sun Zi*	515–512 BC, Spring and Autumn	6,111
論語	*Analects*	480–350 BC, Spring and Autumn - Warring State	11,705
墨子	*Mo Zi*	490–221 BC, Spring and Autumn - Warring State	76,516
荀子	*Xun Zi*	475–221 BC, Warring State	90,800
莊子	*Zhuang Zi*	350–250 BC, Warring State	65,000
孟子	*Mencius*	340–250 BC, Warring State	34,685
管子	*Guan Zi*	475 BC–AD 220, Warring State - Han Dynasty	117,000

Pre-Middle and Middle Chinese			
史記	*The Historical Records*	109–91 BC, Western Han Dynasty	526,500
漢書	*History of the Han Dynasty*	AD 36–111, Eastern Han Dynasty	742,298
釋名	*The Book of Title Explanation*	AD 190–210, Eastern Han Dynasty	
三國志	*Records of the Three Kingdoms*	AD 265–300, Western Jin Dynasty	377,803
後漢書	*Book of the Later Han*	AD 420–445, Southern and Northern Dynasties	894,020
世說新語	*A New Account of the Tales of the World*	AD 420–581, Southern and Northern Dynasties	79,000
通典	*Tong dian*	AD 801, Tang Dynasty	3,218,000
容斋三笔	*The Three Writings in RongZhai*	AD 1123–1202, Southern Song Dynasty	1,428, 000
四書章句集注	*The Analects of four Confucian Classics*	AD 1150–1200, Southern Song Dynasty	280, 418
Pre-Modern Chinese			
三國演義	*Romance of the Three Kingdoms*	AD 1350–1400, Ming Dynasty	590,000
红楼梦	*Dream of Red Chambers*	AD 1780–1792, Qing Dynasty	730,000

Abbreviations

ADV   adverb
AUX   auxiliary
CONJ   conjunction
COP   copula
DAT   dative
EXCL   exclamation
GEN   genitive
NEG   negative
PART   particle
PREP   preposition
PRON   pronoun
SUF   suffix

On Perfective *-le* in Mandarin Chinese: Theoretical and Pedagogical Issues

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Abstract

Although Mandarin Chinese perfective *-le* has been extensively studied in the literature, views on its linguistic properties nevertheless remain controversial. In this study, I first discuss the temporal function of perfective *-le* and provide an alternative account. In the spirit of Klein's (1994) approach regarding different temporal intervals, I demonstrate that the core function of this suffix is to indicate that one event occurs *after* another. I then address the issue of the English translation of perfective *-le* in a Chinese as a foreign or second language class and argue that English present perfect construction may not represent the translation correctly. The proposal not only gives a more straightforward definition of the perfective *-le*, but also provides a simpler way for the instruction of the suffix.

Keywords: Chinese perfective -*le*; tense and aspect; temporal intervals; Chinese language pedagogy

Povzetek

Kljub temu, da je kitajski dovršni *-le* že dodobra raziskan, mnenja o njegovih jezikovnih lastnostih ostajajo različna. V tej študiji se najprej osredotočamo na časovno funkcijo omenjenega dovršnika in predlagamo drugačen pristop. Po Kleinovi metodi različnih časovnih intervalov (Klein, 1994) prikažemo, da je ključna naloga pripone *-le* sporočanje, da se en dogodek pojavi *po* drugem dogodku. Zatem obravnavamo še prevode dovršnega *-le* v angleščino, kjer ugotavljamo, da njegova pretvorba v obliko sedanjega dovršnika (angl. *present perfect*) ni najbolj ustrezna. V članku predlagamo novo definicijo kitajskega dovršnega –*le*, ki hkrati omogoča enostavno razlago pri poučevanju.

Ključne besede: kitajski perfektivni -*le*; čas in aspekt; časovni intervali; poučevanje kitajskega jezika

1   Introduction

As a language that is pragmatically driven (Li & Thompson, 1981), Chinese grammar shows several inconsistent properties. For example, verbal suffix *-le*, which functions as a perfective morpheme (e.g., Smith, 1997; Huang, Li & Li, 2009), is required in a

sentence like (1a); however, in a sentence such as (1b), which is modified by the same temporal adverbial *zuotian* 'yesterday' the suffix is not required:

(1) a. 王五　　　昨天　　　在家　　　写了　　　一封信。
    Wangwu　zuotian　zai jia　xie-le　yi feng xin.
    Wangwu　yesterday　at home　write-PRF　one CL letter
    'Wangwu wrote one letter at home yesterday.'

    b. 王五　　　昨天　　　在家　　　写　　　信。
    Wangwu　zoutian　zai jia　xie　xin.
    Wangwu　yesterday　at home　write　letter
    'Wangwu wrote letters at home yesterday.'

A related problem regarding Chinese perfective *-le* is its interpretation in English. Observe the sentences in (2) and (3) below:

(2) 李四　吃了　三　碗　炒饭。
    Lisi　chi-le　san　wan　chao fan.
    Lisi　eat-PRF　three　CL　fry rice
    i. 'Lisi ate three bowls of fried rice.'
    ii. 'Lisi has eaten three bowls of fried rice.'

(3) 李四　昨天　　　吃了　三　碗　炒饭。
    Lisi　zuotian　chi-le　san　wan　chao fan
    Lisi　yesterday　eat-PRF　three　CL　fry rice
    i. 'Lisi ate three bowls of fried rice yesterday.'
    ii. *'Lisi has eaten two bowls of fried rice yesterday.'

As shown, the sentence in (2), which does not contain any temporal adverbials, can have two different English interpretations according to some studies and textbooks: one interpretation with English past-tense and the other with English present perfect. In contrast, a sentence like (3), which has a temporal adverb *zuotian* 'yesterday' can only have the past-tense interpretation given that the adverbial *yesterday* is incompatible with the present perfect in English. This constraint seems to suggest that *-le* is not completely equivalent to the perfect construction in English (at least, the present perfect) given that this suffix can appear in a sentence containing a temporal adverbial such as *zuotian* 'yesterday'. Moreover, according to Portner (2003), English perfect construction has additional pragmatic contributions in addition to its semantic properties. My observation is that perfective *-le* does not have similar pragmatic contributions and I will give more details later in Section 3.

The sentences in (1) to (3) demonstrate the grammatical complexity of perfective *-le* in Chinese. Although numerous studies have discussed both the theoretical aspect of the suffix (e.g., Shi, 1989; Smith, 1997; Sybesma, 1999; Wu, 2004; Ljungqvist, 2007; Soh & Gao, 2007; Huang, Li & Li 2009; among many others) and CFL/CSL learners' acquisition of the suffix (e.g., Wen, 1997; Teng, 1999; Duff & Li, 2002; Ke, 2005; among

others), nevertheless, the grammatical inconsistency of perfective -le and its correct translations presented above still cause CFL/CSL learners some challenges. As a result, how to instruct the grammar in a more systematic way is one of the priorities that CFL/CSL instructors must consider in the classroom.

This study attempts to address issues related to the semantic properties of Chinese perfective -le and problems that CFL/CSL instructors may face while teaching the translation of the verbal suffix. I will first discuss the main semantic function of the suffix. I follow the proposals regarding grammatical items related to temporal relations like tense and aspect made by Klein (1994), Demirdache and Uribe-Etxebarria (2004, 2007, 2014), and Arche (2014) and argue that the main function of -le is simply to order two temporal intervals. I will then discuss the proper English translation of perfective -le. I deliberate the difference between the *perfective aspect* and the *perfect* construction and demonstrate that a clarification of the differences between these two grammatical items will assist CFL/CSL learners' acquisition of perfective -le.

The paper is organized as follows. After giving an introduction of the scope of the current study in section 1, I review previous studies related to the current discussion in section 2. In section 3, I address theoretical and pedagogical issues regarding the suffix -le and discuss the core function of this suffix and show several problems of using grammatical terms in English to teach this suffix. Several pedagogical implications about perfective -le are presented in Section 4. Finally, section 5 gives a summary and conclusions.

2   Theoretical background

Previous studies have argued that the main function of the suffix -le is to signal the perfective aspect in Mandarin Chinese (e.g., Li & Thompson, 1981; Smith, 1997; Huang, Li & Li, 2009; among many others). As demonstrated in the sentences in (2) and (3), a sentence with this suffix is sometimes translated into the perfect construction in English in some textbooks. However, the perfective aspect and the perfect construction are in fact two different types of grammatical constructions. To clarify the confusion, I review several previous studies that have dealt with these two types of grammatical constructions in this section. However, there is a considerable literature on this topic. My main goal here is not to cover the full range of connotative and contextual meanings, but to present the basic meaning and form of these two types of grammatical constructions.

2.1   The perfective aspect

The term *aspect* traditionally refers to grammaticalized viewpoints like the perfective aspect and the imperfective aspect. Recently, the range of the term has broadened so that it also includes temporal properties of situations or situation types (i.e., different types of verbs). According to Comrie (1976), the perfective aspect indicates the view of a situation as a single whole, without distinction of the various separated phrases that make up that situation. Similarly, Smith (1997) argues that the perfective aspect mainly focuses on a situation in its entirety, including both initial and final points. Therefore, according to Smith, the general schema for the perfective viewpoint aspect is given in (4) below:

(4)   The general schema for the perfective aspect
        I   F
        //////////////

The capitalized 'I' in (4) represents the 'initial point' of a situation, and 'F' represents the 'final point.' As shown, a sentence with the perfective aspect focuses on a situation as a whole; the span of the perfective includes both the initial and the end points of the situation. In informal terms, it represents a closed event.

Smith (1997) further claims that the perfective aspect is incompatible with an assertion whose event is ongoing. The perfective viewpoint indicates that the event it interacts with is either terminated or complete, depending on the type of verb class to which the event belongs.[1] For example, the English perfective aspect indicates that an event is terminated when it is combined with an Activity, as demonstrated in (5a). John's swimming must be terminated at the moment of the utterance. In contrast, combining with a telic event such as an Accomplishment or Achievement, the perfective aspect indicates that the event is completed, as demonstrated by the sentences in (5b) and (5c):

(5)   a. John swam.   (Activity)
        b. John wrote a letter.   (Accomplishment)
        c. John won the race.   (Achievement)

In contrast, stative sentences with the perfective aspect are flexible in interpretation. For example, observe the sentence in (6):[2]

(6)   Sam owned three mansions.   (State)

---

[1] The different types of verbs presented here are based on Vendler's (1967) classification. According to Vendler, verbs can be generally grouped into four classes depending on their aspectual properties: Activity, State, Accomplishment, and Achievement.

[2] Note that the sentence in (6) is perfective although it does not contain an overt perfective marker. According to Demirdache and Uribe-Etxebarria (2004), sentences like (6) in English contain morphological tense, but do not have morphological aspect.

On one reading, (6) conveys an open interpretation; that is, the state of Sam's owning three mansions has not ended and continues into the present; therefore, it is not contradictory to say *John owned three mansions before, and he still does now*.[3] The sentence in (6) is also compatible with a situation in which the state of Sam's owning three mansions has ended before the speech time. This is the closed interpretation of (6); therefore, one can say without contradiction that *Sam owned three mansions, but he no longer owns them*.

Morphologically, according to Comrie (1976), languages use specific forms to express the perfective aspect. For example, English generally uses the *simple past* to express the perfective viewpoint aspect. The sentences in (5) and (6) all contain this form. Other languages such as French have more than one perfective form. For example, Smith (1997) indicates that the French *passé composé* and *passé simple* both convey the perfective viewpoint aspect.

Finally, many previous studies have attempted to map the perfective aspect and the imperfective aspect onto syntax. For example, Travis (2005, 2010) argues that there is a functional phrase, Outer Aspect Phrase, that is projected above the vP, and it is this functional phrase that encodes the perfectivity of an event. According to Travis, when a sentence has the perfective aspect, the head of Outer Aspect Phrase contains the feature [+perfective]. In contrast, when a sentence has the imperfective aspect, the functional phrase contains the feature [-perfective]. Therefore, the syntactic distributions of these two aspect phrases outlined by Travis can be represented in (7):

(7) [OutAspP $_{(\pm)\text{PERFECTIVE}}$ [vP…   [VP…   ]]]

As illustrated, Outer Aspect Phrase (OutAspP) is a functional phrase that is projected above vP. It is encoded with the feature related to (im)perfectivity.

According Huang, Li & Li (2009), like English, Chinese also allows recursive functional phrases related to aspect. The sentence in (8) offers an example in English, and (9) in Chinese:

(8) Mary has been eating the roast duck.

(9) 李四　没　　有　　吃过　　牛肉。
Lisi　mei　you　chi-*guo*　niurou.
Lisi　not　have　eat-guo　beef
'Lisi did not eat beef (before now).

---

[3] However, the more salient interpretation for the open reading is that Sam owns three mansions that are different from previous ones; nevertheless, the sentence may still indicate that Sam owns the same three houses.

As showed in (8), the sentence contains both the perfective auxiliary *have* and the progressive *be*. This indicates that there are two functional phrases related to viewpoint aspect in the inflectional domain. Similarly, the Chinese sentence in (9) also conveys two types of aspectual information. First, the particle *you* 'HAVE' signals the perfectivity of the event. Second, the Experiential *-guo* indicates a past experience (Li & Thompson, 1981). To account for the coexistence of the two types of aspectual particles in the sentence in (9), Huang, Li & Li (2009) suggest that a clause may contain as many aspectual phrases because there are identifiable aspectual markers.

2.2   The perfect construction

The perfect construction is generally used for constructions that have a temporal and aspectual meaning, whether or not they are involved with tense. The sentences in (10) give a demonstration of sentences containing the perfect construction in English:

(10) a. John has eaten three apples.   (present)
        b. John had eaten three apples when Mary entered the living room. (past)

As demonstrated, although the two sentences n (10) have different tenses, they both contain the perfect construction, which is morphologically expressed by the auxiliary verb *have* and the participle *en*, attached to the main verb.

According to Smith (1997), there is a difference between the perfect construction and the perfective aspect. The perfect refers to a special construction with particular temporal and aspectual characteristics; the perfective aspect, on the other hand, refers to a closed aspectual viewpoint. In general, language uses a specific form to express the prefect construction. For instance, as presented, English often uses the auxiliary verb *have* along with the participle *en* to convey the perfect value. The main semantic function of the perfect is to indicate that a given situation occurs or holds prior to the Reference Time (RT). The sentences in (11), taken from Smith's work, give a demonstration:

(11) a. Now John has arrived.   (present)
        b. Last Saturday John had (already) arrived.   (past)
        c. Next Saturday John will have already arrived.   (future)

As shown, the three sentences in (11) all contain the perfect construction with different types of tenses. However, in all these three examples, the event [John arrive] occurs before the RT. In (11a), John's arrival occurred before the RT, which is modified by the temporal adverb *now*. In other words, John's arrival occurred before the sentence is produced. In contrast, the RT in (11b) is last Saturday and John's arrival took place before last Saturday. Finally, the perfect can appear in the future as (11c) shows. In this case, John's arrival will occur any time before next Saturday.

In addition to the temporal function discussed above, there are several different "special" readings that are associated with the perfect construction. Observe the sentences in (12) below:

(12) a. Mary has lived in London for five years.   (Continuative Perfect)
      b. Mary has read *Dream of the Red Chamber*.   (Resultative Perfect)

As can be seen, a sentence like (12a), containing a stative event *live* and the adverbial *for 5 years*, has a continuative perfect reading in which Mary very likely still lives in London when the sentence is produced. Previous studies such as Bäuerle and von Stechow (1980) and Portner (2003) have argued that the syntactic position of the adverbial and the semantic features of a stative event can explain the continuative reading signaled by the adverbial.

Another additional reading that is associated with the perfect construction is the 'resultative' reading and the sentence in (12b) above gives a demonstration. The sentence has a resultative perfect reading in which Mary's reading of the novel has caused some result and some effect to the current situation. For example, Mary can give an introduction about the complexity of Chinese family relationships because she has read the novel.

One final grammatical constraint shown by the English present perfect is its incompatibility with purely past-time adverbials like *yesterday* in (13a):

(13) a. *John has eaten two sandwiches yesterday.
      b. John has eaten two sandwiches today.

As (13) shows, the present perfect is only compatible with the adverbial *today* but not *yesterday*. Previous studies such as Giorgi and Pianesi (1997) provided a syntactic approach and argued that the sentence in (13a) is unacceptable due to a syntactic incompatibility between the present tense and past adverb. This approach also explains why (13b) is acceptable. However, studies such as Portner (2003) argue that the incompatibility is due to pragmatic reasons.

That the present perfect and past-tense like adverbs such as *yesterday* are incompatible in English has important pedagogical implications for Chinese perfective *-le*. As stated in section 1, the suffix has been translated into the present perfect in English by some studies and textbook. However, as demonstrated in (1), perfective *-le* is compatible with past-tense like adverbs such as *zuotian* 'yesterday'. This raises the question whether or not sentence containing this suffix should be translated into English present perfect. In section 3, I will show that sentences like (2) should not be translated as English perfect construction as perfective *-le* in Chinese does not have the same pragmatic properties as English perfect construction.

2.3   Klein's (1994) temporal intervals

With respect to the functions of perfective *-le* in Chinese, the theoretical framework assumed in this study is based on what has been developed by Klein (1994), Stowell (1996, 2007), Demirdache & Uribe-Etxebarria (2004, 2007, 2014) and Arche (2014). In this framework, it is argued that temporal and aspectual interpretations are obtained by virtue of the relations that temporal intervals build between one another. The relationships are established by the syntactic categories of tense and aspect, which are argued to be dynamic predicates that contain the same semantic primitives; however, these two predicates differ in that they order different temporal intervals. The set of time-denoting intervals that tense and aspect order consists of the following in (14):

(14)   a. The Reference Time (REF-Time): the speech time in a matrix clause.
   b. The Assertion Time (AST-Time): the time for which an assertion is made.
   c. The Event Time (EV-Time): the time at which the event/state denoted by
      the VP occurs or holds.

The semantic content of tense and aspect is defined as the ordering predicates *after*, *before* or *within*. The main function of tense is to order the REF-T and the AST-T (Klein, 1994), and the one of aspect is to order the AST-T with respect to the EV-T (Demirdache & Uribe-Etxebarria, 2000, 2004). For example, past tense indicates that the REF-T is *after* the AST-T; However, with the same ordering function (i.e., *after*), the perfect construction indicates that the REF-T is *after* the EV-T. Therefore, a sentence such as (15), which contains past tense and the perfect construction has the temporal structure in (16):

(15)   John had eaten three apples when Mary entered the living room.

(16)   *Temporal Structure of (15)*

         EV-T   AST-T   REF-T
      -----[--------]—[--------]------[--------]-------->
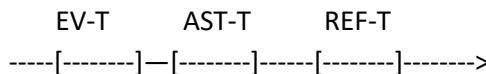
The three temporal intervals expressed in (15) are the follows: (a) the EV-T: the time at which John ate three apples; (b) the AST-T is the time at which Mary entered the living room; (c) the REF-T: the time at which the sentence is produced. As the sentence contains past tense, the REF-T occurs *after* the AST-T. In other words, the time at which Mary entered the living room occurred before the sentence is produced. On the other hand, the perfect construction indicates that the AST-T occurs *after* the EV-T; therefore, John's eating three apples occurred before Mary's entering the living room.

However, English sentences with the perfective aspect is a little more complicated given that the aspect is not morphologically expressed (Smith, 1997). The sentence in

(17a) gives an example that contains the perfective aspect and its temporal structure is represented in (17b):

(17) a. John ate three apples.
      b. *Temporal Structure of (17a)*

```
        EV-T            REF-T
  -----[--------]—------[--------]-------->
        AST-T
```

As demonstrated, two of the three temporal intervals are clearly expressed in (17a). They are: the REF-T (i.e., the time at which the sentence is produced), and the EV-T (i.e., the time at which John ate three apples). As far as the AST-T is concerned, I follow Arche (2014) and assume that the ordering function of the perfective aspect is to signal that the AST-T overlaps the EV-T; therefore, the AST-T is also the time at which John ate three apples. However, English morphology does not overly express this overlapping relation. As the sentence contains past tense, the REF-T occurs *after* the EV-T/AST-T.

The ordering functions of different types of grammatical items related to tense and aspect discussed in this sub-section provides the current study with a valuable insight regarding the semantic functions of perfective *-le* in Mandarin Chinese. As a marker of perfective aspect, *-le* must express a certain type of ordering relation between two different temporal intervals. In section 3, I will give a detailed analysis of the ordering functions that perfective *-le* contains.


3   Theoretical and pedagogical issues of perfective *-le*

3.1   The ordering function of perfective *-le*

Syntactically, the perfective suffix *-le* directly follows a verb and before the object, if any. Its semantic contributions have received considerable attention yet its status still remains controversial. While many scholars have claimed that *-le* is a perfective marker that signals either completion or termination of an event (e.g., Chao, 1968; Smith, 1997; Soh & Gao, 2007), some have proposed that this suffix indicates the boundedness of an event (Li & Thompson, 1981; among others). Still others, Lin (2003) and Sybesma (1999), for example, claim that *-le* signals realization or inception of an event.

As we have discussed in section 2.3, grammatical elements related to time such as tense and aspect build up a temporal relationship between two different temporal intervals. In the spirit of Klein (1994), Demirdache and Uribe-Etxebarria (2007, 2014) and Arche (2014), I would like to propose that the core function of *-le* is to build up a temporal relation between two intervals. However, for the sake of simplicity, I use the

term *event/action* instead of the *time at which an event/action occurs* assuming that an event/action must be associated with a certain temporal interval. Therefore, I argue that *-le* is a perfective marker that indicates an event/action occurs *after* the other. The temporal relation built up by *-le* can be represented by (18) below:[4]

(18)   -----[------]--------------[------]------>
              Event 1(*-le*)   Event 2
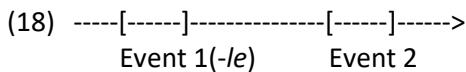
The chart in (18) demonstrates that the suffix builds up a temporal relation between two different events/actions. The event/action denoted by the verb to which *-le* is attached must occur before the other. In other words, the suffix *-le* indicates that there is one event (i.e., Event 2) that occurs *after* the other (i.e., Event 1). The temporal relation expressed by *-le* may occur in the past and the future. This aspectual property then explains why *-le* is not a past tense marker given that it may appear in the future as well.

Let us now discuss the temporal relation built by *-le* in different temporal situations. The sentence in (19a) gives an example in which *-le* appears in a situation in the past and (19b) is its temporal structure:

(19) a. 李四 昨天   看了   那 个 电影   才 回家。
        Lisi   zuotian   kan-le   na ge dianying cai huijia.
        Lisi   yesterday watch-PRF that CL movie   then return home
        'Lisi went home after watching that movie yesterday.'
     b.
            -----[------]-----------------------------[------]-------------->
            movie watching [Event 1] (*-le*)   returning home [Event 2]
            yesterday   yesterday

The sentence in (19a) includes two events that are clearly stated: the movie-watching event and the home-returning event. The chart in (19b) shows that the home-returning event (Event 2) occurred after the movie-watching event (Event 1). This temporal relation is contributed by perfective *-le*. As shown, the two events can both be modified by the adverb *zuotian* 'yesterday'. What the verbal suffix *-le* does here is to indicate that the second event occurred after the first one, which also took place yesterday.

As argued by previous studies such as Li and Thompson (1981) and Smith (1997), the suffix *-le* can be used in the future as well. The sentence in (20a) gives an example:

(20) a. 李四 明天   看了   那 个 电影   才 会 回家。
        Lisi   mingtian   kan-le   na ge dianying cai hui huijia
        Lisi   tomorrow watch-PRF that CL movie   then will return home
        'Lisi will come home after watching the movie tomorrow.'

---

[4] See Petrovčič (2009) for similar charts and representations of *-le*.

b.
```
-----[------]--------------------------------[------]-------->
movie watching [Event1] (-le)     returning home [Event 2]
tomorrow                          tomorrow
```
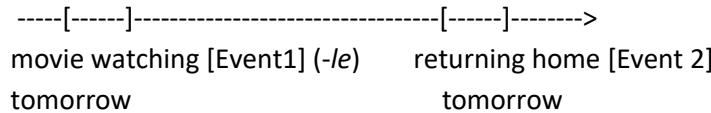
As can be seen, the sentence in (20a) contains two salient events: (a) the movie-watching event (Event 1) and (b) the home-returning event (Event 2). As the perfective is attached to the verb that denotes Event 1, the temporal relation between the two events is that Event 2 occurs after Event 1 as demonstrated in (20b).

The two examples in (19) and (20) both contain two events that are clearly stated in the sentence. However, the suffix -le may also appear in a sentence in which only one event is clearly stated. The sentence in (21a) gives a demonstration:

(21) a. 李四 看了   那   个   电影。
          Lisi   kan-le   na   ge   dianying
          Lisi   watch-PRF that CL   movie
          'Lisi watched that movie.'

      b.
```
-----[-------]-----------------------------[-------]-------->
movie-watching [Event 1] (-le)     ??? [Event 2]
```
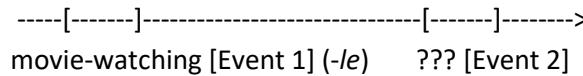
As can be seen in (21a), there is only one event in the sentence; that is, the movie-watching event (Event 1). Given that the suffix -le indicates there is another event that is after Event 1, there must be another event that is associated with the sentence. However, this event is not clearly stated. In the spirit of Demirdache and Uribe-Etxebarria (2007, 2014), I argue that the event that occurs after the moving-watching event is the sentence-producing event; that is, the speaker's production of the sentence. I use the word *speaking* to represent this event. Therefore, -le indicates that the speaking event occurs after the movie-watching event, which occurred in a certain time period that is prior to the speaking event. The chart in (22) represents the relationship between the two events.

(22)
```
-----[-------]--------------------------[--------]-------->
movie-watching [Event 1] (-le)  speaking  [Event 2]
```

The same argument can be used to explain a sentence such as (23a), which contains a temporal adverbial such as *zuotian* 'yesterday':

(23) a. 李四 昨天   看了   那   个   电影。
          Lisi   zuotian   kan-le   na   ge   dianying
          Lisi   yesterday watch-PRF that CL   movie
          'Lisi watched that movie yesterday.'

b.

```
-----[------]----------------------[-------]----------->
movie-watching [Event1]        speaking [Event 2]
yesterday
```
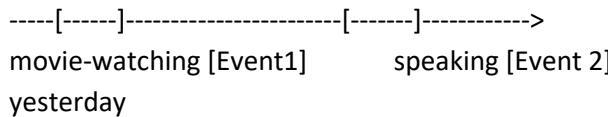
As can be seen in (23a), the adverbial *zuotian* 'yesterday' is used to modify the movie-watching event. Like (22a), the second event is the event of making the sentence. In this case, the suffix again indicates that the speaking event occurs after the movie-watching event. Different from (22a), the movie-watching event must have occurred sometime yesterday as it is modified by this temporal adverb. However, the same adverb *yesterday* cannot be used to modify the speaking event given that the event is always at the present time.

The temporal relation built up by the suffix *-le* is straightforward. When a sentence with *-le* contains two events that are clearly stated, the perfective marker indicates that the one event is after the other. On the other hand, when a sentence only has one clearly stated event like (23a), the perfective marker indicates that the speaking event occurs after the main event of the sentence.

3.2   The English translation of perfective *-le*

In this sub-section I discuss the issue of whether or not perfective *-le* should be translated into an English sentence with the perfect construction.

Recall that the main semantic function of English perfect construction is to build up a temporal relation between the event time (EV-T) and the assertion time (AST-T); it indicates that the assertion time occurs *after* the event time (Demirdache & Uribe-Etxebarria, 2007, 2014). This temporal relation seems to be the same as perfective *-le* given that this suffix also builds up an *after* relation as proposed in section 3.1. Nevertheless, also recall that in addition to the ordering function, there are several different "special" readings that are associated with the perfect construction as demonstrated by sentences in (12) in session 2.2. It is then interesting to see whether or not the suffix *-le* also conveys these special meanings. If it does, we can then conclude that the perfect construction is one of the good interpretations of a sentence containing the suffix; in contrast, if it does not convey these additional meanings, we then need to be more cautious while instructing the interpretations of the suffix.

I begin the discussion on the continuative perfect reading of a sentence such as (12a), repeated as (24) below:

(24) Mary has lived in London for five years.   (Continuative Perfect)

As discussed in session 2, the sentence in (24) has a continuative perfect reading in which Mary very likely still lives in London when the sentence is produced. The Chinese

sentence in (25), which contains the suffix, has similar semantic environment in which the same verb (*zhu* 'to live') and adverbial *wu nian* '(for) five years' are also included:

(25) 李四　在　北京　　住了　　五　年。
     Lisi　zai　Beijing　zhu-le　wu　nian.
     Lisi　at　Beijing　live-PRF　5　year
     'Lisi lived in Beijing for 5 years.'

Based on my own ears and my consultations with several native speakers, the sentence in (25) does not have a continuative reading. It only means that Lisi lived in Beijing sometime in the past for five years and no longer lives there anymore; therefore, the simple past-tense translation in English more properly represents the meaning of the sentence. This seems to suggest that perfective -*le* does not have the same pragmatic function as English present perfect does. Moreover, the two sentences in (26) give additional support:

(26) a. 李四　在　北京　　住了　　五　年　　了。 (continuative)
       Lisi　zai　Beijing　zhu-le　wu　nian　le.
       Lisi　at　Beijing　live-PRF　5　year　SFP
       'Lisi has lived in Beijing for 5 years.'

     b. 李四　在　北京　　住　五　年　　了。 (continuative)
       Lisi　zai　Beijing　zhu　wu　nian　le.
       Lisi　at　Beijing　live　5　year　SFP
       'Lisi has lived in Beijing for 5 years.'

In (26a) there are two different *le*s, one being perfective -*le* immediately after the main verb and the other being Sentence Final Particle *le* (SFP) at the end of the sentence. However, differently from the sentence in (25), the one in (26a) has a continuative reading. When the sentence is produced, it is very likely that Lisi still lives in Beijing. Moreover, the sentence in (26b) only contains Sentence Final Particle *le* but not perfective -*le*, nevertheless, the sentence still has a continuative reading. I take this as an indication that the sentential *le* is the grammatical element which contributes to the continuative reading. In other words, a sentence that has a stative event and a durative adverb such as *wu nian* '(for) five years' along with perfective -*le* should not be translated into an English sentence containing the perfect construction given that no continuative reading is conveyed.

In addition to the continuative reading that is conveyed by the perfect construction, the 'resultative' reading is another possible additional reading in a sentence containing the perfect construction in English. The sentence in (12b), repeated as (27) is an example:

(27) Mary has read *Dream of the Red Chamber*.   (Resultative Perfect)

As discussed, the sentence in (27) has a resultative perfect reading in which Mary's reading of the novel has caused some result and some effect upon the current situation. I now use the three sentences in (28) to test whether or not -*le* has the same pragmatic implication.

(28) a. 李四 看完了   红楼梦。   (可以考试了。)
         Lisi   kan-wan-le   Hongloumeng.   (Keyi kaoshi le.)
         Lisi   read-finish-PRF   Dream of the Red Chamber   (may   take exam SFP)

       b. 李四 看完了   红楼梦   了。 (可以考试了。)
         Lisi   kan-wan-le   Hongloumeng   SFP. (Keyi kaoshi le.)
         Lisi   read-finish-PRF   Dream of the Red Chamber   SFP   (may take exam SFP)

       c. 李四 看完   红楼梦   了。 (可以考试了。)
         Lisi   kan-wan   Hongloumeng   SFP. (Keyi kaoshi le.)
         Lisi   read-finish   Dream of the Red Chamber   SFP   (may take exam SFP)

     a-c. 'Lisi has read DRC; (therefore, he may take the exam now).'

The three sentences in (28) each contains an event denoting accomplishment, namely, Lisi's completion of reading *Dream of Red Chamber*. However, they contain different grammatical elements. The sentence in (28a) does not have the Sentence Final Particle *le* and (28b) and (28c) do. Also, differently from (28c), (28a) and (28b) both include perfective -*le*. In addition, I added a second sentence *keyi kaoshi le* 'may take the exam (now)' to each sentence to create a cause-result relation. If the first sentence has a resultative reading, then the second sentence would be fallacious due to the cause-result effect. This then provides the linguistic environment in which the resultative reading can be tested; therefore, Lisi's being able to take the exam resulted from his completion of the novel.

As demonstrated, the first sentence in (28a), which contains only perfective -*le* does not have a cause-result relation with the following sentence. In fact, the sentence sounds odd if we place the second sentence after it. However, the two sentences in (28b) and (28c), with Sentence Final Particle *le*, tell a different story. They both have a cause-result relation with the following sentence. This indicates that Sentence Final Particle *le* is the element which contributes to the cause-result relation. Therefore, I take it as an indication that perfective -*le* in Mandarin Chinese does not have the same pragmatic function as English perfect construction; at least, in the area of expressing cause-result relation between two events.

The two examples provided in this sub-section suggest that Chinese perfective -*le* does not have similar pragmatic functions as English perfect construction although these two grammatical items both have the same temporal contribution; that is, they both indicate an *after* relation between two temporal intervals.

3.3 Discussion

In sections 3-1 and 3-2, I presented the main semantic function of perfective -le. In the spirit of Demirdache & Uribe-Etxebarria's (2007, 2014) work, I argued that the suffix builds up a temporal relation between two different events; it indicates that one event occurs after the other. This 'anterior' relation is in fact like one of perfective -le's functions discussed in Li and Thompson's (1981, p. 198) study. According to them, in a sentence such as (29), the suffix appears in the first event in a sequence and the sentence can often be translated with 'after', 'when', or 'now that' in English:

(29) 我　看完了　　　报，　　　就　睡。
　　　Wo　kan-wan-le　　bao,　　　jiu　shui
　　　I　read-finish PRF　newspaper　then　sleep
　　　'When I finish reading the paper, I will go to sleep.'

However, this function in fact can be extended to other types of sentences containing perfective -le discussed in Li and Thompson's (1981) study as well. According to them, the suffix can appear in the following types of sentences. (a) A sentence containing a quantified event. (b) A sentence having a definite or specific event. (c) A sentence containing verbs with an inherent bounded meaning. The sentences in (30) give a demonstration:

(30) a. 他　睡了　　三　个　钟头。
　　　　Ta　shui-le　san　ge　zhongtou
　　　　s/he　sleep-PRF　3　CL　hour
　　　　'S/he slept for three hours.'　　　　　　(Li & Thompson, 1981, p. 186)

　　　b. 你　毁了　　　你　自己。
　　　　Ni　hui-le　　ni　ziji
　　　　you　destroy-PRF　you　self
　　　　'You destroyed yourself.'　　　　　　(Li & Thompson, 1981, p. 192)

　　　c. 我　忘了　　　他的　　地址。
　　　　Wo　wang-le　tade　dizhi
　　　　I　forget-PRF　his/her　address　　　(Li & Thompson, 1981, p. 196)
　　'I forgot his/her address.'

As demonstrated, each sentence in (30) provides a special environment in which -le can appear. In (30a), the sleeping event is quantified as the period of the sleeping event is specified. In (30b), the direct object is a pronoun and therefore, the self-destroying event is definite. Finally, the verb wang 'forget' in (30c) has an inherent bound meaning. Although the linguistic environments are different in these sentences, perfective -le here builds up the same temporal relation: it indicates that all the events have occurred before the sentences are produced.

Nevertheless, a bound event for the use of perfective *-le* is crucial as argued by Li and Thompson (1981). This can explain why in a sentence such as (1a), repeated as (31a), perfective *-le* is required but not in (1b), repeated as (31b) below:

(31) a. 王五　　　昨天　　　在家　　　写了　　　一封信。
     Wangwu　zuotian　zai jia　xie-le　　yi feng xin.
     Wangwu　yesterday　at home　write-PRF　one CL letter
     'Wangwu wrote one letter at home yesterday.'

   b. 王五　　　昨天　　　在家　　　写　　　　信。
     Wangwu　zoutian　zai jia　xie　　　xin.
     Wangwu　yesterday　at home　write　　letter
   'Wangwu wrote letters at home yesterday.'

As shown, both sentences are used to express some action that occurred before the speaking event; that is, the time when the sentence is produced. In (31a), perfective *-le* is used as the letter-writing event is specific and bound, and the perfective suffix also indicates that there is another event that occurs *after* the letter-writing event; that is, the event of speaking. In contrast, the sentence in (31b) does not contain perfective *-le* although the sentence is also used to describe some action that happened yesterday. However, the main event, *xie xin* 'write letter(s)' in (31b) differs in that it is a verb that denotes Activity. Other examples of verbs that denote Activity in Chinese include *tiao wu* 'jump dance: to dance', *chi fan* 'eat rice: to eat,' and many others. Given that the sentence does not contain a bound event (i.e., events denoting Accomplishment of Achievement), perfective *-le* may not be used based on Li and Thompson's (1981) argument. The incompatibility between perfective *-le* and unbound events entails that *-le* appears only when the semantic requirements are met. First, the event that *-le* modifies must be bound. Secondly, there must be another event that occurs afterwards as perfective *-le* builds up an *after* relation between two events.

I've also discussed proper English translations of Chinese perfective *-le*. As argued, the suffix builds up an *after* relationship between two different events. This relation is in fact the same as the function of the past tense or the perfect, which also builds up an *after* relation based on Demirdache and Uribe-Etxebarria's studies (2004, 2007, 2014). According to the authors, past tense indicates that the reference time (the RFT-T) occurs after the assertion time (the AST-T) and the perfect indicates that the assertion time (AST-T) is after the event time (EV-T). Given that *-le* also builds up an *after* relation, it seems plausible to assume that a sentence with this suffix can be translated into an English sentence with either the past tense or the perfect construction. However, in addition to its semantic function, the English perfect also has additional pragmatic effects as claimed by previous studies such as Portner (2003). Unless Chinese perfective *-le* also has similar pragmatic effects, past tense is in fact a better translation. As I have shown, perfective *-le* in Chinese does not have similar pragmatic functions as the English perfect construction; therefore, I suggested that the perfect construction (at least, the present

perfect) is not a good translation for sentences containing this suffix unless there are other elements like Sentence Final Particle *le* that have similar pragmatic contributions.

3.4   Pedagogical implications

In this sub-section, I present some pedagogical issues regarding perfective -*le* in a CFL/CSL classroom. As shown in section 2.2, the function of perfective -*le* remains the same in different temporal situations. It indicates that an event occurs, has occurred, or will occur *after* the event that the verbal suffix -*le* is used to modify. Therefore, I suggest that we give a short introduction of the temporal relation built up by -*le* as shown by the chart in (18), repeated as (32) below:

(32)   -----[------]--------------[------]------>
             Event 1(-*le*)   Event 2

The chart in (32) gives a clear definition of the temporal function of perfective -*le*. Syntactically, the suffix is attached to the verb, which denotes a bound event (Event 1). Semantically, the suffix indicates that there is another event (Event 2) that appears *after* Event 1. This introduction will provide CFL learners with a clearer idea of the core function of the verbal suffix. I would also like to suggest that there is no need to introduce conplex grammatical terms such as the *perfective aspect* or the *perfect* construction in the classroom. These terms can be confusing and may even cause misunderstanding of the core function of the verbal suffix. For example, I have demonstrated that although the temporal relations built up by the perfective aspect and the perfect construction are similar, they are not identical.

As far as the interpretation of a sentence with the verbal suffix is concerned, we can leave it to students to discover the correct translation in the contexts. There is not a so-called "fixed" interpretation for a given sentence with perfective -*le* because the interpretation mainly depends on the various contexts it is found. For example, if perfective -*le* is used in a sentence to describe two events in a sequence in the future, English future perfect can be properly used to translate this type of sentences. However, if we use English present perfect to translate a sentence with perfective -*le*, the interpretation may sometime be incorrect as this suffix does not have the same pragmatic functions as English prefect construction. This suggests again that the context in which a sentence with perfective -*le* determinates the interpretation of the sentence.

To make the usages of -*le* more salient to CFL/CSL learners, I'd like to suggest that a handout that explains the usages of perfective -*le* be distributed in class. In addition, I suggest the handout should include Table 1 below, which has examples demonstrating the functions of perfective -*le* in different situations.

Table 1: The functions of perfective *-le* and examples

Examples	Function
1. 李四昨天看了那个电影才回家。 Lisi zuotian kan-le na ge dianying cai huijia Lisi yesterday watch-PRF that CL movie then return home 'Lisi went home after watching that movie yesterday.'	(past; time words) going home *after* watching movie
2. 李四昨天看了那个电影。 Lisi zuotian kan-le na ge dianying Lisi yesterday watch-PRF that CL movie 'Lisi watched that movie yesterday.'	(past; time words) speaking *after* watching movie
3. 李四看了那个电影。 Lisi kan-le na ge dianying Lisi watch-PRF that CL movie 'Lisi watched that movie.'	(past; no time words) speaking *after* watching movie
4. 李四明天看了那个电影才回家。 Lisi mingtian kan-le na ge dianying cai huijia Lisi tomorrow watch-PRF that CL movie then return home 'Lisi will go home after watching that movie tomorrow.'	(future; time words) going home *after* watching movie

As can be seen, Table 1 contains sample sentences including perfective *-le* used in different situations. Each example includes a sentence in Chinese, its word-by-word translation, and the literal translation. The table also includes the functions of perfective *-le* in each example. As shown, the suffix is mainly used to express an *after* relation between two events. However, in Examples 1 to 3, the suffix is used in a past situation and in Example 4 it is used in a situation that will happen in the future.

4   Conclusions

In this study, I have addressed two questions concerning perfective *-le* in Mandarin Chinese. The first one concerns the main semantic function of perfective *-le*. I followed studies like Klein (1994) and Demirdache and Uribe-Etxebarria (2004, 2007, 2014) and argued that the suffix has an ordering function like tense and aspect. However, instead of ordering different types of temporal intervals, I argued that perfective *-le* simply orders two different events. I demonstrated that when a sentence contains two salient events, perfective *-le* indicates that one event occurs after the other. With the same ordering function, when a sentence contains only one salient event, perfective *-le* indicates that the speaking event is after the main event expressed by the sentence.

The second issue that I have addressed in this study is the proper English translation of perfective -*le*. I discussed the difference between the two grammatical items that are related to time: the *perfective aspect* and the *perfect* construction. I demonstrated that a sentence containing perfective -*le* does not have the same pragmatic functions as the English perfect, particularly, the English present perfect although these two grammatical items have similar semantic functions. For example, a sentence containing both the perfective suffix and a verb denoting a stative event has a continuous reading only if Sentence Final *le* also appears in the same sentence; perfective -*le* does not have the same pragmatic contributions. This finding suggests that a sentence containing perfective -*le* should not be translated into English present perfect when it is used to describe a past event.

Based on the proposal I made, I also presented a number of pedagogical suggestions regarding perfective -*le*. For instance, I suggested that the use of handouts would facilitate CFL/CSL learners' acquisition of different grammatical patterns. The handouts should include not only the functions of the suffix, but sample sentences that demonstrate the situations in which -*le* is used. In addition, I have suggested that we should not use complex terms in English such as *perfective* or *the perfect* to instruct grammar in CFL/CSL class.

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