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The syntax-prosody competition: Evidence from adjunct prosodic parsing in iGeneration Taiwanese☆

Yuchau E. Hsiao

National Chengchi University, Taipei, Taiwan

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Abstract

The syntax-phonology interface has been widely discussed. This paper probes into the connection between adjunct tone sandhi and phonological phrasing in iGeneration Taiwanese (iGT); the iGeneration grew up with an iPhone (or a smartphone) in hand. The corpus established in this research shows that the iGT speakers tend to parse expressions into shorter fragments, which are by nature prosodic domains on which tone sandhi operates. The syntax-prosody competition is keyed to a set of alignment and prosodic markedness constraints. An alternative approach under the Match Theory, on the other hand, renders incorrect predictions.

Keywords: Adjunct; Tone sandhi; Phonological phrase; Prosody; iGeneration Taiwanese; Corpus; Alignment; Match

1. Introduction

The role of prosodic structure interfacing between syntax and phonology has been observed in many languages (Selkirk, 1984, 1986, Nespor and Vogel, 1986, Bickmore, 1989, Hayes, 1989, Inkelas, 1989, Kaneva, 1989, Hsu, 1994, Hsiao, 1991, 1995, Truckenbrodt, 1999, Chen, 2000, Simpson, 2014, Pei and Qiu, 2015, Tong, 2017, Wang, 2017b, Feng, 1996, 2019a, 2019b, Bennett and Elfner, 2019, among others). This paper presents a case of syntax-prosody competition based on evidence from adjunct tone sandhi and phonological phrasing in **iGeneration Taiwanese** (**iGT**). The iGeneration, who grew up with an iPhone (or a smartphone) in hand, is loosely referred to people who were born in 1995 or later (Wallop, 2014, Blad, 2016, White, 2016, and others).[1] Speakers of iGT seldom utter long phrases or sentences, but they tend to parse them into shorter fragments. This paper looks into the nature of these

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E-mail address: ychsiao@nccu.edu.tw.

[1] The iGeneration is also known as Generation Z, Post-Millennials, or Homeland Generation. People who are born around and after 1995 grew up with an iPhone (or a smartphone) in hand. As they usually spend a great deal of time on their iPhones, it can be expected that their linguistic behavior is inevitably affected. The iGT speakers largely depend on their smartphones for communication, but tend to speak short expressions in face-to-face contact. As a result, iGT displays quite different patterns in tone group formation. It should be mentioned that certain features of the iGT accent are also found in people who were born earlier, but the accent is more commonly and consistently produced by iGT. This research thus looks closely at the tone sandhi and prosody of the iGT accent.

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shorter fragments. The first question is whether they are syntactic or prosodic constituents, or simply non-constituent spans. The phonological pattern of iGT is quite different from **general Taiwanese** (**GT**), as termed by Ang (2003), which refers to the accent spoken by the majority of population in Taiwan. In particular, the tone group in GT is parsed into smaller domains in iGT. The next two questions then are how these smaller domains are obtained, and what restrictions the domain formation is subject to. In terms of Optimality Theory (Prince and Smolensky (1993/2004)), the syntactic and prosodic factors involved in the domain formation are subsumed under a series of interactions between constraints. The final two questions are thus what constraints are needed to govern the parsing in question, and how the constraints are ranked. The rest of this paper is organized as follows. Section 2 describes some background of the tone system and tone group formation. Section 3 offers an analysis based on the corpus constructed in the present research, and discusses the major patterns in relation to the phonological phrasing. Section 4 engages in the generalization of a dominant grammar taking a constraint-based approach, and an alternative analysis is investigated as well. Section 5 is the conclusion.

2. Some background

Taiwanese refers to the Southern Min dialect spoken in Taiwan. A close neighbor, Xiamen (the Southern Min dialect spoken in the Xiamen City) is often treated as the same dialect (Chen, 1987, Hsu, 1994, Lin, 1994, among others). In spite of slight segmental differences, Taiwanese and Xiamen exhibit the same pattern of tone sandhi. The following sections discuss some background. Section 2.1 describes the tone system and the tone sandhi rule. Section 2.2 addresses the role of syntactic adjunct in tone sandhi, and Section 2.3 characterizes the tone group as a prosodic structure.

2.1. *Tones and tone sandhi*

The accent spoken by the majority of population in Taiwan is known as general Taiwanese (GT). There are seven base tones in the inventory, which includes five smooth tones, 55, 33, 21, 53, and 13, and two checked tones, 3 and 5. In terms of Chao's (1930) tone transcription system, 5 represents high, 3 represents mid, and 1 represents low; 4 can be either high or mid and 2 can be either mid or low, depending on the tone inventory of a language.[2] The tone of a smooth syllable is represented by two numbers: 55 stands for high level tone, 33 for mid level tone, 53 for high falling tone, 21 for low falling tone, and 13 for low rising tone. The single numbers, 3 and 5, indicate the tones of checked syllables. A smooth syllable is an open syllable or a syllable that ends in a sonorant. A tone carried by a smooth syllable is known as a smooth tone, or a long tone. A checked syllable ends in a glottal or unreleased voiceless stop, such as [ʔ], [p], [t] and [k]. A tone carried by a checked syllable is usually referred to as a checked tone, or a short tone. Each base tone surfaces with a corresponding sandhi form in sandhi position, as in (1).

(1) Disyllabic tone sandhi[3]

T_1T_2	55	33	21	53	13	3	5
	ping siunn	*ping minn*	*ping kho*	*ping tsui*	*ping tee*	*ping kak*	*ping bit*
55	33 55	33 33	33 21	33 53	33 13	33 3	33 5
	'refrigerator'	'cold noodle'	'refrigerator'	'ice water'	'ice tea'	'ice'	'ice honey'
	tshiu kin	*tshiu iam*	*tshiu ki*	*tshiu bue*	*tshiu phue*	*tshiu kut*	*tshiu hioh*
33	21 55	21 33	21 21	21 53	21 13	21 3	21 5
	'root'	'tree flame'	'tree saw'	'tree end'	'bark'	'branch'	'leaf'
	pang khang	*pang liao*	*pang phui*	*pang sai*	*pang lang*	*pang sat*	*pang tok*
21	53 55	53 33	53 21	53 53	53 13	53 3	53 5
	'venting'	'discharge'	'fart'	'dung'	'release'	'abandon'	'poisoning'
	tsao tsing	*tsao lo*	*tsao tshiunn*	*tsao siam*	*tsao tsong*	*tsao pak*	*tsao bik*
53	55 55	55 33	55 21	55 53	55 13	55 3	55 5
	'make errors'	'flee'	'sing'	'avoid'	'work hard'	'to the north'	'search'
	bo kim	*bo nua*	*bo khi*	*bo sui*	*bo liang*	*bo sip*	*bo tok*
13	33 55	33 33	33 21	33 53	33 13	33 3	33 5
	'not shiny'	'not soft'	'no air'	'not pretty'	'not cold'	'not wet'	'no poison'

[2] As Yip (2001: 312) indicates, [13] is sometimes transcribed as [24].

	tshit tsia	*tshit bin*	*tshit tshui*	*tshit kao*	*tshit meng*	*tshit tshit*	*tshit tshioq*
3	5 55	5 33	5 21	5 53	5 13	5 3	5 5
	'wipe here'	'wipe the face'	'wipe the lips'	'wipe dogs'	'wipe doors'	'wipe a bit'	'wipe the mat'
	kut kim	*kut bong*	*kut phua*	*kut liao*	*kuti tho*	*kut tshut*	*kut tsioq*
5	3 55	3 33	3 21	3 53	3 13	3 3	3 5
	'dig gold'	'dig the tomb'	'dig broken'	'dig off'	'dig the soil'	'dig out'	'dig stones'

The chart in (1) reveals a series of tonal chain shifts: 13 → 33 → 21 → 53 → 55 → 33 and 3 ←→ 5 (cf. also Chen, 1987, 2000, Hsieh, 2005, Barrie, 2006, Alderete, 2008, Thomas, 2008, Hsiao, 2015, among others, for further discussions of the chain shifts). The disyllabic tone sandhi can be generalized as follows: given a pair of adjacent tones, T_1 and T_2, the left tone (T_1) occurs in its sandhi form, while the right tone (T_2) retains its base form, as summarized by the schema in (2).

(2) B —→ S / ____ B (B: base tone; S: sandhi tone)

The question then is how tone sandhi applies in a longer sequence of tones. Some previous studies have suggested that syntax plays a role in the operation of tone sandhi, as will be discussed in the next section.

2.2. Adjuncthood and tone sandhi

It has been observed in several works (Cheng, 1968, Chen, 1987, 2000, Hsu, 1994, among others) that the tone group (TG) that conditions tone sandhi in Southern Min dialects has direct or indirect access to syntactic maximal projections. Within a TG, only the rightmost tone retains its base form, while all the preceding tones are changed to their sandhi forms, regardless of the speech speed.[4] Cheng (1968) suggested that tone sandhi of GT is conditioned by NP, VP, S, etc. Drawing on evidence from Xiamen, Chen (1987) posits a cross-categorical generalization that the TG is marked at the right edge of a non-adjunct XP, but not of an adjunct XP, as in (3) and (4).

(3) XP as a non-adjunct (Chen, 1987: 122)

tsioq	*hit*	*pun*	*siao-*	*suat*]$_{NP}$	# *lai*	*khuah*	
S	S	S	S	B	S	B	
borrow	that	CL	novel	to			read 'borrow that novel to read'

(4) XP as an adjunct (Chen, 1987: 124)

yi luan-tsu]AdvP kongS S S Bhe mindlessly talk yi luan-tsu]$_{AdvP}$	*kong*	
S S S	B	
he mindlessly	talk	'He is talking mindlessly'

The NP in (3) is an internal argument (object) of the verb *tsioq* 'borrow' but not an adjunct, and thus a TG marker # exists after the NP, where only the rightmost syllable *-suat* preserves its base tone. On the other hand, The AdvP in (4) is an adjunct modifying the verb *kong* 'talk'; hence the adjunct XP does not block tone sandhi, but allows *-tsu* to carry a sandhi tone.

The adjuncthood holds between a head and its modifier. Along the lines of Jackendoff (1977) and Dowty (1982), Chen (1987) defines adjunct as follows.

(5) XP is an adjunct of Y, if XP
a. appears in [... XP ...]$_{YP}$ and
b. is not a strictly subcategorized argument of Y.[5]

An adjunct can be interpreted as a modifier, which is not an obligatory category but serves to modify its head. In this sense, an adjunct can be a NP, an AP, an AdvP (adverbial phrase), or a CLP (classifier phrase), etc. This research focusses on AdvP and CLP as adjuncts due to the fact that NP and AP do not show a clear case of phrasal adjuncthood in

[3] In this paper, some modifications of the spelling are made to avoid special fonts: V*nn* stands for a nasal vowel, C*h* for an aspirated onset consonant, and *-h* for a glottal stop coda and *ng* for the velar nasal ŋ.
[4] Shih (1986) indicates that Mandarin tone sandhi varies depending on the speed of speech; it refers to a smaller prosodic domain at a moderato or adagio tempo, such as foot, but refers to a bigger domain, such as intonational phrase, at a presto tempo. Taiwanese tone sandhi, however, is not affected by speech rate; the shape of TG remains the same at different tempos (Chen, 1987).
[5] Jackendoff (1977: 57) and Dowty (1982: 89) indicate that arguments are strictly subcategorized with respect to the head, but modifiers are not.

relation to tone sandhi. Two observations are in order. First of all, in GT, a morphosyntactic N may serve as a modifier of a head noun, as in (6); whereas a phrasal NP is usually embedded under a projection headed by *e* (which can be considered a complimentizer, genitive, etc. – we leave open), as in (7).

(6)	*se-kai*]$_{N}$ world S S	*sio-tsia* lady S B	'Miss World'

(7)	*se-kai*]$_{NP}$ world S B	# *e*]$_{CP}$	*sio-tsia* lady S B	'Ladies in the world'

In (6), *se-kai* is a morphosyntactic adjunct modifying *sio-tsia*, and thus there is no TG marker # after the adjunct N, allowing *-kai* to undergo tone sandhi. In (7), the CP is an adjunct of *sio-tsia*, but the NP is an argument (but not an adjunct) of *e*; therefore, there is a TG marker # after the NP, where *-kai* retains its base tone.

Second, a monosyllabic adjective is usually lexicalized with a following noun (Shih, 1986, Feng, 1998, 2000, Fu, 2001, Paul, 2005), as in (8), while a disyllabic (or polysyllabic) AP is usually headed by *e* before a noun, as in (9).

(8)	*ping*]$_{A}$ icy S	*ko-tsiap* juice S B	'ice juice'

(9)	*tsin* very S	*ping*]$_{AP}$ icy B	# *e*]$_{CP}$ S	*ko-tsiap* juice S B	'very cold juice'

In (8), *ping ko-tsiap* is lexicalized as a compound, meaning 'ice juice',[6] where *ping* is a morphosyntactic adjunct modifying *ko-tsiap*, and thus no TG is marked after the A. In (9), the AP is an argument (but not an adjunct) of *e*, and thus there is a TG marker # after the AP, where *ping* surfaces with its base tone.

On the other hand, disyllabic (and polysyllabic) AdvP's and CLP's display clear cases of the adjunct-tone connection at the phrasal level.

(10)	*kuann-kin*]$_{AdvP}$ quickly S S	*li-khui* leave S B	'to leave fast'

(11)	*lak* six S	*tai*]$_{CLP}$ CL S	*ki-tshia* motorcycle S B	'six motorcycles'

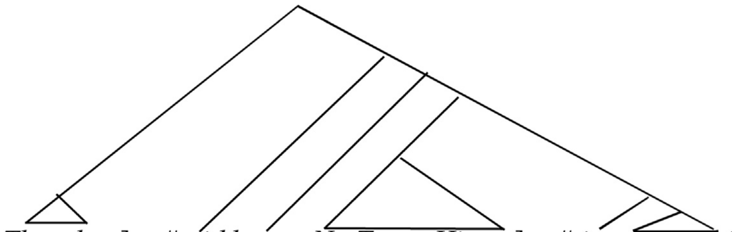
The AdvP in (10) and the CLP in (11) are both adjuncts, respectively modifying the verb *li-khui* and the noun *ki-tshia*. Hence no TG marker occurs after the AdvP or the CLP, but the whole lines form single TG's. (In Section 3, I will offer a corpus-based analysis and show that tone sandhi of the AdvP and the CLP is keyed to the competition of syntax and prosody.) The next question is whether the TG is a syntactic constituent or a prosodic structure. Chen (1987: 144) hesitates to characterize the TG as a prosodic domain, but suggests that it "operates within a domain defined directly over surface syntax." On the other hand, Hsiao (1991, 1995) observes that the TG can in fact be a non-syntactic constituent. The following section will show that the TG does not always match a syntactic constituent.

[6] Feng (2000) refers to the AN construction as a syntactic compound.

2.3. TG as a phonological phrase

In terms of Chen's (1987) TG formation, a non-adjunct XP ends in a TG break, but an adjunct XP does not. As a consequence, there may be a mismatch between a TG and a syntactic structure, as in (12).

(12)



Thao-kee $]_{NP}$ # *ai khuann Ng Tsuun Hiong* $]_{NP}$ # *ian po-tee-hi*

S B S S S S B S S S B

Boss love see Ng Tsuun Hiong perform puppet-show

'The boss loves to watch Ng Tsun Hiong perform puppet shows.'

The phrase in (12) is parsed into three TG's, (*Thao-kee*), (*ai khuann Ng Tsuun Hiong*) and (*ian po-tee-hi*); however, the sequence (*ai khuann Ng Tsuun Hiong*)) does not form a syntactic constituent. The non-syntactic span serves as a domain in which tone sandhi is confined. Hsiao (1991) suggests that the TG is a prosodic domain, specifically, a phonological phrase (φ). Selkirk (1986) proposes a set of end-based parameters which mark the break of a phonological phrase at the right or left edge of a syntactic XP or X^{head}. In the case of GT, a phonological phrase is marked at the right edge of a non-adjunct XP. Unlike the hesitation in Chen (1987), Chen (2000) agrees with Hsiao (1991, 1995) and terms TG a phonological phrase. The rest of this paper also considers the phonological phrase as the domain that limits tone sandhi.

3. A corpus analysis

In this research, I established a corpus of iGT, with the help of ten young speakers, three males and seven females, aged from 19 to 24; four of them are from southern Taiwan (two from Kaohsiung, and two from Tainan), three from central Taiwan (two from Taichung and one from Changhua), and three from northern Taiwan (two from Taipei and one from Keelung). They are all college students, and at least one of their parents is a native speaker of GT. The young speakers from different regions show no obvious difference in tone sandhi. They produce only colloquial pronunciation, but have difficulty in rendering literary pronunciation.[7] The language they use is often a mixture of iGT and Mandarin in social environments, and though understanding GT and iGT, they frequently respond in Mandarin, even at home. The corpus contains 20380 tokens of phrases and sentences, including 1200 disyllabic ones, 6020 trisyllabic ones, 7809 tetrasyllabic ones, and 5270 longer ones. The iGT speakers usually spend a great deal of time using their smartphones for communication and pleasure, but lack of face-to-face social contact. Above all, they seldom utter long expressions, but tend to parse them into shorter fragments.[8] This section examines closely these fragments in connection with tone sandhi. The data are collected through a careful design, based on the number of syllable and a variety of morphosyntactic structures; in particular, different lengths of adjunct XP's are included. The speakers are asked to read a list of the designed data, including 17206 statements, 1330 WH-questions and 1844 other questions. Sections 3.1–3.3 respectively examine tetrasyllabic, trisyllabic and disyllabic strings that end in adjunct XP's. Section 3.4 looks into adjunct XP's that contain a WH element. Section 3.5 discusses some restrictions on phonological phrasing, followed by an interim summary in Section 3.6.

3.1. Tetrasyllabic XP^{+a}-ended sequence

In GT, when the adverbial phrase (AdvP) and classifier phrase (CLP) are adjuncts, they do not block tone sandhi, as mentioned in Section 2. For instance, the entire VP in (13a) and the NP in (14a) respectively form a single phonological

[7] Taiwanese words usually have two distinct pronunciations, literary and colloquial. For example, the word 'fragrant' can be pronounced as *hiong* or *phang*; the former is a literary pronunciation, while the latter is a colloquial pronunciation.

[8] In contrast to the iGT accent, I surveyed five GT speakers as a control group, who are about the age of the iGT speakers' parents. The author is a GT speaker as well.

phrase. In iGT, however, the adjunct XP's (XP^{+a}) tend to end in phonological phrase breaks (φ-breaks), as in (13b) and (14b).

(13)	[[*ko*	*kha*	*kuann-kin*$]_{AdvP}$	[*li-khui*$]_{V'}]_{VP}$			'to leave still faster'
	still	more	fast	leave			
	53	3	53 53	33 55	33	55	base tones
a.	(55	5	55 55	21 55)φ	21	55)φ	GT, iGT (0.4%)
b.	(55	5	55 53)φ	21 55)φ	(21	55)φ	iGT (99.6%)

(14)	[[*lak*	*tsap*	*si*	*tai*$]_{CLP}$	[*ki-tshia*$]_{N}]_{NP}$	'sixty-four motorcycles'
	sixty-four			CL	motorcycle	
	5	5	21	13	55 55	base tones
a.	(3	3	53	33	33 55)φ	GT, iGT (0.4%)
b.	(3	3	53	13)φ	(33 55)φ	iGT (99.6%)

(15)	ssss$]_{XP}{}^{+a}$ ss$]_{XP}{}^{-a}$ (where the XP^{+a}-ended sequence is tetrasyllabic)			
	$]_{XP}{}^{+a}$	$]_{XP}{}^{-a}$	Total	Percentage
	S	B)φ	6	0.4%
	B)φ	B)φ	1659	99.6%
	S	S	0	0%
			1665	100%

In the corpus, the post-adjunct verb and noun are consistently designed as disyllabic. This is to ensure that the syllable grouping before the adjunct XP is not affected by the post-adjunct element. There are 1665 tokens of ssss$]_{XP}{}^{+a}$ ss$]_{XP}{}^{-a}$ structure in the corpus, and in 1659 of them, the adjunct XP's are φ-marked, found in 99.6% of the data. In fact, the type of sentence does not affect the tone sandhi domain (except WH questions, as will be discussed later). The examples in (13) and (14) are intended to show whether AdvP as an adjunct ends in a phonological phrase break, and thus only the phrasing of XP^{+a} is counted. The GT readings, as in (13a) and (14a), are almost absent. The high percentage of the iGT reading suggests two facts: a phonological phrase preferably contains at most four syllables, and the φ-marking of the XP^{+a} here prevents an oversized phonological phrase.

3.2. Trisyllabic XP^{+a}-ended sequence

When an XP^{+a}-ended sequence contains three syllables, it is still likely to form a separate phonological phrase and block tone sandhi, as in (16b) and (17b).

(16)	[[*kha*	*kuann-kin*$]_{AdvP}$	[*li-khui*$]_{V'}]_{VP}$	'to leave faster'
	more	fast	leave	
	3	53 53	55 13	base tones
a.	(5	55 55	33 13)φ	GT, iGT (14.9%)
b.	(5	55 53)φ	(33 13)φ	iGT (84.5%)

(17)	[[*lak*	*tsap*	*tai*$]_{CLP}$	[*ki-tshia*$]_{N}]_{NP}$	'sixty motorcycles'
	sixty		CL	motorcycle	
	5	5	13	55 55	base tones
a.	(3	3	33	33 55)φ	GT, iGT (14.9%)
b.	(3	3	13)φ	(33 55)φ	iGT (84.5%)

(18)	sss$]_{XP}{}^{+a}$ ss$]_{XP}{}^{-a}$ (where the XP^{+a}-ended sequence is trisyllabic)			
	$]_{XP}{}^{+a}$	$]_{XP}{}^{-a}$	Total	Percentage
	S	B)φ	338	14.9%

	B)φ	B)φ	1929	84.5%
	S	S	3	0.6%
			2270	100.0%

There are 2270 tokens of sss]$_{XP}$$^{+a}$ ss]$_{XP}$$^{-a}$ structure in the corpus, and in 1929 of them, the adjunct XP's are φ-marked, found in 84% of the data; the XP^{+a}-final syllables, *kin* in (16) and *tai* in (17), thus preserve their base tones. Only 14.9% of the data derive the GT reading, as in (16a) and (17a). It is clear then that the derived phonological phrase may contain three syllables.

3.3. Disyllabic XP^{+a}-ended sequence

The number of syllable substantially affects the formation of phonological phrase. When the XP^{+a}-ended sequence contains only two syllables, it does not form a separate phonological phrase and thus does not block tone sandhi, as in (19a) and (20a), where *kin* and *tai* surface with their sandhi tones.

(19)	[[*kuann-kin*]$_{AdvP}$	[*li-khui*]$_{V'}$]$_{VP}$	'to leave fast'
	fast	leave	
	53 53	55 13	base tones
a.	(55 55	33 13)φ	GT, iGT (72%)
b.	(55 53)φ	(33 13)φ	iGT (27.8%)

(20)	[[*lak*	*tai*]$_{CLP}$	[*ki-tshia*]$_{N}$]$_{NP}$	'six motorcycles'
	six	CL	motorcycle	
	5	13	55 55	base tones
a.	(3	33	33 55)φ	GT, iGT (72%)
b.	(3	13)φ	(33 55)φ	iGT (27.8%)

(21) ss]$_{XP}$$^{+a}$ ss]$_{XP}$$^{-a}$ (where the XP^{+a}-ended sequence is disyllabic)

]$_{XP}$$^{+a}$	]$_{XP}$$^{-a}$	Total	Percentage
S	B)φ	2085	72.0%
B)φ	B)φ	806	27.8%
S	S	5	0.2%
		2896	100.0%

In the iGT corpus, there are 2896 tokens of ss]$_{XP}$$^{+a}$ ss]$_{XP}$$^{-a}$ structure, where the adjunct XP includes an AdvP or a CLP in particular. Only 806 of the adjunct XP's are φ-marked and block tone sandhi, found in 27.8% of the data. On the other hand, 2085 of the disyllabic XP^{+a}-ended sequences yield the same reading as GT, where the adjunct XP's are not φ-marked, found in 72% of the data. In other words, there is the avoidance of deriving a disyllabic phonological phrase from an adjunct XP.

3.4. $_{WH}$XP^{+a}-ended sequence

A peculiar pattern is observed in the iGT corpus: if an adjunct XP, CLP in particular, contains a WH element, represented here by $_{WH}$XP^{+a}, it preferably ends in a φ-break. Unlike the regular disyllabic XP^{+a}-ended sequences, which tend not to be φ-marked, as in (20a), a disyllabic $_{WH}$XP^{+a}-ended sequence is mostly φ-marked, as in (22b). The table in (23) indicates that the reading of (22b) represents 93.2% of data.

(22)	[[*kui*	*tai*]$_{CLP}$	[*ki-tshia*]$_{N}$]$_{NP}$?	'How many motorcycles are there?'
	WH	CL	motorcycle	
	53	13	55 55	base tones
a.	(55	33	33 55)φ	GT, iGT (6.8%)
b.	(55	13)φ	(33 55)φ	iGT (93.2%)

(23)	ss]$_{_{WH}XP}{}^{+a}$ ss]$_{XP}{}^{-a}$ (where the $_{WH}$XP^{+a}-ended sequence is disyllabic)			
	]$_{_{WH}XP}{}^{+a}$	]$_{XP}{}^{-a}$	Total	Percentage
	S	B)φ	22	6.8%
	B)φ	B)φ	300	93.2%
	S	S	0	0.0%
			322	100.0%

When a $_{WH}$XP^{+a}-ended sequence contains three or more syllables, it more consistently ends in a φ-break. The table in (25) shows that the reading of (24b) represents up to 98.5% of the data.

(24)	[[*kui*	*tsap*	*tai*]$_{CLP}$	[*ki-tshia*]$_{N}$]$_{NP}$?	'How many tens of motorcycles are there?'
	WH	ten	CL	motorcycle	
	53	5	13	55 55	base tones
a.	(55	3	33	33 55)φ	GT, iGT (1.5%)
b.	(55	3	13)φ	(33 55)φ	iGT (98.5%)

(25)	sss]$_{_{WH}XP}{}^{+a}$ ss]$_{XP}{}^{-a}$ (where the $_{WH}$XP^{+a}-ended sequence is trisyllabic)			
	]$_{_{WH}XP}{}^{+a}$	]$_{XP}{}^{-a}$	Total	Percentage
	S	B)φ	7	1.5%
	B)φ	B)φ	392	98.5%
	S	S	0	0.0%
			398	100.0%

In brief, the corpus shows that the $_{WH}$XP^{+a}-ended sequences are mostly φ-marked, regardless of their length.

3.5. Restrictions on phonological phrasing

Sections 3.1–3.3 have shown that the disyllabic XP^{+a}-ended sequences tend not to be φ-marked, while those containing three or four syllables are preferably φ-marked. This fact indicates that a phonological phrase derived from the XP^{+a} is minimally trisyllabic and maximally tetrasyllabic. Longer phonological phrases are avoided, as in (26).

(26)	[*kang-lang*]$_{NP}$	[[*ko*	*kha*	*kuann-kin*]$_{AdvP}$	[*li-khui*]$_{V'}$]$_{VP}$		'The workers left still faster.'
	worker	still	more	fast	leave		
	55 13	53	3	53 53	55 13	13	base tones
a.	(33 13)φ	(55	5	55 55	33 13)φ	13)φ	GT, iGT (1.5%)
b.	(33 13)φ	(55	5	55 53)φ	(33 13)φ	13)φ	iGT (98.5%)
*c.	(33 33	55	5	55 53)φ	(33 13)φ	13)φ	iGT (0%)

(27)	ss]$_{XP}{}^{-a}$ ssss]$_{XP}{}^{+a}$ ss]$_{XP}{}^{-a}$				
	]$_{XP}{}^{-a}$	]$_{XP}{}^{+a}$	]$_{XP}{}^{-a}$	Total	Percentage
	B)φ	S	B)φ	3	1.5%
	B)φ	B)φ	B)φ	198	98.5%
	S	B)φ	B)φ	0	0%
	S	S	S	0	0%
				201	100%

Table (27) shows that the reading of (26c) is absent in the iGT corpus. On the one hand, a hexasyllabic phonological phrase is undesirable. On the other, a non-adjunct XP always ends in a φ-break; the NP *kang-lang* thus forms a separate phonological phrase, and the reading of (26b) represents 98.5% of the data. Compare now (28) and (30).

(28)	[*be*	[[*lak*	*tsap*	*tai*]$_{CLP}$	[*ki-tshia*]$_{N}$]$_{NP}$]$_{VP}$		'to buy sixty motorcycles'
	buy	sixty		CL	motorcycle		
	53	5	5	13	55 55	55	base tones
a.	(55	3	3	33	33 55)φ		GT, iGT (0.17%)

b.	(53)φ	(3	3	13)φ	(33 55)φ	55)φ	iGT (13.1%)
c.	(55	3	3	13)φ	(33 55)φ	55)φ	iGT (85.3%)

(29)	$s]_X\ sss]_{XP}^{+a}\ ss]_{XP}^{-a}$				
	$]_X^{head}$	$]_{XP}^{+a}$	$]_{XP}^{-a}$	Total	Percentage
	S	S	B)φ	2	1.7%
	S	B)φ	B)φ	98	85.3%
	B)φ	B)φ	B)φ	15	13.0%
	S	S	S	0	0%
				115	100%

(30)	[*beh*	*[be*	[[*lak*	*tsap*	*tai*$]_{CLP}$	[*ki-tshia*$]_N]_{NP}]_{VP}]_{IP}$	'will buy sixty motorcycles'
	will	buy	sixty		CL	motorcycle	
	3	53	5	5	13	55 55	base tones
a.	(5	55	3	3	33	33 55)φ	GT, iGT (0.8%)
b.	(5	53)φ	(3	3	13)φ	(33 55)φ	iGT (95.2%)
c.	(5	55	3	3	13)φ	(33 55)φ	iGT (4%)

(31)	$ss]_X\ sss]_{XP}^{+a}\ ss]_{XP}^{-a}$				
	$]_X^{head}$	$]_{XP}^{+a}$	$]_{XP}^{-a}$	Total	Percentage
	S	S	B)φ	1	0.8%
	S	B)φ	B)φ	5	4.0%
	B)φ	B)φ	B)φ	120	95.2%
	S	S	S	0	0%
				126	100%

As shown in table (29), the reading of (28c) represents 85.3% of the data, where the monosyllabic verb, *be*, joins with the trisyllabic CLP, *lak tsap tai*, to form a tetrasyllabic phonological phrase, (*be lak tsap tai*)φ. In (30b), the line is parsed into three phonological phrases, (*beh be*)φ, (*lak tsap tai*)φ and (*ki-tshia*)φ. Table (31) shows that the reading of (30b) represents 95.2% of the data; the high percentage of such parsing lies in the avoidance of an oversized phonological phrase. Conversely, (32) and (34) evade an undersized phonological phrase.

(32)	[*be*	[[*lak*	*tai*$]_{CLP}$	[*ki-tshia*$]_N]_{NP}]_{VP}$		'to buy sixty motorcycles'
	buy	six	CL	motorcycle		
	53	5	13	55 55	55	base tones
a.	(55	3	33	33 55)φ	55)φ	GT, iGT (3.3%)
b.	(53)φ	(3	13)φ	(33 55)φ	55)φ	iGT (10.0%)
c.	(55	3	13)φ	(33 55)φ	55)φ	iGT (86.7%)

(33)	$s]_X\ ss]_{XP}^{+a}\ ss]_{XP}^{-a}$				
	$]_X^{head}$	$]_{XP}^{+a}$	$]_{XP}^{-a}$	Total	Percentage
	S	S	B)φ	29	3.3%
	S	B)φ	B)φ	772	86.7%
	B)φ	B)φ	B)φ	89	10.0%
	S	S	S	0	0%
				890	100%

(34)	[*beh*	[*be*	[[*lak*	*tai*$]_{CLP}$	[*ki-tshia*$]_N]_{NP}]_{VP}]_{IP}$		'will buy six motorcycles'
	will	buy	six	CL	motorcycle		
	3	53	5	13	55 55	55	base tones

a.	(5	55	3	33	33 55)φ	55)φ	GT, iGT (5.5%)
b.	(5	53)φ	(3	13)φ	(33 55)φ	55)φ	iGT (26.7%)
c.	(5	55	3	13)φ	(33 55)φ	55)φ	iGT (67.8%)

(35) ss]$_X$ ss]$_{XP}{}^{+a}$ ss]$_{XP}{}^{-a}$

]$_X{}^{head}$	]$_{XP}{}^{+a}$	]$_{XP}{}^{-a}$	Total	Percentage
S	S	B)φ	33	5.5%
S	B)φ	B)φ	406	67.8%
B)φ	B)φ	B)φ	160	26.7%
S	S	S	0	0%
			599	100%

The readings of (32c) and (34c) represent the majority, found in 86.7% and 67.8% of the data respectively; (32b) and (34b) are not preferred, as the adjunct XP's yield disyllabic phonological phrases. It should be noted that the restrictions on the size specifically apply to the phonological phrases (φ^{+a}) derived from adjunct XP's. For instance, (*lak tai*)φ^{+a} in (34b) is subject to the size restrictions, while (*beh be*)φ and (*ki-tshia*)φ are tolerated. (I will return to this in Sections 4.2–4.3.)

3.6. Interim summary

The corpus has shown that the adjunct XP in iGT behaves differently from GT in relation to the formation of phonological phrase; specifically, the phonological phrase in GT is parsed into smaller ones in iGT. Five patterns are in order. First, 99.6% of the tetrasyllabic XP^{+a}-ended sequences are φ-marked. Second, 84.5% of the trisyllabic XP^{+a}-ended sequences are φ-marked. Third, 72% of the disyllabic XP^{+a}-ended sequences are not φ-marked. Fourth, the $_{WH}XP^{+a}$-ended sequences are φ-marked, regardless of their length. Finally, there is a length restriction on phonological phrasing: a phonological phrase derived from an adjunct XP is minimally trisyllabic and maximally tetrasyllabic. Hence the corpus makes possible the generalization of a dominant grammar. The next section is engaged in a theoretical analysis.

4. A dominant grammar

The syntactic and prosodic factors involved in phonological phrasing can be reframed into a set of constraints under the Optimality Theory (Prince & Smolensky 1993/2004). Sections 4.1–4.4 address the interactions of alignment and prosodic markedness constraints. A dominant grammar is generalized in Section 4.5, and an alternative approach is investigated in Section 4.6. Section 4.7 offers an interim summary and discusses the theoretical implication.

4.1. Adjunct alignment

McCarthy and Prince (1993) posit a family of well-formedness constraints known as generalized alignment, which requires a designated edge of a prosodic or grammatical constituent to coincide with a designated edge of some other prosodic or grammatical constituent. The end-based phonological phrasing in iGT can be captured by the alignment constraints in (36) and (37).

(36)
a. Align-R(XP^{+a}, φ)
Assign a violation mark for every XP^{+a} whose right edge does not coincide with that of a φ.
b. Align-R(XP^{-a}, φ)
Assign a violation mark for every XP^{-a} whose right edge does not coincide with that of a φ.

(37)
a. Align-R(φ, XP^{+a})
Assign a violation mark for every φ whose right edge does not coincide with that of an XP^{+a}.
b. Align-R(φ, XP^{-a})
Assign a violation mark for every φ whose right edge does not coincide with that of an XP^{-a}.

The constraints in (36) require every syntactic XP to be right-aligned with a phonological phrase, while those in (37) require every phonological phrase to be right-aligned with a syntactic XP. These constraints are ranked differently in GT and iGT. In GT, Align-R(φ, XP^{-a}) is top-ranked but Align-R(φ, XP^{+a}) is bottom-ranked such that a phonological phrase will not be aligned with an adjunct XP. As in (38a), the first φ of *CAND 2* is right-aligned with the XP^{+a}, and thus is ruled out by ALIGN-R(φ, XP^{-a}); *CAND 1* is selected as the optimal output in sacrifice of the violations of ALIGN-R(XP^{-a}, φ) and ALIGN-R(φ, XP^{+a}).

(38) σσσ]$_{XP}$$^{+a}$ σσ]$_{XP}$$^{-a}$

CAND 1 ( )φ = (16a), (17a)

CAND 2 ( )φ ( )φ = (16b), (17b)

GT: ALIGN-R(φ, XP^{-a}) >> ALIGN-R(X^{+a}, φ), ALIGN-R(XP^{-a}, φ) >> ALIGN-R(φ, XP^{+a})

a.	ALIGN-R(φ, XP^{-a})	ALIGN-R(XP^{-a}, φ)	ALIGN-R(XP^{+a}, φ)	ALIGN-R(φ, XP^{+a})
☞ *CAND 1*			*	*
CAND 2	*!			*

iGT: ALIGN-R(XP^{-a}, φ) >> ALIGN-R(XP^{+a}, φ) >> ALIGN-R(φ, XP^{-a}) >> ALIGN-R(φ, XP^{+a})

b.	ALIGN-R(XP^{-a}, φ)	ALIGN-R(XP^{+a}, φ)	ALIGN-R(φ, XP^{-a})	ALIGN-R(φ, XP^{+a})
CAND 1		*!		*
☞ *CAND 2*			*	*

Conversely, in iGT, ALIGN-R(XP^{+a}, φ) is ranked higher than ALIGN-R(φ, XP^{-a}) and ALIGN-R(φ, XP^{+a}), a constraint ranking that allows an adjunct XP to be right-aligned with a phonological phrase. As in (38b), the XP^{+a} of *CAND 1* does not end in a φ-break and thus fatally violates ALIGN-R(XP^{+a}, φ); *CAND 2* is selected as the optimal output, tolerating the violations of ALIGN-R(φ, XP^{-a}) and ALIGN-R(φ, XP^{+a}). This reading represents 84.5% of the XP^{+a}-ended trisyllabic data, as shown in table (18). The iGT constraint ranking continues to work for the tetrasyllabic XP^{+a}-ended sequences; as in (39), *CAND 2* emerges in the same way. The table in (15) has shown that this reading represents 99.6% of the data.

(39) σσσσ]$_{XP}$$^{+a}$ σσ]$_{XP}$$^{-a}$ = (13), (14)

CAND 1 ( )φ

CAND 2 ( )φ ( )φ

	ALIGN-R(XP^{-a}, φ)	ALIGN-R(XP^{+a}, φ)	ALIGN-R(φ, XP^{-a})	ALIGN-R(φ, XP^{+a})
CAND 1		*!		*
☞ *CAND 2*			*	*

However, the iGT constraint ranking is insufficient to select a correct output from the disyllabic XP^{+a}-ended data, as in (40).

(40) σσ]$_{XP}$$^{+a}$ σσ]$_{XP}$$^{-a}$ = (19), (20)

CAND 1 ( )φ

CAND 2 ( )φ ( )φ

	ALIGN-R(XP^{-a}, φ)	ALIGN-R(XP^{+a}, φ)	ALIGN-R(φ, XP^{-a})	ALIGN-R(φ, XP^{+a})
(☞) *CAND 1*		*!		*
✘☞ *CAND 2*			*	*

Table (21) has shown that *CAND 1* in (40) represents the majority's reading, found in 72% of the data, but it would be wrongly ruled out by ALIGN-R(XP^{+a}, φ), as indicated by the parenthesized right-headed hand symbol (☞); consequently, *CAND 2*, which obtains a disyllabic phonological phrase from an adjunct XP, is incorrectly selected, as indicated by the symbol ✘☞. In the next section, I will argue that adjunct alignment is subsumed under prosodic minimality.

4.2. Prosodic minimality

The corpus has shown a tendency that an adjunct XP does not end in a φ-break, if the relevant sequence is disyllabic or shorter, but it usually does, if the relevant sequence is trisyllabic or tetrasyllabic. This phenomenon suggests that the phonological phrase mapped from an adjunct XP is subject to some sort of prosodic restriction; specifically, it is minimally trisyllabic. Two constraints on the minimality are thus needed as in (41).

(41) a. φ^{+a}-MIN
Assign a violation mark for every φ^{+a} that contains less than three syllables.

b. φ-MIN
Assign a violation mark for every φ that contains less than three syllables.

The symbol φ^{+a} indicates the phonological phrase mapped from an adjunct XP, while φ indicates a phonological phrase in general. The two constraints in (41) are in a stringency relation (de Lacy, 2002, Prince, 1997b, McCarthy, 2008); φ-MIN is more stringent than φ^{+a}-MIN, and every violation of φ^{+a}-MIN is also a violation of φ-MIN. The less stringent φ^{+a}-MIN is ranked between ALIGN-R(XP^{-a}, φ) and ALIGN-R(XP^{+a}, φ), while the general φ-MIN is ranked at the bottom, as in (42).

(42) σσ]$_{XP}$$^{+a}$ σσ]$_{XP}$$^{-a}$ = (19), (20)

CAND 1 ( )φ^{-a}

CAND 2 ( )φ^{+a} ( )φ^{-a}

iGT: ALIGN-R(XP^{-a}, φ) >> φ^{+a}-MIN >> ALIGN-R(XP^{+a}, φ) >> φ-MIN >> ALIGN-R(φ, XP^{-a}) >> ALIGN-R(φ, XP^{+a})

	ALIGN-R(XP^{-a}, φ)	φ^{+a}-MIN	ALIGN-R(XP^{+a}, φ)	φ-MIN
☞ *CAND 1*			*	
CAND 2		*!		**

In this tableau (and the rest of the paper), irrelevant constraints are omitted due to limited space. The disyllabic φ^{+a} of *CAND 2* is ruled out by φ^{+a}-MIN, and thus *CAND 1* is selected as the optimal output, where the non-adjunct XP but not the adjunct XP is φ -aligned.

In cases like (43–44), the trisyllabic and tetrasyllabic φ^{+a}'s do not violate φ^{+a}-MIN, a fact that permits the XP^{+a}-ended syllable sequence to form a separate phonological phrase. The constraint ALIGN-R(XP^{+a}, φ) thus eliminates *CAND 1* in each example.

(43) σσσ]$_{XP}$$^{+a}$ σσ]$_{XP}$$^{-a}$ = (16), (17)

CAND 1 ( )φ

CAND 2 ( )φ^{+a} ( )φ

	ALIGN-R(XP^{-a}, φ)	φ^{+a}-MIN	ALIGN-R(XP^{+a}, φ)	φ-MIN
CAND 1			*!	
☞ *CAND 2*				**

(44) σσσσ]$_{XP}$$^{+a}$ σσ]$_{XP}$$^{-a}$ = (13), (14)

CAND 1 ( )φ

CAND 2 ( )φ^{+a} ( )φ

	ALIGN-R(XP^{-a}, φ)	φ^{+a}-MIN	ALIGN-R(XP^{+a}, φ)	φ-MIN
CAND 1			*!	
☞ *CAND 2*				**

The two examples above show that the more stringent φ-MIN must be ranked below ALIGN-R(XP^{+a}, φ). In either line, two violations of φ-MIN are tolerated so that *CAND 2* can emerge. Compare now (45) and (46).

(45) σσ]$_{XP}$$^{-a}$ σσσσ]$_{XP}$$^{+a}$ σσ]$_{XP}$$^{-a}$ = (26)

CAND 1 ( )φ ( )φ

CAND 2 ( )φ ( )φ^{+a} ( )φ

CAND 3 ( )φ^{+a} ( )φ

	ALIGN-R(XP^{-a}, φ)	φ^{+a}-MIN	ALIGN-R(XP^{+a}, φ)	φ-MIN
CAND 1			*!	*
☞ *CAND 2*				**
CAND 3	*!			*

(46)

σσ]$_X$ σσσ]$_{XP}^{+a}$ σσ]$_{XP}^{-a}$ = (30)

Cand 1 ( )φ ( )φ

Cand 2 ( )φ ( )$φ^{+a}$ ( )φ

Cand 3 ( )$φ^{+a}$ ( )φ

	Align-R(XP^{-a}, φ)	$φ^{+a}$-Min	Align-R(XP^{+a}, φ)	φ-Min
Cand 1			*!	*
(☞) *Cand 2*				**!
✗☞ *Cand 3*				*

In both tableaux, there are two disyllabic φ's in *Cand 2* but one in *Cand 3*. In (45), Align-R(XP^{-a}, φ) eliminates *Cand 2* and allows *Cand 3* to emerge; table (27) has indicated that *Cand 3* reperesents 98.5% of the data. In spite of that, Align-R (XP^{-a}, φ) is irrelevant to the non-XP (X) in (46); as a consequence, *Cand 3* undesirably wins over *Cand 2* by one less violation of φ-Min. An essential reason for the ill-formedness of *Cand 3* here is that the $φ^{+a}$ is oversized, as will be discussed in the next section.

4.3. Prosodic maximality

Speakers of iGT seldom utter long expressions of this language, but tend to break a long string into shorter fragments. In the corpus, very few pentasyllabic or longer fragments are collected. It is thus reasonable to consider that the phonological phrasing is subject to a restriction on maximality. Two constraints like (47) are needed.

(47) a. $φ^{+a}$-Max
Assign a violation mark for every φ that contains more than four syllables.
b. φ-Max
Assign a violation mark for every φ that contains more than four syllables.

The two constraints in (47) are in a stringency relation as well; φ-Max is more stringent than $φ^{+a}$-Max, and every violation of $φ^{+a}$-Max is also a violation of φ-Max. The constraints $φ^{+a}$-Max and $φ^{+a}$-Min do not interact with each other, and thus are ranked equally, as in (48).

(48)

σσ]$_X$ σσσ]$_{XP}^{+a}$ σσ]$_{XP}^{-a}$ = (34)

Cand 1 ( )φ ( )φ

Cand 2 ( )φ ( )$φ^{+a}$ ( )φ

Cand 3 ( )$φ^{+a}$ ( )φ

iGT: Align-R(XP^{-a}, φ) >> $φ^{+a}$-Max, $φ^{+a}$-Min >> Align-R(XP^{+a}, φ) >> φ-Max, φ-Min >> Align-R(φ, XP^{-a}) >> Align-R(φ, XP^{+a})

	Align-R(XP^{-a}, φ)	$φ^{+a}$-Max	$φ^{+a}$-Min	Align-R(XP^{+a}, φ)	φ-Max	φ-Min
Cand 1				*!	*	
☞ *Cand 2*						**
Cand 3		*!			*	*

With the high-ranked $φ^{+a}$-Max, the oversized $φ^{+a}$ of *Cand 3* in (48) is ruled out, and allows *Cand 2* to surface. The table in (31) has indicated that the reading of *Cand 2* represents 95.2% of the data. While $φ^{+a}$-Max is fatally violated by *Cand 3* of in (48), it is bypassed by *Cand 3* of (49).

(49)

σ]$_X$ σσσ]$_{XP}^{+a}$ σσ]$_{XP}^{-a}$ = (32)

Cand 1 ( )φ

Cand 2 ( )φ ( )$φ^{+a}$ ( )φ

Cand 3 ( )$φ^{+a}$ ( )φ

	Align-R(XP^{-a}, φ)	$φ^{+a}$-Max	$φ^{+a}$-Min	Align-R(XP^{+a}, φ)	φ-Max	φ-Min
Cand 1				*!	*	
Cand 2						**!
☞ *Cand 3*						*

The φ^{+a} in *Cand 3* of (49) is tetrasyllabic, which satisfies both φ^{+a}-Max and φ-Max. *Cand 2* then loses to *Cand 3* by one more violation of φ-Min. The table in (33) has indicated that the reading of *Cand 3* represents 86.7% of the data.

4.4. WH alignment

As indicated by the corpus, an adjunct XP that contains a WH element mostly ends in a φ-break. This tendency can be governed by the constraint in (50).

(50) Align-R($_{WH}XP^{+a}$, φ)
Assign a violation mark for every $_{WH}XP^{+a}$ whose right edge does not coincide with that of a φ.

This constraint is ranked at the top, dominating the prosodic markedness constraints, φ^{+a}-Max and φ^{+a}-Min, as in (51).

(51) $\sigma\sigma]_{_{WH}XP}{}^{+a}$ $\sigma\sigma]_{XP}{}^{-a}$ = (22)
Cand 1 ($)\varphi^{-a}$
Cand 2 ($)\varphi^{+a}$ ($)\varphi^{-a}$
iGT: Align-R($_{WH}XP^{+a}$, φ), Align-R(XP^{-a}, φ) >> φ^{+a}-Max, φ^{+a}-Min >> Align-R(XP^{+a}, φ) >> φ-Max, φ-Min >> Align-R(φ, XP^{-a}) >> Align-R(φ, XP^{+a})

	Align-R($_{WH}XP^{+a}$, φ)	φ^{+a}-Max	φ^{+a}-Min	Align-R(XP^{+a}, φ)	φ-Max	φ-Min
Cand 1	*!			*	*	
☞ *Cand 2*			*			**

The top-ranking of Align-R($_{WH}XP^{+a}$, φ) requires every $_{WH}XP^{+a}$-ended sequence to be right-aligned with a phonological phrase, regardless of its length. This constraint thus rules out *Cand 1* and selects *Cand 2* as the optimal output in sacrifice of a violation of φ^{+a}-Min. Table (23) has indicated that the reading of *Cand 2* represents 93.2% of the disyllabic data.

(52) $\sigma\sigma\sigma]_{_{WH}XP}{}^{+a}$ $\sigma\sigma]_{XP}{}^{-a}$ = (24)
Cand 1 ($)\varphi^{-a}$
Cand 2 ($)\varphi^{+a}$ ($)\varphi^{-a}$

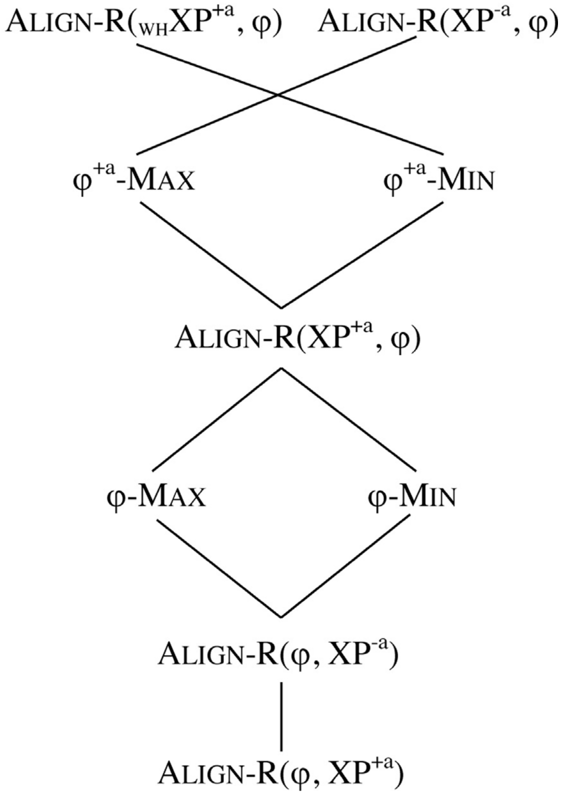
	Align-R($_{WH}XP^{+a}$, φ)	φ^{+a}-Max	φ^{+a}-Min	Align-R(XP^{+a}, φ)	φ-Max	φ-Min
Cand 1	*!			*	*	
☞ *Cand 2*						*

The constraint Align-R($_{WH}XP^{+a}$, φ) eliminates *Cand 1* of (51) in the same fashion, and selects *Cand 2* as the optimal output. Table (25) has indicated that the reading of *Cand 2* represents 98.5% of the trisyllabic data. It has been observed in several works (Cheng, 1991, Mathieu, 2016, Kandybowicz, 2017, Wang, 2017a, Yang, 2018, among others) that WH elements behave quite differently from other syntactic categories. The peculiar pattern of WH-phrasing should not be surprising then.

4.5. Grammar lattice

The sections above have addressed a dominant grammar of iGT based on the corpus. Five patterns can be summarized. First, a phonological phrase in GT tends to be parsed into smaller ones in iGT. Second, the size of a phonological phrase in iGT preferably contains three to four syllables. Third, an adjunct XP is not aligned to form a disyllabic or shorter phonological phrase. Fourth, the adjunct XP alignment is triggered to avoid a phonological phrase which is longer than tetrasyllabic. Finally, a non-adjunct XP or an adjunct XP that contains a WH element is usually right-aligned with a phonological phrase. The Hasse diagram in (53) sums up the grammar lattice.

(53) Grammar lattice of iGT



The high-ranked ALIGN-R(φ, XP^{-a}) in GT is demoted below ALIGN-R(XP^{+a}, φ) in iGT such that ALIGN-R(XP^{+a}, φ) is no longer suspended. The ranking of $φ^{+a}$-MAXand$φ^{+a}$-MIN above ALIGN-R(XP^{+a}, φ) indicates that ALIGN-R(XP^{+a}, φ) is activated only to obtain a trisyllabic or tetasyllable phonological phrase. On the other hand, with a lower ranking, these two prosodic markedness constraints do not place restrictions on ALIGN-R($_{WH}XP^{+a}$, φ) or ALIGN-R(XP^{-a}, φ).

4.6. An alternative analysis

Selkirk (2011) rethinks her (1986) end-parameters and raises a doubt on whether a nonsyntactic span really forms a prosodic constituent. She suggests that further empirical evidence is required, and she proposes a theory of ''Match'' that indicates a tendency for prosodic constituents to mirror syntactic constituents. In this sense, the syntax-prosody match is no longer a matter of alignment (or markedness) but operates on correspondence (or faithfulness). In this spirit, an alternative approach to the phonological phrasing of iGT can be examined through the two sets of match constraints in (54) and (55).

(54)
a. MATCH(XP^{+a}, φ)
Assign a violation mark for every syntactic XP^{+a} which is not matched by a φ.
b. MATCH(XP^{-a}, φ)
Assign a violation mark for every syntactic XP^{-a} which is not matched by a φ.

(55)
a. MATCH(φ, XP^{+a})
Assign a violation mark for every φ which is not matched by a syntactic XP^{+a}.
b. MATCH(φ, XP^{-a})
Assign a violation mark for every φ which is not matched by a syntactic XP^{-a}.

The notion of match refers to the constituent-to-constituent correspondence, which requires coincidence of both edges, but not simply the right edge. As a consequence, a phonological phrase can be hierarchically embedded under another phonological phrase, as in (56).

(56) [*be* [[*lak tsap tai*]$_{CLP}$ [*ki-tshia*]$_N$]$_{NP}$]$_{VP}$ 'to buy sixty motorcycles' = (28)
buy sixty CL motorcycle
53 5 5 13 55 55 base tones
Cand 1 (55 (3 3 33 33 55)φ)φ
Cand 2 (55 ((3 3 13)φ^{+a} 33 55)φ)φ
iGT: Match(XP^{-a}, φ) >> φ^{+a}-Max, φ^{+a}-Min >> Match(XP^{+a}, φ) >> φ-Max, φ-Min >> Match(φ, XP^{-a}) >> Match(φ, XP^{+a})

	Match(XP^{-a}, φ)	φ^{+a}-Max	φ^{+a}-Min	Match(XP^{+a}, φ)	φ-Max	φ-Min
Cand 1				*!	**	
☞*Cand 2*					**	

The constraint Match(XP^{+a}, φ) requires the trisyllabic CLP to be matched by a φ^{+a}, and rules out *Cand 1* in (56); *Cand 2* then is correctly selected as the optimal output. The Match Theory suggests relaxation of the Strict Layer Hypothesis (SLH), which is a claim about the prosodic hierarchy that prohibits recursion, skipping or reversion of a constituent type on the hierarchy (Selkirk, 1980, 1984, Nespor and Vogel, 1986, Hayes, 1989). On the other hand, it has been postulated in several works that the SLH is inevitably violated: recursion of intonational phrase in Ladd (1986), recursion of prosodic foot in Shih (1986) and Hung (1987), and recursion of prosodic word in Selkirk (1995). In the case of iGT, recursion of phonological phrase would be assumed under the Match Theory, and the match constraint ranking continues to select the optimal output in (57) successfully.

(57) [[*lak tai*]$_{CLP}$ [*ki-tshia*]$_N$]$_{NP}$ 'to buy sixty motorcycles' = (20)
six CL motorcycle
5 13 55 55 base tones
Cand 1 (3 33 33 55)φ
Cand 2 ((3 13)φ^{+a} 33 55)φ
iGT: Match(XP^{-a}, φ) >> φ^{+a}-Max, φ^{+a}-Min >> Match(XP^{+a}, φ) >> φ-Max, φ-Min >> Match(φ, XP^{-a}) >> Match(φ, XP^{+a}) >> NoRecursion-φ

	Match(XP^{-a}, φ)	φ^{+a}-Max	φ^{+a}-Min	Match(XP^{+a}, φ)	φ-Max	φ-Min
☞*Cand 1*				*	*	
Cand 2			*!		*	*

The constraint Match(XP^{+a}, φ) is suspended in (57), where the disyllabic φ^{+a} of *Cand 2* incurs a fatal violation of φ^{+a}-Min. *Cand 1* is thus favored over *Cand 2*. In terms of OT, the SLH has been split off into a family of violable constraints NoRecursion-X. and the constraint NoRecursion-φ is ranked at the bottom (and thus omitted in the tableaux). However, the Match Theory approach encounters a problem in structures like (58).

(58) [*be* [[*lak tai*]$_{CLP}$ [*ki-tshia*]$_N$]$_{NP}$]$_{VP}$ 'to buy sixty motorcycles' = (32)
buy six CL motorcycle
53 5 13 55 55 base tones
Cand 1 (55 (3 33 33 55)φ)φ
Cand 2 (55 ((3 13)φ^{+a} 33 55)φ)φ

	Match(XP^{-a}, φ)	φ^{+a}-Max	φ^{+a}-Min	Match(XP^{+a}, φ)	φ-Max	φ-Min
✗☞*Cand 1*				*	**	
(☞)*Cand 2*			*!		**	

The real optimal output in (58) is *Cand 2*; unfortunately its disyllabic φ^{+a} is ruled out by φ^{+a}-Min. As a result, *Cand 1* is incorrectly chosen.[9] The implication here is that the phonological phrase is not organized hierarchically like *Cand 2*, but in a linear way like *Cand 3* in (59).

[9] An anonymous reviewer suggests that the processes of phonological grouping could have different operations requested by different rules at different levels. For example, the *Cand2* of (58) may be derived through the following steps:
Step one: at P-morphology level: (55 ((5 13) φ (55 55) φ)))φ by P-morphology rule
Step two: at P-syntax level: (55 (5 13 35 55 φ))φ by Match Theory
Step three: at phonology level: (55 ((5 13) φ^{+a} 35 55)φ)φ by Phonological dominant hypothesis
In this case, the argument against Match Theory may appear insufficient. These three steps, however, are unable to predict the optimal output in *Cand 4* of (60).

(59)	*Cand*	*3*	(55	3	13)φ^{+a}	(33	55)φ

The φ^{+a} in *Cand 3* is composed of a syntactic non-constituent span, which cannot be matched by a prosodic constituent, in terms of the match theory. Instead, the syllable grouping is achieved by aligning the right edges of the adjunct XP and the phonological phrase. In other words, the phonological phrase is constituted from the syllable string between prosodic boundaries. A similar concept is proposed by Tokizaki (2001); as he suggested, ''Prosodic categories are the derived notion of the strings demarcated by prosodic boundaries'' (pp. 2–3).[10] Compare now (60) and (61).

(60)

[[*ko kha kuann-kin*]$_{AdvP}$ [[*siu-li*]$_{V'}$ [[*lak tsap tai*]$_{CLP}$ [*ki-tshia*]$_N$]$_{NP}$]$_{VP}$ 'to fix the sixty
still more fast fix sixty CL motorcycle motorcycles still faster'
53 3 53 53 55 53 5 5 13 55 55 base tones
Cand 1 (55 3 55 55 33 55 3 3 33 33 55)φ
Cand 2 (55 3 55 53)φ^{+a} (33 55 ((3 3 13)φ^{+a} 33 55)φ)φ
Cand 3 (55 3 55 53)φ^{+a} ((33 53)φ (3 3 33 33 55)φ)φ
Cand 4 (55 3 55 53)φ^{+a} ((33 53)φ ((3 3 13)φ^{+a} 33 55)φ)φ

	Match(XP^{-a}, φ)	φ^{+a}-Max	φ^{+a}-Min	Match(XP^{+a}, φ)	φ-Max	φ-Min	Match(φ, XP^{-a})
Cand 1				*!*	*		
✗☞*Cand 2*					**	*	
Cand 3				*!	**	*	*
(☞)*Cand 4*					**	*	*!

(61)

[[*ko kha kuann-kin*]$_{AdvP}$ [[*siu-li*]$_V$ [[*lak tsap tai*]$_{CLP}$ [*ki-tshia*]$_N$]$_{NP}$]$_{VP}$ 'to fix the sixty
still more fast fix sixty CL motorcycle motorcycles still faster'
53 3 53 53 55 53 5 5 13 55 55 base tones
Cand 1 (55 3 55 55 33 55 3 3 33 33 55)φ
Cand 2 (55 3 55 53)φ^{+a} (33 55 3 3 13)φ^{+a} (33 55)φ
Cand 3 (55 3 55 53)φ^{+a} (33 53)φ (3 3 33 33 55)φ
Cand 4 (55 3 55 53)φ^{+a} (33 53)φ (3 3 13)φ^{+a} (33 55)φ

	Align(XP^{-a}, φ)	φ^{+a}-Max	φ^{+a}-Min	Align(XP^{+a}, φ)	φ-Max	φ-Min	Align(φ, XP^{-a})
Cand 1				*!*	*		
Cand 2		*!				*	
Cand 3				*!	*	*	*
☞*Cand 4*						*	*

In (60), the lower-ranked constraint Match(φ, XP^{-a}) incorrectly rules out *Cand 4*, the real optimal output, but allows the wrong output, *Cand 2*. On the other hand, the alignment constraints, as in (61), correctly chooses *Cand 4* as the optimal output. In (61), *Cands 1–3* are respectively ruled out by Align(XP^{+a}, φ) and φ^{+a}-Max, and hence *Cand 4* emerges.

4.7. Interim summary and theoretical implication

In Sections 4.1–4.5, I employ the Standard Prosodic Theory to analyze the phonological phrasing in relation to the iGT adjuncts, positing a set of alignment constraints and prosodic markedness constraints. In Section 4.6, I examine an alternative analysis under the Match Theory, and the alignment constraints are replaced by a set of match constraints. These two theories render different implications. First, the alignment constraints require designated edges of prosodic and/or grammatical constituents to coincide, and they are usually constraints of markedness. The match constraints indicate a tendency for prosodic constituents to mirror syntactic constituents, and they are basically constraints of faithfulness. Second, the match constraints allow recursion of a prosodic category; in particular, a phonological phrase can be hierarchically embedded under another phonological phrase, as in (56) and (60). On the other hand, the alignment constraints prohibit recursion of any prosodic category; the phonological phrase is constituted from linear syllable grouping between prosodic boundaries, as in (61). The interaction of the alignment constraints and the and prosodic

[10] Tokizaki (2001) suggests that there is no need to posit different prosodic categories. His theory claims that phonological operation is blocked not by prosodic categories but by prosodic boundaries themselves. In this paper, however, I have shown that prosodic categories are indispensable. The tone group in iGT is a phonological phrase, the formation of which is subject to certain prosodic restrictions, and which serves to confine tone sandhi.

markedness constraints correctly eliminates oversized and undersized phonological phrases, while the match constraints may render incorrect predicts. In any case, the adjunct tone sandhi instantiates a case of the syntax-phonology interface; the tone sandhi is confined by the domain of the phonological phrase, which has an access to syntax, such as XP^{-a} and XP^{+a}. The formation of the phonological phrase in iGT is also affected by the number of syllable, i.e., minimally trisyllabic and maximally tetrasyllabic, and hence illustrates a competition between syntax and prosody.

5. Conclusion

The accent of iGT is more or less a newly developed form, where in fact exist some variations. This research builds an iGT corpus, which makes possible the generalization of a dominant grammar. The corpus has shown that the iGT speakers preferably parse longer expressions into trisyllabic or tetrasyllabic fragments. These fragments are by nature phonological phrases, to which tone sandhi is limited. The phonological phrasing has access to syntactic adjuncthood and is affected by the number of syllable. The syntax-prosody competition is keyed to a set of alignment and prosodic markedness constraints. An alternative analysis under the Match Theory, however, renders erroneous predictions. Further research of the iGT corpus can be twofold. First, the corpus can be used to observe language change. As mentioned earlier, certain features of the iGT accent are also found in those who were born earlier, what factors exactly trigger those parsing alternations between different generations is worth-exploring. Second, the current corpus study may have a value for the Theory of Stylistic-Register Grammar Feng (2010), Feng and Shi (2018), and Lee and Chan (2015), which considers that the use of wrong register-style is not only an issue of embarrassment or inappropriateness, but relates to grammaticality issues. The iGT accent appears to be a mixture of formal and informal styles. One the one hand, the iGT speakers do not produce literary pronunciation, but produce mostly colloquial pronunciation as in informal speech. On the other hand, the iGT speakers tend to parse long expressions into short prosodic fragments, a style that is similar to formal speech. It is worth-investigating how the iGT accent is processed in relation to the Theory of Stylistic-Register Grammar.

Declaration of competing interest

The author claims NO affiliations with or involvement in any organization or entity with any financial interest or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript published by Lingua.

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