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Rhythm and Syntax in Chinese: A Case Study¹

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1. Introduction

It has been observed that in Chinese the trisyllabic VO (verb-object) structure strongly prefers 1-2 rhythm over 2-1 while the trisyllabic MN (modifier-noun) structure strongly prefers 2-1 over 1-2 (Lü, 1962). The preferences are particularly obvious when both components can take either a monosyllabic form or a disyllabic one. (In this paper we keep the English translation close to Chinese, i.e. often without marking number or tense.)

(1) VO

2-2	1-1	2-1	1-2	
閱讀-報紙	讀-報	*閱讀-報	讀-報紙	'to read newspaper'
表演-戲劇	演-戲	*表演-戲	演-戲劇	'to perform play'
種植-樹木	種-樹	*種植-樹	種-樹木	'to plant tree'

(2) MN

2-2	1-1	2-1	1-2	
手錶-工廠	錶-廠	手錶-廠	*錶-工廠	'watch factory'
技術-工人	技-工	技術-工	*技-工人	'skill worker'
煤炭-商店	煤-店	煤炭-店	*煤-商店	'coal store'

The preferences can be further shown in the following examples, where the ambiguous quadrisyllabic forms are abbreviated to 1-2 as VO structures but to 2-1 as MN ones (Wu 1986).

(3)	VO or MN	VO	MN
	複印-文件	印-文件	複印-件
		'to copy/reduplicate files'	'reduplicated file'
	測量-儀器	測-儀器	測量-儀
		'to measure instruments'	'measuring instrument'
	籌備-經費	籌-經費	籌備-費
		'to prepare funds'	'preparatory fund'
	運輸-箱子	運-箱子	運輸-箱
		'to ship boxes'	'shipping box'

Although the facts have been known for some time, there has been no satisfactory explanation. In the following section, we offer an analysis for the preferences.

2. A Basic Explanation: Nonhead Length Rule (NHL)

In (1)-(3), each word has both a long (disyllabic) form and a short (monosyllabic) form. Thus, we can treat the preferences as the default tendencies. Expressions without word length choices behave somewhat differently, to be discussed later.

Lu (1989) suggests that the phenomena have something to do with the placement of the syntactic head. Duanmu (1990) proposes a Nonhead Stress rule, stated in (4).

- (4) Nonhead Stress (NHS):
In a syntactic head-nonhead (or a nonhead-head) relation, the nonhead has greater stress than the head.

The rule can explain the above data if we assume that stress and length are related. Thus, Lu and Duanmu (1991) propose the following Nonhead Length rule.

- (5) Nonhead Length (NHL):
In a syntactic head-nonhead (or a nonhead-head) relation, the head cannot have greater length than the nonhead.²

In trisyllabic VO structures, O is the nonhead, so O tends to be longer than V. In trisyllabic MN structures, M is the nonhead, so M tends to be longer than N. This gives 1-2 in VO and 2-1 in MN.

Both stress and length are phonetic quantities. NHL, therefore, seems to be a natural extension of NHS. In Duanmu (2000), Nonhead Length has been reinterpreted in terms of Nonhead Stress and foot structure.

Some of the constructions we are discussing here are compounds, not phrases. However, the relation between head and nonhead exists in compounds as well. Therefore, NHL (or NHS) applies to word length in compounds the same way as in phrases.

In the following, we can see that the same analysis works for other endocentric constructions in Chinese.

- (6) X-Locative (X is nonhead)³
- | | | | | |
|-------|-----|------|-------|--------------------|
| 2-2 | 1-1 | 2-1 | 1-2 | |
| 桌子-下面 | 桌-下 | 桌子-下 | *桌-下面 | 'lit: table under' |
| 身體-上面 | 身-上 | 身體-上 | *身-上面 | 'lit: body on' |
| 吃飯-以前 | 飯-前 | 吃飯-前 | *飯-以前 | 'lit: meal before' |
| 喝酒-以後 | 酒-後 | 喝酒-後 | *酒-以後 | 'lit: drink after' |
- (7) Verb-Result (Result is nonhead)
- | | | | | |
|-------|-----|-------|------|-----------------------|
| 2-2 | 1-1 | 2-1 | 1-2 | |
| 講解-清楚 | 講-清 | *講解-清 | 講-清楚 | 'lit: to talk clear' |
| 打掃-干淨 | 掃-淨 | *打掃-淨 | 掃-干淨 | 'lit: to sweep clean' |

In summary, we believe that the head-nonhead relation plays a central role in the choice between 1-2 and 2-1 alternative forms.⁴

There are some examples that do not seem to follow NHL, such as 2-1 VO (e.g. 喜歡-書 'to like books', 研究-人 'to study people') and 1-2 MN forms (e.g. 省-領導 'province leader', 金-屋頂 'gold roof'). Such examples involve the interference of other factors. We discuss them next.

3. Apparent Counter-examples and Explanations

There are three cases where NHL seems to fail. The first case involves words that do not have flexible length. The second case involves AN (adjective-noun) constructions. The third case involves nouns that serve as adjectives. We discuss them in turn.

3.1. Words without flexible length

The VO constructions in (8) are 2-1, which seem to violate NHL.

- (8) 2-1 VO
 喜歡-書 'to like books'
 研究-人 'to study people'

However, a close look reveals an additional factor, namely, the words in (8) do not have flexible length. In particular, 喜歡 'to like' and 研究 'to study' do not have monosyllabic synonyms, and 人 'person' does not have a disyllabic synonym. Thus, the 1-2 or 2-2 form is not available here to choose from. The fact that the default NHL is not always observed does not mean NHL does not exist. Rather, there is a pre-condition for NHL, which is elasticity in word length. It is still true to say that when both words have flexible length, NHL chooses 2-2 and 1-2 in VO and 2-2 and 2-1 in MN.⁵

It is interesting to observe that when a 2-1 VO is used, it sounds better when it appears after a 2-2 VO than before it:

- (9) a. 2-2 2-1
 相信-迷信 相信-鬼
 'believe superstition and believe ghost'
- b. 2-1 2-2
 ?相信-鬼 相信-迷信
 'believe ghost and believe superstition'

According to Feng (1998), disyllabic feet are built from left to right; if there is any odd syllable left, it should be left at the right end. Thus, (9a) is better than (9b). According to Duanmu (2000), there is an empty beat X (or pause) in (相信)-(鬼 X), so the expression still forms two binary feet. Since it is easier for a pause to occur in final position, (9a) is better than (9b).

3.2. AN Constructions

In many MN constructions where both words have flexible length, not only can the 1-2 form (disfavored by NHL) be used, but the 2-1 form (favored by NHL) is not allowed, as shown below.

(10)	AN				
	2-2	1-1	2-1	1-2	
	女性-工人	女-工	*女性-工	女-工人	'female worker'
	大號-房間	大-間	*大號-間	大-房間	'big room'
	?重大-事情	大-事	?重大-事	大-事情	'big issue'

A close look shows that the M in such constructions is an adjective, whereas the M in the structures we discussed earlier are nouns. In other words, NHL applies to NN (noun-noun compounds), but not to AN (adjective-noun).

Why AN does not observe NHL was not properly explained in Lu and Duanmu (1991). According to Duanmu (2000), the basic AN structure is [A 的 N]. This can be seen in the 2-2 AN in (11), where [A 的 N] is always good but [A N] is not always so.

(11)	[A N]	[A 的 N]	
	大號房間	大號的房間	'big room'
	?重大事情	重大的事情	'big issue'
	?困難問題	困難的問題	'difficult problem'

If the basic structure of [A N] is [A 的 N], then the functional element 的 is the syntactic head, following Pollock (1989) and current theory in generative syntax, where functional elements are heads of projections. Let us now consider why some AN can be used without 的, and why 2-1 is bad.

We propose that 的 can be omitted in two cases: (a) when it occurs between two feet, and (b) when it occurs within a foot. Consider the examples in (10) again, repeated in (12), where foot boundaries are based on the analysis of Duanmu (2000).

(12)	2-2	1-1	2-1	1-2	
	(女性)-(工人)	(女-工)	*(女性)-工	(女-工)人	'female worker'
	(大號)-(房間)	(大-間)	*(大號)-間	(大-房)間	'big room'
	(重大)-(事情)	(大-事)	?(重大)-事	(大-事)情	'big issue'

In 2-2, the position of 的 is between two feet, so it can (sometimes) be omitted. In 1-1 and 1-2, the position of 的 is inside a foot, so it can also be omitted. In 2-1, the position of 的 is neither between two feet nor inside a foot, so it cannot be omitted. It is worth noting that even if we add 的 in 2-1, the expression is still bad. We explain this below. The idea that 的 can be omitted inside a foot has been proposed before. According to Duanmu (2000), syntax within a foot can be ignored (the 'Foot Shelter' effect). Similarly, according to Feng (2001b), syntax within a 'minimal word' (a disyllabic unit) can be ignored.⁶

When 的 is present, the preferred length patterns change. Compare the cases without 的, shown in (10) and repeated in (13), and those with 的, shown in (14).

(13)	2-2 女性-工人 大號-房間 ?重大-事情	1-1 女-工 大-間 大-事	2-1 *女性-工 *大號-間 ?重大-事	1-2 女-工人 大-房間 大-事情	'female worker' 'big room' 'big issue'
(14)	2-的-2 女性的工人 大號的房間 重大的事情	1-的-1 *女的工 *大的間 ?大的事	2-的-1 *女性的工 *大號的間 ?重大的事	1-的-2 女的工人 大的房間 大的事情	'female worker' 'big room' 'big issue'

We have already explained (13)=(10) in (12). So let us focus on (14). According to Nonhead Stress (Duanmu 2000), in [A 的 N], 的 is the syntactic head and A and N are syntactic nonheads, so both A and N have stress. In addition, a stressed word should have two syllables (foot binarity). The analysis of (14) is shown in (15).

(15)	2-的-2 (女性)的(工人) (大號)的(房間) (重大)的(事情)	1-的-1 *(女的)(工) *(大的)(間) *(大的)(事)	2-的-1 *(女性)的(工) *(大號)的(間) ?(重大)的(事)	1-的-2 (女的)(工人) (大的)(房間) (大的)(事情)
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In [2-的-2], both A and N are in a binary foot, so there is no problem. In [1-的-2], A is in a binary foot with 的, and N is a binary foot by itself, so there is again no problem. In [1-的-1] and [2-的-1], A is in a binary foot but N is not, so the forms are generally not good. It is also interesting to compare the expressions in (16).

(16)	1-1 (女工) (高山) ?(高樹)	1-的-1 *(女的)(工) (高的)(山) (高的)(樹)	'female worker' 'tall mountain' 'tall tree'
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According to Zhu (1980), 1-1 AN is not fully productive, and 高樹 is marginal. In the present analysis, the basic form of AN is [A 的 N] (so 高樹 is marginal), and some 1-1 AN can be allowed because of the Foot Shelter effect (so 女工 and 高山 are OK). In [1-的-1], N should be disyllabic if there is one. 女的工 is marginal because there is a disyllabic 工人, which is better than 工 here. 高的山 and 高的樹 are OK because there is no good disyllabic synonym for 山 and 樹 here. For example, 樹木 (usually many trees) is not quite the same as 樹 (usually one tree). If one wants to refer to many tall trees, then 高的樹木 is better than 高的樹.

In summary, NHL applies to NN compounds. The basic structure of AN is [A 的 N], the analysis of which is more complicated than NN compounds. But Nonhead Stress (which underlies NHL) and foot binarity still play a central role in explaining the length patterns.

3.3. Nouns that serve as adjectives

Lu and Duanmu (1991) observed another kind of exceptions, exemplified in (17).

(17) 金色-屋頂 金-頂 *金色-頂 金-屋頂 'golden roof'

The expression seems to be NN, in which case we expect 2-2, 1-1, and 2-1 to be good and 1-2 to be bad, yet in (17) 2-1 is bad while 1-2 is good. In other words, (17) does not pattern with NN but patterns with AN. This problem was not explained in Lu and Duanmu (1991).

We suggest that the modifier in (17) in fact serves as an adjective. A similar proposal is made by Feng (2001b). If so, (17) should not be analyzed as NN but should be analyzed as AN, and its length pattern is now expected. We do not intend to imply that it is always easy to decide whether a given NN is a true NN compound or an AN. Nevertheless, there is a difference between expressions like (17) and those in (2). In (17), 的 can be added in the middle, whereas in NN compounds like those in (2), 的 cannot be added. This is shown in (18) and (19).

(18) AN type NN: 的 can be added
 金色屋頂 金色的屋頂 'golden roof'

(19) True NN: 的 cannot be added
 手錶工廠 *手錶的工廠 'watch factory'
 技術工人 *技術的工人 'skill worker'
 煤炭商店 *煤炭的商店 'coal store'

We believe that the relation between 的-insertion and word length pattern is not an accident. The present analysis can also account for the examples in (20).

(20)	2-2	1-2	
	省級-代表	省-代表	'province representative'
	學校-領導	校-領導	'school leadership'
	班級-主任	班-主任	'class head (head teacher of a class)'
	皮革-沙發	皮-沙發	'leather sofa'
	綿布-手套	布-手套	'cloth glove'

If they are NN, we do not expect 1-2 to be used, since 2-2 is better and available. If they are AN, then we expect both 2-2 and 1-2 to be possible, as discussed in section 3.2. Since 的 can be added in those expressions, it is reasonable to consider them to be AN, and the presence of 1-2 is expected.

Although the AN type NN allows 的-insertion, the reverse is not always true. In other words, not all NNs that allow 的-insertion are AN. Consider the example in (21).

(21) NN length pattern, but 的-insertion possible for 2-2
 彩色-照片 彩-照 彩色-照 *彩-照片 'color photo'

In (21), it is possible to insert 的 in the 2-2 form. Yet the length pattern resembles that of NN, where 2-1 is good and 1-2 is bad. We believe that, despite the possibility for 的-insertion, the expression is an NN compound, which originally comes from 'color photo' in English, which is

itself an NN compound. In the next section we discuss other factors that might influence word length choices.

3.4. Lexical parallels and frequency effect

It is unrealistic to think that we have covered all factors that affect word length choices. In fact, many other factors may play a role. We will discuss one here: lexical parallels and frequency effect. Consider the examples in (22) and (23).

(22)	黑白-影片	--	黑白-片	--	'color movie'
(23)	彩色-影片	?彩-片	彩色-片	*彩-影片	'color movie'

We assume that both (22) and (23) are NN compounds, as their English sources are. In (22), 黑白 'back-white' does not have a monosyllabic form, so there are just two length patterns, 2-2 and 2-1, both of which are good. In (23), both words have flexible length (彩色/彩 and 影片/片), so there are four length patterns. Because (23) is NN, we expect the length pattern to be the same as in (2), that is, 2-2, 1-1, and 2-1 are good and 1-2 are bad. The predictions are correct except for 1-1, which is predicted to be good yet actually marginal. The reason, we suggest, lies in the fact that 彩色-片 is often used in parallel to 黑白-片, which are both 2-1. As a result, 彩色-片 is used more frequently than 彩-片, hence the former sounds more natural than the latter.

3.5. Summary

We have shown that several cases that appear to be problems can still be accounted for in the present analysis, provided we understand the syntax properly and identify additional factors that interact with prosody.⁷

4. Conclusions

In this paper we made the following proposals. First, in VO, 2-1 is the disfavored length pattern. Second, in NN, 1-2 is the disfavored length pattern. Third, the length pattern preferences can be analyzed in terms of Nonhead Length (based on Nonhead Stress, Duanmu 1990), which requires the syntactic nonhead to be no shorter than the syntactic head. Fourth, a pre-condition for NHL is for words to have elastic length (i.e. for each word to have both a monosyllabic form and a disyllabic form); words without elastic length may not observe NHL. Fifth, the basic structure of AN is [A 的 N], where the syntactic head is 的. The word length pattern of AN can be analyzed in terms of Nonhead Stress, foot binarity, and the Foot Shelter effect (Duanmu 2000).

Beside metrical and syntactic factors, word length choices can also be influenced by other factors, in particular lexical parallels and frequency effect (section 3.4).

We are not aware of any other language in which syntax and word length show such a striking relation. Chinese is unique in this regard probably because most of its morphemes are monosyllabic, and in order to satisfy foot binarity, semantically redundant syllables have to be added or deleted on a frequent basis. The present study shows that the analysis of prosody is closely related to the analysis of syntax. The understanding of one helps the understanding of the other, and neither can be fully understood without the other.

Notes

¹ The original version of this paper was Lu and Duanmu (1991), which we presented at the Third North American Conference on Chinese Linguistics, Cornell University. It has triggered a number of subsequent studies (e.g. Duanmu 1999, 2000; Feng 1997, 1998, 2000, 2001a, 2001b; and Wang 2000, 2001). In 2001, ten years after its initial presentation, we submitted it for publication, in the hope that the issues would become available to a broader audience. On the advice of the Editor, we have made substantial revisions to bring the analysis up to date.

² Lu (1993: 111-112, 117-120) proposes a word order principle 'putting the big chunk outward and the small inward', where the reference point for 'outward', 'inward' is the head. This principle explains the following word order length phenomenon:

- | | | |
|-----|--|------------|
| (1) | 新編-英漢-詞典 | *英漢-新編-詞典 |
| | 新-英漢-詞典 | 英漢-新-詞典 |
| | New English-Chinese Dictionary | |
| (2) | 高層-水泥-建築 | *水泥-高層-建築 |
| | 高層-鋼筋水泥-建築 | 鋼筋水泥-高層-建築 |
| | high-level reinforcing bar-cement building | |

In (1) the semantically disfavored order 英漢-新-詞典 is licensed by the principle. Since 詞典 is the head and 新 is smaller than 英漢, 新 tends to move inward, that is, towards the head. In contrast, 英漢-新編-詞典 is wrong because the two modifiers are of the same length, hence only the semantic ordering rule works here and it disallows the given order. The same explanation holds for (2).

The rationale for the above ordering principle is as follows. First, it can reduce the interference imposed by the intermediary chunk on the semantic relation between the head and the outer chunk. Second, peripheral outer positions are the positions easy to process, being without anterior and posterior interference.

We can take the statement 'the more inner a unit is, the shorter it tends to be' as the natural extension of the above ordering principle unless otherwise disproved. This statement is consistent with NHL. Since the head is the innermost unit by definition, it is natural tends to be the shortest.

Though the data in this article do not involve an intermediate unit, the treatment that the head is in the innermost position is expected to hold by default.

Common sense supports this conclusion as well. The head is the origin of a construction, and the origin normally tends to be simple and tiny.

³ In fact, locatives, or postpositions, are nominal in nature. Therefore, the X-Locative form is another kind of MN. However, there is a difference between Chinese locatives and nouns. When a modifier of a N is a phrase, the modification marker 的 is obligatorily required, shown in (1) below, but 的 is optional when the locative is disyllabic, shown in (2), and prohibited when the locator is monosyllabic, shown in (3).

- | | |
|-----|---|
| (1) | 他昨天買來的桌子* (的) 質量 |
| | he yesterday bought DE table (DE) quality |
| | 'the quality of the table that he bought yesterday' |

(2) 他昨天買來的桌子(的)上面
 he yesterday bought DE table (DE) top
 'the top of the table that he bought yesterday'

(3) 他昨天買來的桌子(*的)上
 he yesterday bought DE table (DE) top
 'the top of the table that he bought yesterday'

We thus, list X-Locative as another kind of MN than normal NN.

⁴ Lu and Duanmu (1991) also listed some subject-predicate constructions, shown below, where the subject is thought to be the nonhead.

2-2	1-2	2-1	
旗幟-飄揚	*旗-飄揚	旗幟-飄	'flag fly'
歌聲-嘹亮	*歌-嘹亮	歌聲-亮	'song loud'

We now believe that the head of a sentence is not the verb or the predicate, but the inflection (INFL), in agreement with generative syntax (e.g. Chomsky 1981, Pollock 1989). Therefore, subject-predicate constructions should have a different analysis.

⁵ The pre-condition for NHL simply means that the preferred word length pattern can be observed best when words have flexible length. This does not imply that when words do not have flexible length, NHL has no effect at all. In fact, NHL may be a trigger for the development of flexible word length. For example, a monosyllabic form may develop from a disyllabic form when the word occurs in a head position, where it should be short. Thus, 駝 'camel' may have developed from the disyllabic 駱駝 'camel' in such expressions as 雙峰-駱駝 → 雙峰-駝 'two-hump camel', where the head 駱駝 'camel' shortens from disyllabic to monosyllabic, which is not even a full morpheme. In contrast, 駱駝-絨毛 cannot be shortened to 駝-絨毛, which violates NHL.

⁶ The Foot Shelter effect also accounts for the fact that the so-called 'exocentric' constructions are typically disyllabic in Chinese, such as 填房 (VO→N) 'fill-room → second wife (to a widower)', 火燒 (SV→N) 'fire burn → baked wheaten cake', and 開關 (V V → N) 'open close → switch'.

⁷ Lu and Duanmu (1991) also discussed some data that involve 很不-X 'very not-X' and 不很X 'not very-X'. LÜ (1965) notices that 很不 'very not' usually precedes disyllabic adjectives of positive meanings, as indicated by (1a). But it usually precedes monosyllabic adjectives of negative meanings, indicated by (1b).

(1) a. 很不 + AA: (good if AA has positive meanings)

很不堅強	'very not-firm'	* 很不軟弱	'very not-weak'
很不清楚	'very not-clear'	* 很不模糊	'very not-fuzzy'
很不安全	'very not-safe'	* 很不危險	'very not-dangerous'
很不老實	'very not-honest'	* 很不狡猾	'very not-cunning'
很不文明	'very not-civilized'	* 很不野蠻	'very not-savage'

b. 很不 + A (good if A has negative meanings):

* 很不強	'very not-strong'	很不弱	'very not-weak'
* 很不多	'very not-many'	很不少	'very not-few'
* 不大	'very not-big'	不小	'very not-small'
* 很不長	'very not-long'	很短	'very not-short'
* 不厚	'very not-thick'	不薄	'very not-thin'

There are a couple of exceptions to (1b), such as 很不好 and 很不妙, both meaning 'very not good (very bad)', but such examples are few.

It is unclear why the length and the meaning of an adjective should show such a selectional relation. The phenomenon seems more puzzling when we compare 很不 'very not' with 不很 'not very', which, unlike 很不 'very not', normally only precedes positive adjectives regardless their length, as shown in (2).

(2) a. 不很 + AA: (good if AA has positive meanings)

不很清楚	'not very-clear'	* 不很模糊	'not very-fuzzy'
不很堅強	'not very-strong'	* 不很軟弱	'not very-weak'
不很安全	'not very-safe'	* 不很危險	'not very-dangerous'
不很老實	'not very-honest'	* 不很狡猾	'not very-cunning'
不很文明	'not very-civilized'	* 不很野蠻	'not very-savage'

b. 不很 + A (good if A has positive meanings):

不很多	'not very-many'	* 不很少	'not very-few'
不很大	'not very-big'	* 不很小	'not very-small'
不很長	'not very-long'	* 不很短	'not very-short'
不很厚	'not very-thick'	* 不很薄	'not very-thin'

We do not attempt to offer an analysis of those data here, because it is unclear to us what the exact syntactic structures are.

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