# Minimal Word in Mandarin Chinese

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**Abstract:**
Minimal Word is of unique significance in characterizing certain Prosodic-Morphological phenomena. This paper explores the minimal word effect in Mandarin Chinese. It is shown that the minimal word phenomena in Chinese provide strong evidence supporting McCarthy & Prince's minimality theorem and most importantly, as argued in this paper, that the minimal word constraint can also be extended to much broader applications such as compound formation and its interaction with syntactic constructions in languages like Chinese.

## 1. Background

The notion of Minimal Word (MinWd) has always been a fundamental concept in Prosodic-Morphological systems developed since McCarthy and Prince (M & P) 1990. It is a prosodically circumscribed domain which may be selected as the locus of morphological transformation in lieu of the whole domain (M & P 1990, 1993, 1998). Theoretically, the notion of MinWd is derived from the interaction of both Prosodic Hierarchy and Foot Binarity, as stated in the following (taken from M & P 1998:284):

1  **Prosodic Hierarchy**

| | |
|---|---|
| Prosodic Word | PrWd |
| | | |
| Foot | Ft |
| | | |
| Syllable | σ |
| | | |
| Mora | μ |

2  **Foot Binarity**: Feet are binary under syllabic or moraic analysis.

The Prosodic Hierarchy impinges on every prosodic word to contain at least one foot, while the foot Binarity demands that every foot be bimoraic or disyllabic. As a result, a prosodic word must contain at least two moras or syllables according to the transitivity of the Prosodic Hierarchy. The minimal word is therefore a single PrWd in the system. As we will see below, the Minimal Word is of singular importance in characterizing a wide range of Prosodic-Morphological phenomena not only in languages known in previous studies, but also in Mandarin Chinese, as I would like to argue in this paper.

In this paper, I shall explore the Minimal Word effect in Chinese in order to support the MinWd-theorem and to extend its applications not only to compound formations but also their interactions with syntax. In what follows, I will focus on the theory developed in M & P's 1998 paper, where the minimality property follows from interactions of some general constraints on prosodic forms.

One theoretical question in Prosodic Morphology is why the minimal word should be a possible reduplicative template in languages like Diyari and others. In other words, why is the reduplicant identical to the minimal word in those languages? By deriving the minimality effects from some general and independent principles and constraints in prosodic morphology, M & P answered these questions within the theory of Optimality. The results are not only significant for constructing a genuine theory of Prosodic Morphology, but also important for further investigations on languages like Chinese. To review briefly, the following constraints with a ranking are essential for the minimality effects in Diyari (M & P 1998):

3       ALL-FT-LEFT
        Align(Ft, L, PrWd, L)
        "The left edge of every foot aligns with the left edge of some PrWd."
        ="Every foot is initial in the PrWd."

4       PARSE-SYLL
        Every syllable belongs to a foot.

5       PARSE-SYLL >> ALL-FT-LEFT

The ALL-FT-LEFT demands that all feet be exactly at the left edge; the ALL-FT-LEFT requires that every form be fully footed. Hence, the following situation emerges:

        Every syllable is footed,
        and
        Every foot is initial.

As a logical consequence, only one configuration can meet both of these requirements, that is, the Minimal Word, because it has a single foot that parses all syllables and is itself properly LEFT-aligned:

6       $[\text{Ft }]_{\text{PrWd,}}$    i.e. $[(\sigma\ \sigma)_{\text{Ft}}]_{\text{PrWd}}$   or   $[(\mu\ \mu)_{\text{Ft}}]_{\text{PrWd}}$

Given this, the minimal word can now be characterized as the most harmonic prosodic word.[1] Thus, as M & P concluded: "the most harmonic prosodic word, with respect to these metrical constraints, is a disyllable in any language that does not make syllable-weight distinctions." Since Diyari is such a language (1998:299), reduplicants in Diyari are constrained by PrWds. What I would like to demonstrate in this paper is this: Chinese is also such a language, thus, there are minimal word effects akin to other languages (Yip 1992), and most importantly, there are different minimal word effects that have not been discovered before. The present study will bring some new facts to the current research in Prosodic Morphology and will also contribute some new perspectives to the theory of minimal word.

        Let us first consider the foot structure in Chinese. Even though there have been proposals that feet in Chinese can be bimoraic in some phonological analyses (Duanmu 1990,

Wang 1993), the dominant metrical structure is a disyllabic unit which has been widely recognized as a basic prosodic domain in various studies of phonology (Chen 1979, 1996, Shih 1986) and morphology (Lü 1963, Feng 1998b, Duanmu 1999).[2] Following Chen (2000), the notion of foot used here can be defined in terms of a minimal prosodically independent unit, or more directly, the Minimal Rhythmic Unit (MRU) given by Chen (2000:367), which states as follows:

7       Binarity            The MRU is at least disyllabic.
        Boundedness         The MRU is at most disyllabic.
        LtoR                MRUs are constructed from left to right.

Thus, the FTBIN in Chinese can be described accordingly as this: Feet in (Beijing) Chinese are binary under syllabic analysis. Furthermore, as we can see from Chen's eurhythmic principles, the directional footing in Mandarin is from left to right.[3] For example (Taken form Feng 1998a and Chen 2000:368.  The parentheses mark the foot boundaries):

8    a. **Five syllable string**
        (jin mu) (shui huo tu)
        *(jin mu shui) (huo tu)
        'metal, wood, water, fire and earth, the five elements.'

        (55)(555)
        *(555) (55)

        (jia-li) (-fu-ni-ya)
        *(jia-li-fu) (-ni-ya)
        'California'

     b. **Seven syllable string**
        (chai mi) (you yan) (jiang cu cha)
        *(chai mi you) (yan jiang) (cu cha)
        'fuel, rice, oil, salt, (soy)sauce and tee, daily necessities.'

        (55) (55) (555)
        *(555) (55) (55)

        (Bu-yi) (-nuo-si) (ai-li-si)
        *(Bu-yi-nuo) (-si-ai) (-li-si)
        'Buenos Aires'

From the above examples we can see clearly that a stray syllable in each of the syllable strings can only be grouped with the last foot. A question arises: Why must the stray syllable be grouped with the last, rather than the initial foot? This question cannot be answered unless the

directional footing is from left to right. In addition to this, the left-footing process is also exhibited in noun+noun compounding (see footnote 3). Given all the evidence, it is reasonable to say that the ALL-FT-LEFT in (1) is clearly operative in Chinese. That is, "the left edge of every foot aligns with the left edge of some PrWd" which requires that "every foot be initial in the PrWd."

Furthermore, given the PARSE-SYLL (every syllable belongs to a foot) and the ranking: PARSE-SYLL >> ALL-FT-LEFT, it is natural to expect that there must be minimal word effect in Chinese, resulting from the interaction between prosodic constraints.[4] Thus, the most harmonic prosodic words in Mandarin Chinese are expected to be minimally and maximally disyllabic. This, as we can see below, is exactly the case. In what follows I will focus only on the minimal word effect of a different kind in Chinese, by extending the theory of PrWd to compound formation and its interaction with syntactic constructions as well.

Of course, we are fully aware that in Chinese morphology, there are complexities which may not be accounted for only by the MinWd hypothesis.[5] However, what I am going to demonstrate is this: there are phenomena that can *only* be explained in terms of a Minimal Word analysis. This is the very purpose of the present study.

This paper is organized as follows. Section 2 consists of a study on the verb-object structure and shows that among all VO forms in the language, only the ones that meet the minimal word requirement exhibit word properties while longer forms are all in a par with phrases. Section 3 shows that a process of category changing from a [Aux V] verbal expression to a [Axu-V]$_{adjective}$ compound is conditioned strictly on whether or not the [Aux V] is a minimal word. Section 4 shows that the canonical verb+resultative construction requires a prosodic word as its main verb, so that the ones that are longer than a prosodic word must be re-constructed with alternative structures. Section 5 demonstrates that there is a clear distinction between MinWd and non-MinWd [A+N] forms differentiated syntactically as well. Section 6 is a summary of this study.


## 2. Minimal Word as a condition for VO Compound

In Chinese traditional linguistics, it has long been a problem to distinguish VO compounds from VO phrases. For example:

9 a.    guan-xin                                    b.    dan-xin
        'concern heart, concern'                          'carry heart, worry'

  a'.   Wo guan-xin ta                              b'.   Wo hen dan-xin ta
        I   concern  him                                  I   very worry  him
        'I am concerned about him.'                       'I am worried about him very much.'

  a".   Ni guan shenme xin?                         b".   Ta dan  le   san   nian xin?
        You concern what heart                            he  carry Asp., three years heart
        'What on earth are you concerned about?'          'He is worried for three years.'

c. pao-bu                             d. shui-jiao
     'run-feet, jog'                        'sleep-wake, sleep'

c' Ta pao le san ci bu          d'. Ta shui le yi tian de jiao
     he run Asp. three time feet           he sleep Asp. one day POSS wake
     'He went jogging three times.'       'He slept for a day.'

As we can see from the above examples, a VO form can sometimes be separated as a phrase and sometimes be used as a word. This situation has motivated Chao (1968) to characterize the alternative forms in terms of *ionization*. Since then, great efforts have been devoted into the studies about a variety of conditions by which compounds and phrases could possibly be distinguished (see Lu 1964, Huang 1984, Dai 1990, Zhang 1992, Duanmu 1998, Packard 2000, and many others). However, even though various proposals have been made and each of them may work in certain areas for certain cases, there is no overall generalization and constraint on what is a compound and what must be a phrase.[6] Over a long period of time, the difficulties have made linguists wonder if there is indeed a clear-cut solution at all. Hu (1999), for example, recently claimed that since there is no overall satisfactory solution after years of theoretical investigation, linguists now should consult with native speakers about what a word is. This suggestion was carried out by Wang (1998) in a study of a total of 647 questionnaires. The informants are asked to make judgments about how many words are in 10 sentences where 25 VO forms are distributively used. The results, as we can see form Table 1, are somewhat surprising (taken from Wang 1998, only 5 forms are given here).

Table 1 **Judgments on Wordhood for VO forms**[7]

| VO forms | word (%) | phrase (%) |
|---|---|---|
| shui jiao `have a sleep, sleep' | 95.97 | 4.03 |
| xi zao `take a bath, bathe' | 92.52 | 7.48 |
| pao bu `run feet, jog' | 99.34 | 0.66 |
| nian shu `read books, study' | 96.84 | 3.16 |
| dan xin `carry heart, worry' | 97.01 | 2.99 |

As seen from Table 1, the informants' judgments are far different from linguists because according to linguistic analysis, the first four forms should all be analyzed as phrases.[8] However, the native speakers' judgments converge upon one conclusion: disyllabic VO forms (or more specifically, VO idioms) are overwhelmingly considered as words. For traditional linguists these results would create more puzzles than solutions because what must be analyzed as phrases by linguists are now treated as words by native speakers. Of course, linguists cannot rely on layman's solution about what is a word. However, linguists cannot ignore native speakers' intuition about what a word is, especially when there is a strong agreement among speakers on the issue. It seems that the notion of "word" used by non-linguists may not be the
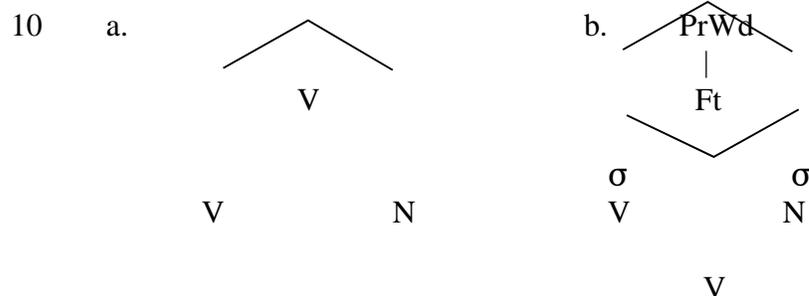
same as it is used by linguists. At the present, we are left with two fundamental questions that need to be considered immediately. First, why are native speakers most likely to consider disyllabic forms to be words, even if some of them are linguistically tested as phrases? Second, are there any clear-cut distinctions at all between what are compounds and what are phrases?

Given the minimal word theorem and the fundamental hypothesis  P >> M in Prosodic Morphology,  I argue that the study of Chinese morphology will make a great deal of progress once the PrWd is taken into account.

Of course,  prosody cannot resolve all of the problems involved in Chinese morphology, but, as we will see later, the prosodic analysis proposed here not only gives us an entirely new insight about Chinese morphology, but also enables us to determine a prosodic-morphological domain in which every form is legitimate to be or become a compound and out of which every form is a phrase, strictly within VO and similarly within other structures as well. In other words, there indeed exists a clear boundary demarcating what *can be* a compound and what *must be* a phrase or at least have phrasal properties, defined by a prosodic qualification of being a minimal word ----- a new discovery which could explain a quite wide range of phenomena in Chinese morphology and syntax.

To see how prosody works in Chinese VO compounds, let us assume, first, that within a structure of two sister nodes labeled as in (10a),  if every syllable of the two sister nodes ( V and N) is footed (PARSE-SYLL) and every foot is initial (ALL-FT-LEFT), then the two sister nodes will satisfy the requirements of being a MinWd, provided that every syllable in Chinese is a morpheme.[9] This is shown in (10b):

10      a.                                               b.          PrWd
                        V                                            |
                                                                     Ft

                                                          σ                   σ
              V                    N                      V                   N

                                                                     V

Second, it is well-known that the VO-compounds in Chinese are all formed with a left-headed structure, exactly like VO phrases. That is to say, the internal argument of a verb must be located on the right side of the V in both phrases and compounds. Given this, if both PARSE-SYLL and ALL-FT-LEFT are at work in Chinese and if their applications can be extended to word formation, we would expect their interaction to give rise to a Templatic Constraint for compounding, in a similar way as they do for inflection and reduplication. That is,

11      **Templatic constraint on VO-compounds**
         VO-Compd = PrWd
         "The VO-compound is a prosodic word."

This is expected because a prosodically circumscribed domain (MinWd) can be taken as the

locus of morphological transformation required by the P >> M, and because compounding is the most productive morphological process in the language. As a result, if PrWd is the most harmonic prosodic unit in the language and if it affects morphology at all, then compounding will be the very target inevitably impinged by the PrWd engaged in prosodic-morphological operations. As we will see below, this is indeed the case.

First, we have discovered that even if not all VO forms can take an object, the ones that can are all disyllabic (i.e., PrWd). For example:

12      fu-ze                           Ta fu-ze            baowei gongzuo
        carry-responsibility                  he carry-responsibility security affairs
        `be responsible for, be in charge of'    `He is in charge of security affairs.'

        guan-xin                           Ta bu guan-xin       bieren
        concern heart                         He not concern-heart others
        `concern, care for'                  `He does not care about others.'

        dan-xin                            Ta dan-xin qingkuang hui you bianhua.
        carry heart                          he carry-heart situation will have change
        `worry'                                `He worries that the situation will change.'

There is no doubt that when it takes an object, the VO must be considered a compound, because their internal verb+object structure are syntactically opaque as far as the phrase-structure condition is concerned . Given this, all of the above VO forms are doubtlessly compounds. We are aware of the fact that not all disyllabic VO-compounds can take an 'outer' object. However, what is important to note here is a categorical behavior of the trisyllabic (or polysyllabic) forms: *No* polysyllabic VO forms can take an 'outer' object. For instance,

13      *Ta fu-zeren          baowei gongzuo
         he carry-responsibility security affair
        `He is in charge of security affairs.'

        *Wo kai-wanxiao ta.
        I make-joke he
        `I make fun of him.'

The contrast between (12) and (13) shows that *only* disyllabic VO forms can have an object, while *all* trisyllabic forms fail to do so. A question rises immediately: why cannot trisyllabic forms take an object as disyllabic forms do? For whatever reason it might be, it is unquestionable that there exists a categorical distinction between disyllabic VO forms on the one hand, and trisyllabic VO forms on the other.

Of course, one may wonder if the trisyllabic VO forms are intransitive verbs and if they are, they do not take an object. However, even this is so, the same question still remains: Why can *only* disyllabic but *not* trisyllabic forms be transitive? As a result, the same conclusion will

still be hold: there must be a distinction between disyllabic and trisyllabic VO forms in the language. The question, then, is: why is there a distinction and how does it come about? Obviously, an explanation is called for.

Furthermore, examples given below show that the trisyllabic VO forms cannot simply be considered as intransitive verbs, because they cannot take aspect makers like VO verbs do.

14      a.      Ta fu-ze             -guo  baowei gongzuo
                   he carry-responsibility   Asp. security affair
                   `He has been in charge of security affairs.'

         b       *Ta dui baowei  gongzuo fu    zeren         -guo
                   he to   security affair     carry responsibility Asp.
                   `He has been in charge of security affairs.'

         b'      Ta dui baowei gongzuo fu-guo zeren.
                   `He has been in charge of security affairs.'

         c.      Ta dan-xin     -zhe  ni   de jiankang
                   he carry-heart  Asp. you 's  health
                   `He is worrying about your health.'

         d.      *Ta  kai   wanxiao -zhe  shuo:....
                   He  make joke     Asp. say...
                   He is making jokes while talking'

         d'.     Ta kai   -zhe wanxiao shuo...
                   He  make Asp. joke     say
                   `He says while making a joke...'

As a general rule, a VO compound, like all other verbs in the language, can naturally co-occur with an aspect maker. Thus, in (14a), *fu-ze* can occur with an experience aspect marker *-guo* and in (14c), *dan-xin* is with a progressive aspect marker *-zhe*. What is remarkable in the above examples is that the ones that can take an aspect marker are *all* disyllabic while *all* of the trisyllabic forms cannot. It is clear that the ones that can take aspectual markers must be compound verbs and the ones that cannot must **not** be compounds because there is no reason for a compound verb not to be able to co-occur with an aspectual marker. Given this, we see that: all compounds are disyllabic and all trisyllabic forms are not compounds. Put differently, *all* trisyllabic VO forms, unlike the disyllabic ones, cannot function as a single (or a zero-level) verb, hence cannot be considered as a compound. As a result, trisyllabic VO forms must all belong to the category of phrases.

The contrast between (14c) and (14d) therefore suggests a prosodic categorization in the Chinese morphological system, that is, *only* disyllabic VO forms can be compounds while *all* trisyllabic VO forms lack the ability to be compounds. As seen above, the disyllabicity perfectly

meets the definition of the prosodic word, thus, it is natural to see that, for all VO forms, only the  ones that meet the minimal word requirements are qualified to be a compound (through regular word formation or lexicalization),[10]  while those whose size is bigger than a PrWd are not qualified to be compounds.

Finally, separability can also be used to manifest the distinction between disyllabic and trisyllabic VO forms. That is, only disyllabic forms cannot be separated, while all polysyllabic forms are separable. For example ("de' is a possessive marker in Chinese):

| 15 | de-zui | de-zui    ta | *de ta  de  zui |
|----|--------|--------------|------------------|
|    | get-offence | get-offence he | get  he  's  offence |
|    | offend | `To offend him.' | `To offend him.' |
|    |        |              |                  |
|    | kai wanxiao | *ka wanxiao ta | kai   ta  de  wanxiao |
|    | make joke | m  -joke he | make he  's  joke |
|    | `joke, make fun of' | `To make fun of him'. | `To make fun of him.' |

Given the separability test above, we see, again, that there is a clear distinction between what is revealed in the disyllabic forms and what is lacking in the trisyllabic VO forms.

Given the evidence illustrated above, there is no doubt that the minimal word (PrWd) is indeed very active in the language, otherwise there is no reason why trisyllabic VO forms are systematically different from the disyllabic ones. That is to say, within the VO structure, if the verb and its object are formed by exactly two syllables, then the VO form will construct a minimal prosodic unit. Since the minimal prosodic unit is the most harmonic PrWd in the language, by P>>M, all compounds that are formed by verb+object must first be a PrWd. This is captured by the Templatic Constraint given in (11).

Under the above analysis, we now began to understand why disyllabic VO forms such as *nian-shu* `read books, study*', shui-jiao* 'have a sleep, sleep'...etc in Table 1 are treated as "words" by native speakers. Because they represent the most harmonic prosodic category of PrWd, even though they are not lexicalized or just idioms. On the other hand, longer VO forms such as *kai wanxiao* `joke', *fu zeren* `be in charge of'...etc. have never been justified as words by native speakers because they do not meet the definition of being a PrWd, hence they can never be lexicalized as compounds regardless of how highly they are idiomatized.[11] This suggests that the native speaker's intuition about "words" in Wang's study is in fact a prosodic notion of PrWd, which is different from the syntactic notion of  word used by traditional linguists.

This calls for a further explanation about disyllabic VO idioms. By syntax, the disyllabic idioms are not compounds; by prosody, however, they belong to the same category of foot, hence satisfy the requirement of being a PrWd, even if they are not (yet) lexicalized as a compound in the lexicon. The native speaker's word-judgments about the disyllabic idioms suggest clearly that in Chinese, even phrases are distinguished prosodically. That is to say, there are apparently two types of phrases: one consists of disyllabic idiomatized phrases which meet perfectly the MinWd requirements and can potentially become compounds, hence can be interpreted as a single unit (i.e., a "word" in an undefined usage, but a PrWd in a strict sense)

by native speakers. The second one consists of freely constructed polysyllabic phrases that are beyond the Templatic Constraint, hence can never become compounds in the language.[12] This will indicate further that the native speaker's intuition about the disyllabic forms are not based on their innate grammar of syntax (which sometimes can best be detected by linguists), but primarily on their innate grammar of prosody.

In fact, if *pao bu* 'jog', *nian shu* 'read books, study'...etc. in Table 1 are indeed phrases, the only way to explain the native speakers' word-intuition about these phrases is to admit that the function of minimal word is also active in syntax (at the PF level or before Spell-Out as suggested in Zubizarreta 1998). Nevertheless, the fact shows clearly that PrWd also circumscribes phrases in syntax. Given this, we may suggest that the notion of PrWd defined in terms of prosody could function at different levels of the grammar, that is, it can apply to both morphology and syntax, though the ways it works may be different. In morphology, every VO compound must be PrWd. In syntax, every VO phrase that meets the PrWd could have a potential to become a compound depending on their semantics and pragmatic usages in the language, and importantly, those whose shapes are beyond the control of minimality constraint will never be compounds. This will give rise to the distinction between disyllabic idioms that are treated as words and trisyllabic idioms that are not considered as words by native speakers. Thus, the linguistic intuition of PrWd by Chinese speakers provides a strong evidence for the minimal word constraint applying not only to morphology but also to syntax.[13]

## 3. Minimal Word as a condition for Category Changing

The minimal word effect can also be observed in auxiliary+verb compounds in Chinese. The auxiliary *ke* `can' can be used to form a compound with a verb, meaning `V-able', for example:

16          ke-xiao `can-laugh, laughable'
            ke-lian `can-sympathize, pitiable'
            ke-kao `can-trust, trust-able, reliable'
            ke-pa `can-terrify, terrible'
            ke-chi `can-sham, shame-able, shameful'
            ke-xing `can-do, doable'
            ke-ai `can-love, lovable, lovely'
            ke-hen `can-hate, detestable, hateful'
            ke-yi `can-suspect, suspect-able'

In Chinese, the ordinary *ke*+V compounds all consist of two syllables. Of course, there are Aux+VV trisyllabic forms used in the language,[14] for example:

17          ke-zaojiu de ren
            can-train 's person `a person who can be trained, a trainable person'
            ke-jiagong de cailiao
            can-process 's material `material that can be processed, process-able material'
            ke-yuedu de shuji
            can-read 's book `books that can be read, readable books'

However, the following contrasts show that the trisyllabic *ke+VV* forms are different from the disyllabic *ke+V* compounds. Compare:

18    a.    ke-pa  de shi                *keyi-pa de shi
              terrible 's thing            terrible 's thing
              `a terrible thing'          `a terrible thing'

    b.    ke-yi      de ren            *keyi-yi   de ren
              suspect-able 's person     suspect-able 's person
              'a suspect'             'a suspect'

    c.    ke jiagong      de cailiao     keyi  jiagong    de cailiao
              can be processed 's material can be processed 's material
              `process-able material       `process-able material

    d.    ke     zaojiu de ren         keyi   zaojiu de ren
              can be trained 's person      can be trained 's person
              `a trainable person'         `a trainable person

Only within disyllabic compounds, the auxiliary *ke* cannot be substituted by the free standing counterpart *keyi* in the language, as seen in (18a-b), but within trisyllabic *ke+VV* forms, *ke* and *keyi* are interchangeable. The fact that only in disyllabic forms, *ke* cannot be changed into *keyi* indicates that only disyllabic forms are compounds whereas the trisyllabic ones all parallel with phrases. The following examples show even more clearly that the trisyllabic *ke+VV* and the disyllabic *ke+V* are not simply different but indeed belong to two syntactic categories.

19    a.    Ta feichang   ke-yi
              he extremely suspect-table
              'He is extremely suspect-able.'

    a'    *Ta feichang ke-huaiyi
              he extremely suspect-able
              'He is extremely suspect-able.'

    b.    Ta feichang ke-kao
              he extremely trust-able
              'He is extremely reliable.'

    b'.    *Ta feichang ke yikao
              he extremely trust-able
              'He is extremely reliable.'

    c.    Ta feichang ke-xin

he extremely trust-able'
'He is extremely trust-able.'

c'.    *Ta feichang ke-xinren
   he extremely trust-able
'He is extremely trust-able.'

d.    *Zhege dongxi feichang  ke jiagong
   this   thing  extremely process-able
'This thing is extremely precess-able.'

As we can see, only disyllabic *ke*+V forms can be used as adjectives whereas all longer forms are either not found in the language or ill-formed by this type of process, even if the verbs used in these two forms are synonyms (i.e., *yi = huaiyi* 'doubt', *kao= yikao* `relay' *xin=xinren* `trust'), as seen in (19). This shows clearly that all longer forms are forbidden to undergo the category changing from [Aux V] verbal expressions to [Aux-V] adjectives. In other words, *only* disyllabic [Aux-V] forms are allowed to form adjectives whereas the trisyllabic ones are all prohibited from doing so. That is a clear-cut distinction that trisyllabic forms are differentiated from the disyllabic [AuxV] forms in the language and it cannot be properly explained according to traditional morphology. In fact, this phenomenon was discovered only recently by the application of minimal word effect in the language (Feng, 2000).

Given the minimal word theorem and the analysis above, a Templatic Constraint is therefore expected to be formulated in order to capture the category changing within all Aux+V forms and it can be seen in (20).

20        **Templatic constraint on categorical change**[15]
[*ke*+V] → Adjective ／ [*ke*+V]$_{PrWd}$
"A *ke*+V form undergoes a process of category changing, iff it is a prosodic word."

Obviously, without the notion of MinWd (PrWd), the contrast between the disyllabic *ke*-V and the *tri*syllabic *ke*-VV forms revealed in the language will be lost, and most importantly, the grammar, which would make a strict distinction by the Templatic Constraint for the morphological process to take place, will be lacking.[16]

## 4. Minimal Word as a Condition for Syntactic Operation

The V(erb)+R(esultative) compounds in Chinese have been studied intensively in past decades (Chao 1968, Huang 1988, Li 1990, and many others), however, a prosodic pattern exhibited in these forms was not recognized until recently. Dong (1998) first observed the following contrast:

21    **Disyllabic V-R**              **Trisyllabic V-RR**
  a.   guan  yan  chuanghu        a'    *guan yanshi chuanghu

close tight window                                  close tight   window
`To close the window tightly'                       `To close the window tightly.'

b.    da    lao jichu                    b'        *da   laogu jichu
      make firm foundation                          make firm   foundation
      `To make the foundation firm.'                `To make the foundation firm.'

c.    xiang tou     wenti                 c'.       *xiang touche wenti
      think  through problem                         think  through problem
      `To think the problem throughly.'              `To think the problem throughly.'

In Chinese, all disyllabic VR forms can take a post-verbal object freely, while all trisyllabic VRR forms fail to do so.[17] This fact, once again, not only shows a clear-cut distinction between disyllabic and trisyllabic forms in the language, but also indicates the minimal word effect in verb+resultative constructions.

Of course, the inability to take an object may be attributed to an intransitive property of the VRR forms. If this is indeed the case, the fact that VRR forms do not take postverbal objects will be a natural consequence. However, as Feng (2000) has pointed out, the inability to take an object for VRR forms cannot be simply attributed to an analysis of intransitivity, because an object can indeed appear in the VRR constructions only in a different syntactic position: Compare:

22 a.  Ta guan-yan chuanghu le.          a'.  Ta guan-yanshi *chuanghu le.
        he close-tight window Asp.              he close-tight    window   Asp.
        'He closed the window tightly.'         'He closed the window tightly.'

   b.  Chuanghu, ta guan-yan le          b'   Chuanghu, ta guan-yanshi le
        Window,   he close-tight Asp.          Window,   he close-tight Asp.
        'As for the window, he closed it tightly.'   'As for the window, he closed it tightly.'

   c.  Ta ba chuanghu guan-yan le.       c'   Ta ba chuanghu guan-yanshi le.
        he ba window   close-tight Asp.        he ba window   close-tight Asp.
        'He closed the window tightly.'        'He closed the window tightly.'

If the object is topicalized (22b-b') or located in a *ba* construction (22c-c'), the result is always grammatical in both VR and VRR sentences. As a result, the ungrammatical sentences in (19a'-c') cannot be attributed to the inability to take an object for all VRR forms, simply because one cannot treat a verb as an intransitive just because its object is not in the post-verbal position.

The separability test given below can also reveal the distinction between disyllabic and trisyllabic verb+resultative forms. For example (the particle *de* used in verb+resultative phrases is to mark the result of the action):

.

23     jian-shao                   *jian-bu       (-de hen) shao

|  |  |
|---|---|
| subtract-few | subtract not (de very) small |
| reduce | 'cannot subtract to (very) fewer, cannot reduce very much' |
|  |  |
| jia-zhong | *jia-bu  (-de hen)  zhong |
| add-heavy | add not (-de very) heavy |
| 'increase the weight of | 'cannot increase the weight (very much)' |
|  |  |
| tui-chi | *tui-bu (-de hen) chi |
| push-late | push not (de very) late |
| postpone | 'cannot postpone (to a very late time)' |
|  |  |
| shuo-mingque | shuo-bu (-de hen) mingque |
| say-clear | say-not (de very) clear |
| `say it clearly' | 'cannot say (very) clearly.' |
|  |  |
| jia-wanzheng | jia-bu   (-de hen) wanzheng |
| add-complete | add not (de very) complete |
| 'add completely' | cannot add (very) completely.' |
|  |  |
| jian-chedi | jian-bu (-de hen)  chedi |
| subtract-through | subtract not (de very) through |
| 'subtract throughly' | 'cannot subtract throughly. |

As we can see from the above examples, only disyllabic VR forms cannot be separated while all trisyllabic forms are separable in the language. That is, there are no trisyllabic forms that are not separable and the inseparability can only be found in disyllabic VR forms.

Based on the facts given above, the question then is why the VRR forms cannot take an object as VR forms do and why the property of inseparability can only be fond in disyllabic but not in trisyllabic forms. To answer the first question will go far beyond the scope of this paper and I am not going to discuss it here.[18] However, for whatever reason it might be, the crucial fact here is clear: only disyllabic VR forms can take a post-verbal object and all trisyllabic forms cannot. This, I argue, is sufficient for us to see the minimal word effect in the VR constructions, because the contrast itself is significant enough to call for an explanation both theoretically and empirically, for their different syntactic behaviors corresponding to their different prosodic shapes. According to M & P's theory, the constraint can therefore be formulated as follows:

24    **Templatic Constraint on canonical VR construction**
$VR_{CANO} = PrWd$
"The VR in canonical ([V R Obj]) structure is a prosodic word."

This constraint demands that in order to license the canonical configuration (i.e., [V+R+Obj]) to be grammatical, the verb+resultative cannot be formed bigger than a PrWd. This implies

further that the syntax needs a minimal word in this environment. More specifically, the grammar of the canonical VR structure (i.e., the surface order of [Subj V+R Obj]) demands that the VR be a PrWd, otherwise, the result will be ungrammatical.

We have seen that the minimal word is the most harmonic prosodic word possible and that this is due to interactions of different prosodic constraints. Given this, a question arises immediately: Why does syntax demand a minimal word in order to license certain structures to be grammatical? The question itself is very important and interesting, because it not only admits the power of minimal word involved in syntactic organizations (not only in morphology), but also implies an even broader effect: prosody can exert influence on syntax. As we can see from the following analysis, the ungrammaticality itself is strong enough to show the influence of prosody on syntax.

First, as seen in (22b') and (22c'), the VRR can occur in either a [Obj, Subj VRR] or a [Subj *ba* Obj VRR] structure, but cannot take the canonical [Subj VR Obj] structure. If an object can legitimately appear in disyllabic VR sentences (22a), why cannot it appear in trisyllabic VRR sentences (22a')? Syntax cannot distinguish the VR from the VRR, because both are the same in category. Semantics can not make a clear distinction either because both R and RR could be synonymies, as seen in (21). The only difference is their number of syllables: VR is disyllabic and VRR is trisyllabic. As a result, the difference between the two forms with two syntactic functions can only be explained in terms of prosody. If this is so, the ungrammaticality of [VRR *Obj] sentences are prosodically ill-formed, which is a clear case of prosodically constrained syntax.

Second, it is well-known that topicalizations and *ba* sentences in Chinese both correspond to a canonical structure, even if the semantics of the canonical sentence are slightly different from the two alternatives (cf. the active and passive alternatives),  as seen in (22). Given this, we see that only the disyllabic VR forms can have an alternative choice to form either a canonical or a topicalized (or *ba*) sentence (22a-c). The VRR forms, on the other hand, do not have the freedom of being formed canonically, regardless of the pragmatic usages of the canonical sentences that the VRR could possibly request. Why is this so? Given the above analysis the reason is quite simple, because the canonical structure is constrained by the minimal word template. Thus, if the verb+resultative is formed by more than two syllables (i.e., larger than a PrWd) it will violate the Templatic Constraint and it is, therefore, forbidden to occur in the canonical structure. As a result, such a sentence must be ruled out or the canonical order must be altered accordingly. In fact, the latter option is available in the language because the topicalization and the *ba* construction can alter the canonical word order into different configurations, and this option is practically activated because the alternative is forced to take place when the VRR is used. Given this, the "topicalized object" and the "*ba*-object" can both be considered as prosodically forced alternatives. This explains why the VRR verbs occur only in a topicalized or a *ba* sentence. To put it differently, if the Templatic Constraint prevents the VRR verbs from appearing in canonical sentences, the only way to guarantee the VRR to be used grammatically in the language is to re-construct the canonical structure into an alternative one (through topicalization, for example). Obviously, it is the Templatic Constraint that forces the VRR to use a different syntactic structure. Given this analysis, the verb+resultative constructions in Chinese constitute another evidence of prosodically constrained syntax.

While it is not the purpose of this paper to explore the full scale of interactions between prosody and syntax, it is worthwhile to point out that the minimal word investigation may have a much broader implication and that its role in syntax is a matter of continuing study.

## 5. Minimal Word as a Condition for Morphsyntactic Operation

In Mandarin Chinese, there are many A(djective)+N(oun) compounds such as *dami* 'big+rice, rice', *dahan* `big+man, burly fellow', *xiaobiar* `little+plait, pigtail'...etc. Traditionally, most of the A+N forms such as *da laohu* `big tiger', *xiao yusan* `little umbrella'...etc. have always been considered as phrases, rather than compound words, even if it has been recognized that the A+N combinations are not freely constructed (Zhu 1980), as shown in the following contrasts (*'de'* in Chinese is a possessive marker and a relative clause complementizer):

25     **Semantic Gap**

        bai zhi        bai   de zhi
        'white paper'   'white 's paper, white paper, a paper that is white'

        *bai shou     bai   de shou
        'white hand'    'white 's  hand, white hand, the hands that are white'

    **Alternative Forms** (but semantically not equivalent)

        dami        da de mi
        big rice      big 's rice
        'rice'        'the rice that are big.'

        da che      da de che
        big vehicle   big 's vehicle
        'cart'      'the vehicle that is big.'

Recently, Shih (1986), Dai (1992), Sproat and Shih (1991, 1996a), Duanmu (1998), Chen (2000) and others have argued that the bare A+N forms exemplified above should all be considered as compounds, rather than phrases. Among the evidence supporting this analysis, the following is the strongest: the A in all A+N forms cannot take a modifier like *hen* 'very', for example:

26     *hen da shu      hen   da de shu
       'very big trees'     'very big 's trees, the trees that are very big.'

       *hen da che      hen   da de che
       'very big vehicle'    'very big 's vehicle, the vehicle that is very big.'

       *hen xiao yusan   hen   xiao de yusan
       'very small umbrella' very small 's umbrella, the umbrella that is very small.'

Such a syntactic behavior, therefore, forces one to conclude that the A+N forms are not phrases because there is no reason why the A cannot be modified if the [A+N] is a phrase, as compared with English:

27      little umbrella         very little umbrella
          blackboard         *very blackboard
          small-pox          *very small-pox

In English, the A of an [A+N] form cannot be modified only if the [A+N] is a compound. In Chinese, however, the A in all of the A+N forms is not allowed to be modified. Thus, it is reasonable to consider them as $N^0$ modifiers (Sproat and Shih, 1991:571). However, what we found is a clear distinction between different prosodic entities with different syntactic behaviors among all A+N forms. That is, disyllabic AN forms (if not all ) behave differently from the longer ones systematically. To see this, let us began with Sproat and Shih's (1991) generalization about the adjective ordering between "COLOR" and "SIZE" used in noun phrases.[19]  First, to observe:

28     **SIZE COLOR**      **NOUN**
        little    black        umbrella      *black little umbrella
        xiao    hei         yusan        *hei xiao yusan
        big     white     plate         *white big plate
        da      bai         panzi         *bai da panzi

Based on mounting evidence in different languages, Sproat and Shih (1991) generalized an Adjectival Ordering Restriction (AOR), which says essentially that: the AOR ----- [SIZE > COLOR] ------  obtains iff the adjectives involved are hierarchical direct modifiers. This is argued to be a universal constraint for the ordering of multiple adjectival modifiers, not only in English but also in Chinese (and many other languages, see Sproat and Shih 1991).

     Given this constraint, a clear-cut distinction emerges between disyllabic AN forms and trisyllabic AN forms. For example (taken from Feng, 2000):

29     **Trisyllable AN**                  **Disyllable AN**
        **\*COLOR > SIZE**             **COLOR > SIZE**
        *bai  da  panzi             hong xiao-bing
        'White big pate'            'red small-soldier, the red guard'

        *hong xiao yusan         hei da-han
        'red small umbrella'       'black big-man, a black bully fellow'

        *hong xiao jisuanji       hei xiao-biar
        'red small computer'      'black little-plait, a black pigtail'

| | |
|---|---|
| *hei da xiongmao | hei da-yan |
| 'black big panda' | 'black big-goose, wild goose' |
| | |
| *bai da luobo | bai da-mi |
| 'white big radish' | 'white big-rice, white rice.' |
| | |
| *zi xiao fanqie | lü xiao-cong |
| 'violet small tomato' | 'green small-scallion, green scallion' |

Clearly, only (if not all) disyllabic AN forms can violate the universal constraint of [SIZE > COLOR] whereas three (or more) syllable AAN forms must *all* obey this constraint. Once again, we see that the trisyllabic AAN forms, like all other trisyllabic forms (V+OO, Aux+VV and V+RR), inherently lack the properties exhibited in disyllabic forms. Why must this be? Traditional grammarians would answer this question immediately: because the ones that can violate the general constraint are compounds. This is indeed correct because in English the [SIZE > COLOR] order can also be violated if the [SIZE+N] is a compound. For example,

30        red small-pox
             black big-foot

      The compound status of the disyllabic AN forms in (29) can also be seen from the fact that the ones that can violate the ordering requirement are all inseparable, which shows the inherent property of being a compound. For example,

| | | |
|---|---|---|
| 31 | hei da-han | *da de han |
| | black big-man | big 's man |
| | 'black bully fellow' | |
| | | |
| | hei xiao-biar | *xiao de biar |
| | black little-plait | little 's plait |
| | 'a black pigtail' | |
| | | |
| | lü xiao-cong | *xiao de cong |
| | green small scallion | mall 's scallion |
| | 'green scallion' | |

The inseparability of the [SIZE+N] forms in the [COLOR+[SIZE+N]] environment confirms the analysis that the [SIZE+N] forms in (29) and (31) must all be compounds, which makes a reasonable exception to the general constraint on ordinary phrases, as what we would expect in English.

      However, a question rises once we adopt the above analysis, because it would imply that the ones that must obey the general constraint are phrases. This must be so otherwise there is no reason why they would behave differently from the ones that violate the [SIZE > COLOR]

constraint if both AN and AAN are compounds. In other words, if only compounds can violate the constraint (cf. red small-pox), the ones that must obey it should not be compounds (cf. *red small umbrella).[20] However, as we have seen above, there is evidence that all A+N forms in Chinese are compounds, because none of them can be modified by a degree adverb like *hen* `very' (cf. *very blackboard). Given this, we are left with a paradoxical situation: according to the [SIZE > COLOR] constraint, the ones that obey it must not be considered as compounds because only compounds can disobey it; but according to the modifier *hen* test, all AN forms must be compounds regardless of whether they obey the [SIZE > COLOR] or not.

How can we resolve this dilemma? While other analyses are plausible (see footnote 20), I would like to suggest, first, that the ones that disobey the [SIZE > COLOR] constraint are unquestionably compounds. However, they are not compounds in general, rather a specific kind, say, lexical compounds. By lexical compound I mean that they are generated in the lexicon governed by (prosodic) morphological rules.

What about the ones that must obey the [SIZE > COLOR] constraint? Regarding the *hen* `very' test given above, they cannot simply be treated as phrases, but they cannot be lexical compounds either. What I would like to suggest is this: they are syntactic compounds, which means that they are formed in syntax,[21] hence are visible to the syntactic restriction of [SIZE > COLOR]. In fact, whatever they are is not the central issue to be addressed here. The point I am making concerns the following fact: Only (if not all) disyllabic forms are able to take the [COLOR+SIZE] structure, while polysyllabic forms all fail to do so. The question then is: why are the trisyllabic ones different from the disyllabic ones? Why must the difference be made by different numbers of syllables? Furthermore, how can we characterize the difference? Juxtaposed with the analyses in the previous sections, it is clear that the difference is due to whether an AN form is a PrWd or not, hence it can only be explained in terms of prosody. Similar to the minimal word effect on VO, AuxV and VR forms discussed above, this phenomena can best be accounted for in the same way as a minimal word effect. That is,

32    **Minimal Word Constraint on AN forms in Chinese**
       AN-Compd = PrWd
       A AN (lexical) compound is a PrWd.

Here, we do not exclude the possibility that the polysyllabic AN forms are (syntactic) compounds, but they must be different from lexical compounds. If we adopt the classification of lexical compounds and syntactic compounds, we have good reason to say that the requirement of $[A+N]_{PrWd/Compound}$ in the [COLOR+[SIZE+N]] structure follows directly from the minimality constraint: a lexical compound of [A+N] forms must be a PrWd. Thus, in the environment of [COLOR+SIZE+N], the application of Prosodic-Morphologic constraint (32) will give rise to the following result: $[COLOR [size+N]_{PrWd/Compound}]$. The present theory also predicts that the trisyllabic AAN forms cannot be lexical compounds. If, for whatever reasons they have to be compounds of some sort in the language, the best thing they can do is to become syntactic compounds, by which their components are still visible to certain syntactic processes (i.e., the phrasal restriction of [COLOR > SIZE]).

If the above analysis is correct, it provides additional evidence for the argument that the

minimal word in Chinese is the most harmonic prosodic word which is extremely active in a variety of constructions in the language.

## 6. Theoretical Implications and Empirical Consequences

We have discussed several different syntactic and morphologic constructions in the present study: the Verb+object, the Auxiliary+Verb, the Verb+Resultative and the Adjective+Noun. We have also seen that all these different syntactic forms share a common property, that is: the trisyllabic ones are syntactically different from the disyllabic ones systematically. To be more specific, only the disyllabic ones exhibit lexical properties, hence only the disyllabic ones can be (lexical) compounds. Thus, for VO and VR forms, only the disyllabic ones can take an object; for AuxV forms, only the disyllabic ones can be modified by a degree modifier like *feichang* `extremely'; for AN forms, only the disyllabic ones can violate the [SIZE+COLOR+N] phrasal constraint. Contrary to the case of disyllabicity, all trisyllabic forms of each of the four constructions syntactically deviate from the properties of being a (true) lexical item, for example: the separable property and the inability to take a (post-verbal) object for all trisyllabic VOO and VRR forms; the inability to undergo the process of category changing for all trisyllabic AuxV forms; and the obligation to follow strictly the phrasal constraint [SIZE+COLOR+N] for all trisyllabic AN forms.

It is possible for one to pose a different analysis about the trisyllabic forms. For example, the AAN forms may reasonably be treated as phrases with a [SIZE+COLOR+N] order, or compounds with the *hen* test. Also the VRR forms may be analyzed as compounds or phrases, depending on one's theories. However, it does not matter how one analyzes them, the distinction between the disyllabic and the trisyllabic ones will still be there. The syntactic contrast cannot be explained away by whatever analysis that overlooks the disyllabic and the trisyllabic distinctions. The facts brought to light in this study are quite striking: the distinction among all the four types of forms is not only differentiated syntactically, but also prosodically. In fact, their different syntactic behaviors were not discovered and will not be fully understood until the prosodic distinction is bought to light. In this sense, it is reasonable to say that the study of prosody has revealed some important prosodic-syntactic phenomena that would otherwise be a mystery in the language. In the dislocated object of VRR forms, for example, it is prosody, rather than syntax, that forbids the VRR forms to take place in the canonical surface structure, and it is the prosody that causes the object to raise to the topic position, for otherwise the sentences would be prosodically ungrammatical.

As we have seen, the prosodic distinction in all of the four different structures is centered upon the basic domain of disyllabicity. Why is this so? The minimal word theorem developed by M & P provides the best explanation and it is simply the legitimacy of being a PrWd in the language. The Chinese language is, therefore, a language that is extremely sensitive to the prosodic domain. Actually, it is the domain that permits only disyllabic forms to have the priority to be or become compounds, and it is also the domain that prevents trisyllabic forms from entering into the realm of lexical compounding. As a result, a boundary in Chinese morphology can be set between what is a compound (PrWd applies in morphology) or permitted to be a compound (PrWd applies in syntax), and what is forbidden to be a lexical compound, or at most a syntactic compound.

It is well known that in Prosodic Morphology, the core area of previous investigations is focused mainly on reduplication and infixation. The present study, however, extends the notion of PrWd into the area of compounding and its interaction with syntax. For all of the four types of forms discussed above, we have seen that the minimality constraint indeed controls the word formation of compounding in Chinese. That is, a compound (or more specifically a lexical compound) must first be a PrWd, even if a PrWd may not be, by necessity, a compound. This solution has several implications in Prosodic Morphology. First, the Templatic Constraint not only determines the morphological operations like reduplication and infixation, but also controls the word formation of compounding in languages like Chinese. This raises a question for future study as to why and how the Templatic Constraint could also control compounding. Furthermore, it is clear, by now, that the minimal word requirement functions in Chinese. Yet, when it does, it not only affects word formation, but also syntactic structures in a way that sentences can or cannot be well-formed. To one's surprise, the MinWd may also circumscribe certain syntactic phrases, so that the native speaker's intuition about what is a "word" is unquestionably affected by the prosodic notion of MinWd. The final question then is how and to what extent prosody would affect syntax, a question which is extremely important for theoretical as well as empirical inquiries in future research.

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## Notes

1.  Note that the result of this reasoning may end up with a simple statement like this: "a minimal word is just a foot". Why, then, do we need the notion of 'minimal word' if it is indeed a foot? Note that, without the Ft/PrWd alignment, there is no reason why the size of a word (morphology) should coincide with a foot (prosody). Here, following M & P (1990, 1998), I will assume that the P >> M is the fundamental hypothesis in Prosodic Morphology.

2. We note that the notion of foot has varying definitions in previous studies of Chinese phonology and prosody. It has been used as a unit containing only one tone-bearing syllable (Yip 1995), and also for poetic feet (Chen 1979) or stressed feet (Duanmu 1998). Here, however, based on the fact that "the foot binarity condition holds true of Chinese dialects in general"and that "in Beijing Mandarin, foot binarity is enforced regardless of morphosyntactic statues" (Chen 2000:242), I will consider the minimal rhythmic unit exhibited in connected speech and defined in Chen (2000 Ch-9) to be foot with its applications in the theory of prosodic morphology.

3. Since the majority of syllables in Chinese are monomorphemes (or words), morphological and syntactic structures can always affect the footing directions. Shih (1986), for example, has proposed two opposite directions of footing to capture the sandhi effects in compounds and phrases in Mandarin Chinese. In order to overcome the interferences from morphology and syntax, two types of syllable strings (i.e., the coordinating syllable-words and the polysyllabic monomorphemic translation of foreign words) are used in Feng's 1998 to test the default footing direction, as seen in (8). The results are not only consistent but also exhibited in a group of noun+noun compounds observed in Lu & Duanmu (1991) and Sproat & Shih (1996). For example:

| | | | |
|---|---|---|---|
| i. | *pi-gongchang | iii. | pixie chang |
| | skin-factory | | skin-shoe factory |
| | 'leather factory' | | 'leather-shoe factory' |
| | | | |
| ii. | *xie-(pi-chang) | iv. | (xie-pi)-chang |
| | shoe leather-factory | | shoe-skin factory |
| | 'a leather factory that makes shoes.' | | 'a factory that makes shoe-leather.' |

In this group of compounds, only left footing is acceptable as in (iii) and (iv), and right footing will result in ungrammatical compounds, as shown in (i) and (ii). This confirms the left-footing process in Chinese prosodic morphology. Note that the contrast in the examples given above has also been explained in terms of a "non-head stress rule" in Lu and Duanmu (1991). The competitive analysis of the left-footing account given here, however, offers a different perspective for the same phenomena.

There are, unsurprisingly, exceptions to the left-footing analysis and the non-head stress rule, such as *nao-zuzhi* 'brain tissue', *zhi-laohu* 'paper tiger'...etc., noticed in Sproat and Shih (1996), Duanmu (1997) and Feng (2001). However, we certainly do not want to say that there is no constraint at all, at the expense of the fact that "Mandarin words clearly do obey prosodic

constraints" (Sproat and Shih, 1996). Here, I would follow Sproat and Shih's (1996) suggestion that these exceptions can best be handled in terms of an OT analysis.

4. This result can also be achieved by applications of Chen's prosodic principles given in (7). That is, if every MRU is formed minimally, as well as maximally, by two syllables, the most harmonic prosodic unit will be a disyllabic foot which gives rise to the same result of a minimal word as it does in the prosodic morphological system.

5. For example, in Chinese there are many trisyllabic as well as quadrisyllabic compounds which are obviously beyond the size of a PrWd. While it is not the purpose of this paper to discuss the variety of compound formations, it is important to point out that it is entirely possible to derive polysyllabic compounds in Prosodic Morphology within the Optimality Theory. For example, the PARSE-SYLL requires that every form be fully footed. This will demand multiple feet in longer words. Yet, the ALL-Ft-LEFT will never be completely satisfied in words which have more than one foot. Now, under minimal violation of All-Ft-Left, a multifoot form is allowable but it must have its feet as close to the beginning of the word as possible (see M & P, 1998:298). Given this and the language specific constraint that every syllable is a morpheme in Chinese, polysyllabic compounds are allowable and probably predicted: The trisyllabic (σσ)σ) compounds as seen in footnote 3, will be more optimal than (σ(σσ) because only in the former is the initial foot closer to the beginning of the compound and therefore the better candidate in competing with the (σ(σσ) forms.

6. For example, Huang (1984) proposed a Phrases Structure Condition (PSC) demanding that no two constituents be allowed after the main verb. This works perfectly in cases where a VO (or VR) co-occurs with an object (or a duration/frequence expression). That is, if a VO/VR can take an object (or a complement) like (8a'-b'), it must be a compound and if it cannot, it is a phrase. However, as Zhang (1992) has pointed out, the PSC cannot determine whether a VO/VR is a compound or a phrase if there is no second constituent (complement) after it. The present theory, however, predicts a categorical distinction: all trisyllabic VOO (as well as VRR) are phrases regardless of whether there is a second constituent or not. As we can see below, the present analysis generalizes a prosodic condition of what can (if not must) be compounds and what must be phrases (or at least have phrasal properties) in the language.

7. In Wang's study, there is a total of 25 VO forms examined by native speakers. In addition to the ones given in Table 1, they are *shang ban* `go to work', *jie hun* `get married', *xia ban* `off work', *zhuan shen* `turn the body', *luo di* `fall on the floor', *tan hua* `talk words, chat'..etc. The total average of word-judgments is 95.6%, giving only 4.4% of phrasal-judgments among all the 25 forms. It would not be surprising if the judgments varied, even tremendously, when other forms and methods are used. However, for the present purpose, it is enough to see how differently the native speaker's judgments deviate from linguistic analyses, and how highly the judgments converge upon the disyllabicity.

8. For example, by Huang's PSC (see footnote 4), all of the VO forms, except the last one, are phrases because no second constituent is allowed after the four VO forms, for example:

    i.        \*Ta shui-jiao    le  yi  tian
                 He sleep-wake Asp. one day
                `He slept for a day.'

    ii.      \*Ta xi-zao    le   san  ci.
               He  take-bath Asp. three time
               `He took bath for three times'.

    iii.    \*Ta pao-bu le   liang ci.
               He run-feet Asp. two  time
               `He jogged twice.'

    iv.     \*Ta nian-shu   le    sange zhongtou.
                He read-book Asp. three   hours.
               `He read books for three hours.'

    v.       Ta dan-xin    qingkuang hui you bianhua.
                He carry-heart situation    will have change
               `He worried that the situation will change.'

9. There are exceptions to this generalization. However, these exceptions will not affect our analysis here, because none of them is able to form a VO compound in the language. Note also that neither a two-syllable verb nor a two-syllable noun in (10a) will result in a VO-MinWd, regardless of the number of syllables of their sister nodes, because either way will violate the PARSE-SYLL together with the ALL-FT-LEFT constraints.

10. This is to say that the ones that can (if not yet) be lexicalized as compounds must all be PrWds. What is important to note here is this: polysyllabic VO forms have never been tested as lexicalized compounds in the language, because, according to the present theory, they violate the Templatic constraint: VO-Compd = PrWd.

11. For example, the trisyllabic forms such as *pao-mogu* 'soak mushroom, use delaying tactics ', *ji yagao* 'squeeze toothpaste out of a tube, be forced to tell the truth bit by bit'...etc., are highly idiomatized but they can never function as compounds examined by transitivity, aspect making, the PSC test, as well as native speakers' intuition.

12. This may lead us to the following conclusion reached in Feng 1997: in Chinese, a compound must be a PrWd, while a PrWd may not, by necessity, be a compound. This raises an important question about whether or not the MinWd effect can go beyond the hypothesis of P >> M. The facts given in this paper suggest a positive answer. That is,  P >> S (prosody dominates syntax). If this is so, the next question is to what extent this hypothesis can hold, a question that has been raised in previous studies (Zec and Inkelas 1990, Truckenbrodt 1995, Feng 1995, Zubizarreda 1998, among others) and preliminarily touched upon in this paper. It will certainly engage further investigations in future studies.

13. This analysis allows us to conclude that the disyllabic VO forms are not a single syntactic category in the language because they contain prosodically minimal words (compounds) and prosodically minimal phrases (including idiomatized and free phrases). On the other hand, the trisyllabic (or polysyllabic) VO phrases belong to a purely syntactic category, because they can only be phrases and can never interact with morphology through prosody, which is a crucial difference between the disyllabic and trisyllabic phrases. It is important to note that, even though a subset of disyllabic VO forms behaves just like the trisyllabic VO forms, this will not cancel the distinction between the disyllabic and the trisyllabic forms. The point made here is based on the following argument: no trisyllabic forms behave like (some) disyllabic forms, only some disyllabic forms act like  trisyllabic ones. This is illustrated in the following diagrams:

Disyllabic properties=    =Trisyllabic Properties
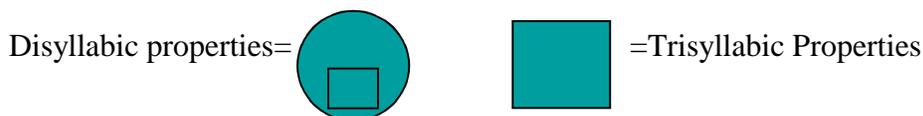
Even if  "B" contains a part of  "A",  as a whole, "A" and "B" are still different, i.e., "A" can never be the upper part of B. This relationship is also observed in auxiliary+verb, verb+resultative and adjective+noun forms, as discussed below.

14. The double "VV"used here refers to a "disyllabic V", henceforth,  "RR" for a "disyllabic R" and "NN"for a "disyllabic N"...etc..

15.The auxiliary *ke* can also be analyzed as a prefix like"-able" as seen in (14). In this case the Templatic Constraint can still hold, because only disyllabic [*ke*+V] can function as adjectives, and all longer forms fail to do so. Thus, there are no lexical items like *[*feichang ke*-VV] in the language. The reason I analyze the [*ke* V] forms as a case of category changing concerns examples like the following:

    i.      zhe zhong ren    ke  kao  ke  bu  kao /  ke xin   ke  bu  xin.
               This type   person can relay can not rely / can trust can not trust
               `This type of person can either be or not be reliable/trustful.'

    ii.      Women xianzai zhi ke kao ziji de nuli bu ke kao bieren de bangzhu.
               We now only can rely on self 's endeavor not can rely on other 's help.
               'Now we can only rely on endeavors of ourselves and not on others help.'

    iii.      Wo de pengyou feichang   ke-kao / ke-xin
                I   's friend     extremely reliable / trustful.
               'My friends are extremely reliable / trustful.'

Thus, *ke-kao/xin* can be used as a phrase (i-ii) and also can be lexicalized as a compound through category changing (iii) according to the present analysis.

16. Similar to Aux+V forms discussed above, the process of category changing can also be observed in VO forms. For example:

mai-tou    (*-naodai) nian-shu
bury-head (head)      read-book
`To study in a manner of immersing oneself in it, to immerse oneself in the study.'

bing-jian          (*-jianbang) zhandou
parallel-shoulder (shoulder)    fight
`To fight shoulder to shoulder (side by side).'

ai-hu        (*-menhu) diaocha
touch-door (door)      investigation
`To investigate from door to door.'

bian-far         (*-fangfa) daoluan
change-method (method) disturb
`To disturb in various ways.'

These examples show that a VO form can be used as an adverb only if it is a PrWd. This is so because all trisyllabic VO forms used in this way will cause an ungrammatical consequence as seen above. Thus, the Templatic Constraint is: VO → Adverb ╱ [VO]$_{PrWd}$, i.e., "a V+O form undergoes a process of category changing, iff it is a prosodic word." This provides additional evidence for the Templatic Constraint on Category Changing in Chinese.

17. As far as I know, there are only three exceptions to this generalization. They are V-*ganjing* 'V-clean'*,* V-*mingbai* 'V-clear' and V-*qingchu* 'V-clear', each of which can take a post-verbal object even if they are trisyllabic. While they are exceptional for unknown reasons (hence future study is definitely needed), it is worthwhile to point out that all of the three forms share one common feature: the second syllable in the R.R forms is neutralized (marked with a dot before the syllable), thus, they pronounced: *gān.jin(g)*, *chīng.chu*, *míng.ba(i)*. Apparently, the neutralized R.R forms parallel the monosyllabic R forms in the verb+resultative construction. This suggests that the neutralization may be a necessary (if not sufficient) phonological condition required for the exceptions to take place. This is so because if the second syllables of the RR forms are not neutralized, they cannot take an object in the canonical verb+resultative construction, as seen in (19) and Dong (1998).

18. I will not go into the complexity of why the VRR cannot take an object in this paper. The reader is referred to Dong (1998) for a detailed analysis of this issue. The basic idea of her paper is this: the [V+RR+Object] sentences violate the prosodic structure required by the nuclear stress rule interacted with a heaviness condition, hence they must be ruled out prosodically.

19. ">" means 'X precedes Y' or more specifically, 'X is further from the head than Y' in Sproat and Shih's study. The pronominal adjectival modifiers examined by Sproat and Shih (1991) actually include a successive hierarchical schema: QUALITY > SIZE > SHAPE > COLOR > PROVENANCE.  Here, since only the order of [SIZE > COLOR] is directly relevant to the present analysis, other relations are omitted.

20. One possibility is to use 'frozen compound' vs. 'lexicalized compound' to capture this difference, which is plausible under the classifications of different types of lexicalization, i.e., the ones that have lost their internal structures (frozen compound) and the ones that retain their internal structures (lexical compound), as discussed in Liberman and Sproat (1992:514-5). In this respect, however, the same prosodic pattern observed in the present study is still there: No trisyllabic AAN lexicalized compounds (retain internal structures) can be frozen and the frozen ones (lost internal structures) can only be disyllabic.

21. Note that the syntactic compound assumed here agrees with Sproat and Shih's (1991:571) analysis that "In Mandarin...direct adjectives would appear to be restricted to modifying $N^0$." Actually, the syntactic compounds of (A)AN forms are indeed analyzed as being formed in syntax through $X^0$ adjunction in Feng's 2001. The analysis of two levels of compounds in Chinese is supported by distinctions between lexical and post-syntactic compounds in Japanese proposed in Shibatani and Kageyama's 1988 study and between ordinary compounds and construct state nominals in Hebrew observed by Borer (1988), who argues that the ordinary compounds are formed in the lexicon whereas the construct state nominals are built in the syntax where the components are visible to syntactic processes.