Verbal reduplication in Mandarin Chinese: An HPSG account

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Abstract

The current study presents an HPSG analysis for verbal reduplication in Mandarin Chinese. After discussing reduplication's interaction with *Aktionsarten* and aspect markers, we argue that it is a morphological rather than a syntactic process. We put forward a lexical rule for verbal reduplication in Mandarin Chinese, and the different forms of reduplication are captured in an inheritance hierarchy. The interaction between verbal reduplication and aspect marking is handled by multiple inheritance. This analysis covers all forms of verbal reduplication in Mandarin Chinese and has none of the shortcomings of previous analyses.

1 Introduction

In Mandarin Chinese, verbs can be reduplicated to express a delimitative aspectual meaning (e.g. Chao 1968; Q. Chen 2001; Dai 1997; Li 1996; Li & Thompson 1981; Tsao 2001; Xiao & McEnery 2004; Yang 2003; Zhu 1998). This means that the event or state denoted by the verb happens in a short duration and/or at a low frequency (Xiao & McEnery 2004: 155), as illustrated in (1).[1] Thus, verbal reduplication in Mandarin Chinese is often translated as doing something "a little bit/for a little while".

(1)   a. qing   ni   chang zhe dao cai.   b. qing   ni   *chang-chang* zhe dao cai.
       please you taste   this CLF dish   please you taste-taste   this CLF dish
       'Please taste this dish.'   'Please taste this dish a little bit.'

The current study tries to determine a suitable formal and unified analysis for the structure of verbal reduplication in Mandarin Chinese. It provides a novel HPSG analysis of this phenomenon and avoids the problems of previous approaches.

We will present in Section 2 the forms and syntactic distribution as well as the semantics of verbal reduplication in Mandarin Chinese. Importantly, we restrict the object of this study to the AA, A-*yi*-A, A-*le*-A, A-*le*-*yi*-A, ABAB and AB-*le*-AB forms (these templates will be illustrated below). We will also discuss in this section, with the help of corpus data, the question of whether the reduplication is a morphological or a syntactic process. In Section 3, we will discuss the advantages and drawbacks of previous approaches. Finally, in Section 4, we will present a new HPSG account for verbal reduplication in Mandarin Chinese.

The data in this paper was drawn from several sources. In addition to introspection, the Modern Chinese subcorpus of the corpus of the *Center for Chinese Linguistics of Peking University* (CCL) (Zhan et al. 2003; 2019) was consulted. Other examples from novels and plays written by native speakers were also considered.

[†] We want to thank Elizabeth Pankratz for comments on an earlier version of this paper.
[1] Reduplications in the example sentences will be set in italics.

2 The phenomenon

Verbal reduplication in Mandarin Chinese takes the forms listed in (2).

(2)   a. for monosyllabic verbs: *shuo* 'say'

        i. shuo-shuo   AA
           say-say

       ii. shuo-yi-shuo   A-*yi*-A
           say-one-say

      iii. shuo-le-shuo   A-*le*-A
           say-PFV-say

      iv. shuo-le-yi-shuo   A-*le*-*yi*-A
           say-PFV-one-say

       v. shuo-shuo-kan   AA-*kan*
           say-say-look

      vi. shuo-kan-kan   A-*kan-kan*[2]
           say-look-look

    b. for disyllabic verbs: *lai-wang* come-go 'come and go/communicate'

        i. lai-wang-lai-wang   ABAB
           come-go-come-go

       ii. lai-wang-le-lai-wang AB-*le*-AB
           come-go-PFV-come-go

      iii. lai-lai-wang-wang   AABB
           come-come-go-go

    c. for Verb-Object (V-O) compounds: *chang-ge* sing-song 'sing'

        i. chang-chang-ge   AAB
           sing-sing-song

       ii. chang-yi-chang-ge   A-*yi*-AB
           sing-one-sing-song

      iii. chang-le-chang-ge   A-*le*-AB
           sing-PFV-sing-song

Arcodia et al. (2014), Fan (1964), Melloni & Basciano (2018) and Xie (2020) compared the AA, ABAB and AABB forms of reduplication and found a number of differences for the AA and ABAB forms compared to the AABB form in terms of their semantics, productivity, syntactic distribution and origin. The current study will only focus on the AA, A-*yi*-A, A-*le*-A, A-*le*-*yi*-A, ABAB and AB-*le*-AB forms, though AA-*kan*, A-*kan-kan*, AAB, A-*yi*-AB, A-*le*-AB will also be mentioned occasionally to provide further arguments. In what follows, the term *reduplication* will be

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[2]This form is more common in Taiwan than in Mainland China.

used to refer specifically to the AA, A-*yi*-A, A-*le*-A, A-*le*-*yi*-A, ABAB and AB-*le*-AB forms, if not specified otherwise.

The reduplication has a similar syntactic distribution to an unreduplicated verb. The reduplication cannot be aspect-marked, though, except with the perfective aspect marker *le* (for further discussion, see Section 2.2). The reduplication is incompatible with an expression that quantifies the duration or the extent of the event expressed in the sentence, as in (3) (L. Chen 2005: 114–115; Li 1998: 83–84). This is probably because the reduplication already contains a quantity meaning (L. Chen 2005: 114–115; Li 1998: 84).

(3) a. ta yi tian pao shi li. b. * ta yi tian *pao-pao* shi li.
      he one day run ten mile   he one day run-run ten mile
      'He runs ten miles a day.'

The reduplication has a *delimitative* meaning (e.g. Chao 1968; Q. Chen 2001; Dai 1997; Li 1996; Li & Thompson 1981; Tsao 2001; Xiao & McEnery 2004; Yang 2003; Zhu 1998). The semantics of the reduplication has the properties of transitoriness, holisticity and dynamicity (Dai 1997: 70–79; Xiao & McEnery 2004: 155–159). It presents the situation as a transitory and non-decomposable whole, which involves not only changes in the initiation and termination of an event, but also changes in the transitory process itself. Compared to (4a), which could mean that the protagonist kept staring at the footprint, (4b) indicates that the protagonist took a brief look or several brief looks at the footprint and looked away in the end, which is a process full of changes.

(4) a. Wu Xumang kan-le   zuo-an   shi liuxia de jiaoyin …
      Wu Xumang look-PFV commit-crime when leave DE footprint
                                              (Xiao & McEnery 2004: 158)
      'Wu Xumang looked at the footprint left when the crime was committed.'
    b. Wu Xumang *kan-le-kan*   zuo-an   shi liuxia de jiaoyin …
      Wu Xumang look-PFV-look commit-crime when leave DE footprint
                                              (Xiao & McEnery 2004: 158)
      'Wu Xumang looked a little bit at the footprint left when the crime was committed.'

As for the other forms of the reduplication, A-*yi*-A is considered to have the same core semantics as AA, although its pragmatic uses may be different (Yang 2003). The semantics of A-*le*-A can be deduced compositionally from its structure. It is a combination of the perfective aspect and delimitativeness, "conveying a transitory event which has been actualized" (Xiao & McEnery 2004: 151). In contrast, AA-*kan* and A-*kan-kan* are described as expressing a "try … and find out" meaning (Cheng 2012: 63). Tsao (2001: 290) also observed that the tentative meaning is particularly prominent when the reduplication is followed by *kan* 'look'. We consider the tentativeness implied by these two forms to be a pragmatic extension of delimitativeness. The tentative meaning is made prominent by the verb *kan* 'look', and the whole structure can be understood as "do A a little bit and see".

2.1 Interaction with *Aktionsarten*

Previous research often claimed that the reduplication can only be used for verb classes of certain *Aktionsarten*, while it is infelicitous for others. Hong (1999: 277–278) and Li & Thompson (1981: 234–235) suggested that reduplication is only possible for volitional activity verbs. Dai (1997: 70–71) and Tsao (2001: 290) both considered that reduplication can only be used in dynamic situations. The former further claimed that achievement verbs cannot be reduplicated. Arcodia et al. (2014: 20), Basciano & Melloni (2017) and Xiao & McEnery (2004: 155) proposed that only [+dynamic] and [−result] verbs can be reduplicated. This means that the reduplication can only interact with activities and semelfactives, but not with states and achievements.

Q. Chen (2001: 53) and Yang (2003: 10–11) acknowledged that the reduplication of non-volitional verbs is more restricted than that of volitional ones. But Zhu (1998: 381–382) listed a number of non-volitional predicates that can be reduplicated. We found the examples shown in (5) in CCL where non-volitional verbs *weiqu* 'feel wronged', *ren-xing* 'be willful' and *diao* 'drop' are reduplicated.

(5) a. dajia   ye zhihao *weiqu-weiqu*   le.   (CCL)
         everybody also can.only feel.wronged-feel.wronged PTC
         'Everybody can only feel wronged a little bit.'

     b. ta-men neng zuo de buguo shi *ren-ren-xing*   shua
        she-PL can do DE just   be be.willful-be.willful-temperament play
        dian'er xiao piqi   *diao-diao* yanlei shenme de.   (CCL)
        a.little small temper drop-drop tear   what   DE
        'What they can do is just to be a little bit willful, to lose their temper a little bit and to drop a little bit of tears or something.'

It is true that the reduplication of stative and achievement verbs is not as easily acceptable as that of activities and semelfactives. Compared to the questionable reduplication of the stative verb *bing* 'be sick' in (6a) and that of the achievement verb *ying* 'win' in (6b), the reduplication of the activity verb *kan* 'watch' in (6c) and that of the semelfactive verb *kesou* 'cough' in (6d) is readily acceptable.

(6) a. ? ta *bing-bing*   jiu hao le.   (Xiao & McEnery 2004: 155)
          he be.sick-be.sick then well PTC
          Intended: 'He was sick for a little while and then got well.'

     b. ? ta *ying-le-ying* na   chang bisai.   (Xiao & McEnery 2004: 155)
          he win-PFV-win that CLF   competition
          Intended: 'He won that competition a little bit.'

     c. ta *kan-le-kan*   na   chang bisai.
        he watch-PFV-watch that CLF   competition
        'He watched that competition for a little while.'

    d.   ta *kesou-kesou* jiu hao le.
        he cough-cough then well PTC
        'He coughed a little bit and then got well.'

However, examples such as those in (7a)–(7b) were found in novels and plays written by native speakers, and sentences like (7c) and (7d) were constructed by native speaker linguists. Here, achievement verbs like *wang* 'forget' and *sheng* 'give birth to' and stative verbs like *shutan* 'be comfortable' and *bing* 'be sick' are reduplicated.

(7)   a. deng ren-men ba zhe jian shi   *wang-wang* zai shuo ba.[3]
          wait people-PL BA this CLF incident forget-forget then talk PTC
          'Let's wait until people forget this incident a little bit and then talk about it.'

     b. huitou mo ge zao *shutan-shutan*   ba.[4]
          later wipe CLF bath be.comfortable-be.comfortable PTC
          'Let's take a bath later and be comfortable for a little while.'

     c. wo zhen xiang *bing-yi-bing*,   xie ta ge shi tian ban yue.
          I really want be.sick-one-be.sick rest it CLF ten day half month
                                  (Q. Chen 2001: 54)

          'I really want to be sick for a little while and rest for ten days or half a month.'

     d. jiao ta *sheng-sheng*   xiaohai, jiu zhidao zuo muqin de
          let she give.birth.to-give.birth.to child   then know COP mother DE
          gan-ku   le.   (L. Chen 2005: 112)
          sweet-bitter PTC
          'Let her try to give birth to a child and then she will know the bittersweetness of being a mother.'

This shows that although the reduplication does have a tendency to interact with volitional verbs and with activities and semelfactives due to its dynamic meaning, this is by no means a rigid constraint, and non-volitional verbs, states and achievements can be reduplicated in certain contexts as well.

2.2 Interaction with aspect markers

As mentioned above, the reduplication can only be marked by the perfective aspect marker *le* but not other aspect markers.[5] We believe this incompatibility to be for semantic reasons.

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[3]Liu, Zhen. 1963. *Chang chang de liushui [Long long water]*, 72. Beijing: The Writers Publishing House.

[4]Tian, Han. 1959. *Tianhan xuanji [Selected works of Tianhan]*, 122. Beijing: People's Literature Publishing House.

[5]There is no consensus on which elements exactly are considered aspect markers in Mandarin Chinese. We only discuss the most commonly recognized ones here.

Xiao & McEnery (2004: Ch. 4) considered the markers *le* and *guo*, as well as reduplication, to indicate perfective aspects. The perfective aspect marker *le* is compatible with reduplication, while the experiential aspect marker *guo* is not. *Le* "can focus on both heterogeneous internal structures and changing points" (Xiao & McEnery 2004: 129). It is compatible with the reduplication because its dynamicity can relate not only to the termination or instantiation of an event (a point of change), but also to the process of the situation, just like the dynamicity of the reduplication.

On the other hand, the experiential aspect marker *guo* cannot co-occur with a reduplicated verb because its dynamicity relates to an "experiential change" (Xiao & McEnery 2004: 148), namely that a situation has been experienced historically and that "the final state of the situation no longer obtains" at the reference time (Xiao & McEnery 2004: 144). It is clear that *guo* only indicates a change at the termination of a situation and cannot express the dynamicity within a situation. Hence, it is incompatible with the semantics of the reduplication.

Due to the holistic semantics of the reduplication, it is incompatible with imperfective aspect markers—the durative aspect marker *zhe* and the progressive aspect marker *zai*—as both only focus on a part of the situation and do not view the situation as a whole (Xiao & McEnery 2004: Ch. 5).

From the illustration above, it seems that due to its semantics, reduplication can only be marked by *le* but not the other aspect markers.

2.3 Word vs. phrase

The literature on reduplication makes different assumptions on whether it is a morphological or syntactic phenomenon. Chao (1968) and Li & Thompson (1981) listed reduplication under morphological processes. Arcodia et al. (2014), Basciano & Melloni (2017), Melloni & Basciano (2018), Xie (2020), Xiong (2016) and Yang & Wei (2017), on the other hand, claimed it to be syntactic. This section reviews the arguments in Xie (2020) and applies the tests proposed by Duanmu (1998) and Schäfer (2009) to distinguish words from phrases in Mandarin Chinese. The results argue for a morphological status of reduplication.

Xie (2020) compared the AA and the ABAB forms of reduplication with the AABB form and claimed that AA and ABAB are syntactic processes, while AABB is morphological. She pointed out that AA and ABAB behave differently from AABB in their productivity, possibility of *le* insertion, categorial stability, transitivity and input/output constraints. While AA and ABAB are highly productive, AABB shows low productivity. *Le* can be inserted freely into AA and ABAB but not into AABB. The output of AA and ABAB does not change the grammatical category of the input (verb), but the output of AABB could have other categories such as adverb or adjective. AA and ABAB do not change the valency of the input verb, but AABB makes a transitive verb intransitive. The two groups also have different input and output constraints. Xie (2020) claimed that only dynamic and volitional verbs can undergo AA or ABAB reduplication (but see Section 2.1). On the other hand, AABB requires its input to be a complex verb whose constituents are either synonymous, antonymous or

logically coordinated. Moreover, the output of AABB has an increasing meaning, i.e. an event happens repeatedly or continuously, as opposed to the delimitative meaning of AA and ABAB.

However, these criteria do not suitably distinguish morphological and syntactic processes. A morphological process can be productive, and it does not necessarily change the category or valency of the input. Further, if *le* is considered to be a morphological element (e.g. Huang et al. 2009; Müller & Lipenkova 2013), the insertion of *le* does not have to be viewed as a syntactic process either. It seems that Xie (2020) only showed that AA and ABAB are different processes than AABB, but not necessarily that the former is syntactic while the latter morphological.

It is, therefore, necessary to resort to other tests that are intended to distinguish words from phrases. Duanmu (1998) and Schäfer (2009) proposed the following four tests to distinguish words from phrases in Mandarin Chinese: semantic compositionality, phrasal extension, phrasal substitution and conjunction reduction.[6]

The semantic criterion is that the meaning of a phrase is usually built up in a compositional way while that of a word is usually not (Duanmu 1998: 140; Schäfer 2009: 275). The meaning of the reduplication is not compositional, as it does not mean that the event denoted by the verb happens twice or multiple times, but rather that the event happens for a short duration and/or a low frequency. This non-compositionality suggests that a reduplication is more word-like.

The first syntactic test is phrasal extension, namely the addition of optional elements (Duanmu 1998: 150; Schäfer 2009: 280). If the unit is a phrase, then optional elements that may appear in phrases should be able to be added into it. And subparts of a phrase should be able to be modified separately. If the unit is a word, however, then neither of these should be possible. As illustrated in (2) in Section 1, the base verb and its reduplicant can only be separated by *le* and *yi*, but the word status of these elements cannot be easily defined. We mentioned above that whether aspect markers like *le* are considered to be morphological or syntactic elements depends on the theoretical framework (and possibly the target language). And the status of *yi* is unclear. Turning to the second part of this test, separate modification, we see that elements in the reduplication cannot be modified individually. Compared to (8a), where the adverbial *qingsheng de* 'quietly' modifies the whole reduplication, (8b) is ungrammatical, as the adverbial cannot modify the reduplicant alone. All in all, by the test of phrasal extension, reduplications behave more like words than like phrases.

(8) a. ta qingsheng de *xiao-le-xiao.* b. * ta *xiao-le* qingsheng de *xiao.*
        he quietly DE laugh-LE-laugh   he laugh-PFV quietly   DE laugh
        'He quietly laughed a little bit.'

The second syntactic test is phrasal substitution, namely the substitution of smaller exemplars of a specific category with a full-blown XP (Duanmu 1998: 152; Schäfer

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[6]It is important to note that none of these criteria are sufficient or necessary to determine the word or phrase status of an expression. Nevertheless, they together might suggest which of the two statuses is more likely.

2009: 280). If a part of an expression is actually an XP that only contains one element, a full realization of this XP should be possible as well. Otherwise, this expression is considered to be a word. As (9) shows, in a reduplication structure, it is ungrammatical to substitute each element with a full VP. Again, reduplications look more word-like than phrase-like.

(9) a. ta *chang-le-chang* tang.　　　b. * ta *chang tang le　chang tang.*
　　　he taste-PFV-taste soup　　　　　 he taste　soup PFV taste　soup
　　　'He tasted the soup a little bit.'

Finally, the third syntactic criterion is conjunction reduction. Reduction should only be possible for coordinated phrases and not for coordinated words (Duanmu 1998: 137; Schäfer 2009: 283). For the reduplication, conjunction reduction does not seem to be possible. In (10a), the reduplication *jiao-jiao* 'chew a little bit' is coordinated with a simple verb *mo* 'apply' together with the adverbial *yidian* 'a little bit'. Without the adverbial *yidian* 'a little bit', *mo* 'apply' by itself cannot express the additional 'a little bit' meaning, even when it is coordinated with a reduplicated verb. Similarly, in (10b), the reduplication *kan-le-kan* 'looked a little bit' is coordinated with the predicate *zou-le chulai* 'walked out'. The verb in the latter case is not reduplicated, and it cannot express the delimitative meaning either. Once again, this criterion suggests that reduplications do not have this expected property of phrases.

(10) a. wujian gong-xiu　mo　dian　bohe-gao　huo *jiao-jiao*
　　　 midday work-break apply a.little mint-cream or　chew-chew
　　　 kouxiangtang.　　　　　　　　　　　　　　　　(CCL)
　　　 chewing.gum
　　　 'During the working break at midday, apply a little bit of mint cream or chew some chewing gum a little bit.'
　　b. Song Ailing *kan-le-kan*　yupen　you　zou-le　chulai.　(CCL)
　　　 Song Ailing look-PFV-look bath.tub again walk-PFV out
　　　 'Song Ailing looked at the bath tub a little bit and walked out again.'

Following the analyses above, it is clear that the reduplication failed all of the tests for phrasal status. Therefore, it seems more likely to assume the reduplication to be a morphological process rather than a syntactic one.

3　Previous analyses

Previous analyses of the reduplication in Mandarin Chinese and in other languages can be classified into three groups: those that consider the reduplicant to be a verbal classifier, those that take the reduplicant to be an aspect marker and those that postulate a special reduplication structure.

Chao (1968), Fan (1964) and Xiong (2016) analyzed the reduplicant in Mandarin Chinese as a verbal classifier. A verbal classifier is a measure for verbs of action that

"expresses the number of times an action takes place" (Chao 1968: 615). In this analysis, the first element in the reduplication is the actual verb, the second element is a verbal classifier borrowed from the verb, and *yi* 'one' is an optional pseudo-numeral that only has an abstract 'a little bit' meaning. Although the reduplication and the verbal classifier both serve to quantify the extent of an event and can often be used interchangeably, they behave differently in the following three ways. First, the verb and the verbal classifier can be separated, while the reduplication cannot (Paris 2013: 269). Second, unlike verbal classifiers, the *yi* 'one' in A-*yi*-A cannot be replaced by other numerals (Yang & Wei 2017: 299–230). Third, idioms lose their idiomatic meaning when used with verbal classifiers, but maintain their idiomatic meaning with reduplications (Yang & Wei 2017: 230–231). Based on these observations, it seems inappropriate to view the reduplicant as a kind of verbal classifier.

A number of studies consider the reduplicant to be a delimitative aspect marker (Arcodia et al. 2014; Basciano & Melloni 2017; Yang & Wei 2017) due to the delimitative meaning of the reduplication. Travis (1999; 2000) also analyzed the reduplication in Tagalog as an imperfective aspect marker. In Arcodia et al. (2014) and Basciano & Melloni's (2017) analysis, the reduplication of stative and achievement verbs is structurally ruled out, which does not fit the empirical observations we presented in Section 2.1. The other analyses along these lines all have problems with the A-*yi*-A form, as the addition of *yi* in the reduplication does not lead to further syntactic or semantic functions. Moreover, although the reduplicant is postulated as a special affix that copies the phonology of the base morpheme, the exact nature of this copying process is not formalized.

Ghomeshi et al. (2004) gave an analysis for Contrastive Reduplications (CRs) in English like (11) based on the Parallel Architecture proposed by Jackendoff (1997; 2002), as shown in Figure 1.[7]

(11)   I make the tuna salad, and you make the *SALAD-salad*.

Phonology	Syntax	Semantics
$\text{P}_{j,k}\ \text{P}_k$	X/XP^{min}	

$$\text{CR}^{syn}{}_j\ \ \text{X/XP}^{min}{}_k \qquad \begin{bmatrix} Z_k \\ \begin{bmatrix} P/E/S \\ CTR \end{bmatrix}_j \end{bmatrix}$$
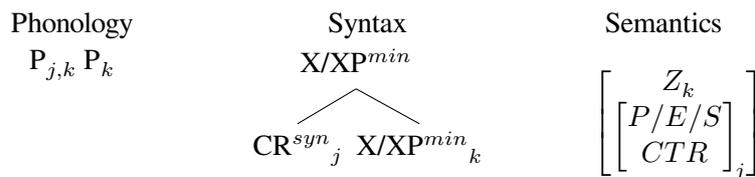
Figure 1: Analysis for CRs in English according to Ghomeshi et al. (2004: 344)

Applying this to the reduplication in Mandarin Chinese, the structure should be something like Figure 2.[8,9] Further, A-*le*-A can be handled as two compositional processes [[[A]-*le*] -A]. Moreover, the *yi* in A-*yi*-A and A-*le*-*yi*-A can simply be

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[7]P = phonological unit, P/E/S CTR = prototypical/extreme/salient contrast, XP^{min} = XP without its specifier

[8]DELIM = delimitative

[9]Although the reduplication in Mandarin Chinese does not have a contrastive meaning, we preserved the notation of CR^{syn} in Ghomeshi et al. (2004) to simply refer to the reduplicant. In English, it makes

viewed as a dangling phonological unit. In this case, the phonological unit $\langle\, yi\, \rangle$ is coindexed neither with a syntactic unit nor with a semantic one.
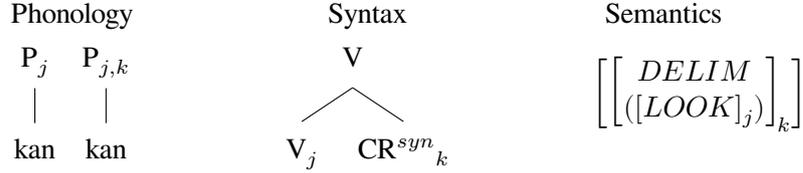
Phonology	Syntax	Semantics

$$\begin{array}{ccc}
\text{P}_j \quad \text{P}_{j,k} & \text{V} & \left[\left[\begin{array}{l} DELIM \\ ([LOOK]_j) \end{array}\right]_k\right] \\
\mid \qquad \mid & \diagup\diagdown & \\
\text{kan} \quad \text{kan} & \text{V}_j \quad \text{CR}^{syn}{}_k &
\end{array}$$

Figure 2: Analysis for AA following Ghomeshi et al. (2004)

This analysis correctly captures the fact that the addition of *yi* does not change the syntactic and semantic behavior of the reduplication. It also provides a formal account for the phonology of the reduplication. On the other hand, by assuming a construction specially for the reduplication, Ghomeshi et al.'s (2004) approach loses the connection between the reduplication and other aspect markers in Mandarin Chinese, unlike the affixation analysis.

Finally, Fan et al. (2015) provided a unified HPSG analysis for the reduplication of both verbs and adjectives in Mandarin Chinese. They considered reduplication to be a morphological process and modeled the reduplication via lexical rules. They regarded the reduplication as functioning as an intensifier predicate, which has the subtypes *redup_up_x_rel* and *redup_down_x_rel*. They provided the lexical rule (12) for reduplication in general, and further proposed *redup-a-lr* and *redup-v-lr* as subtypes of *redup-type*, as illustrated in (13) and (14) respectively. The orthography is handled separately. The AABB form for adjectives and the ABAB form for verbs, as well as the AAB form for V-O compounds, are handled as irregular derivation forms.

(12)
$$\begin{bmatrix}
redup\text{-}type \\
\text{CAT}|\text{HEAD} \quad \boxed{1} \\
\text{VAL} \qquad\quad \boxed{2} \\
\text{CONT} \qquad\; \boxed{3}\; \text{HOOK} \begin{bmatrix} \text{LTOP} & \boxed{4} \\ \text{IND} & \boxed{5} \end{bmatrix} \\
\text{C-CONT} \qquad \left\langle \begin{bmatrix} event\text{-}rel \\ \text{PRED} & intensifier\_x\_rel \\ \text{LBL} & \boxed{4} \\ \text{ARG}1 & \boxed{5} \end{bmatrix} \right\rangle
\end{bmatrix}
\rightarrow
\begin{bmatrix}
\text{CAT}|\text{HEAD} & \boxed{1} \\
\text{VAL} & \boxed{2} \\
\text{CONT} & \boxed{3}
\end{bmatrix}$$

(13)
$$\begin{bmatrix}
redup\text{-}a\text{-}lr \subset redup\text{-}type \\
\text{CAT}|\text{HEAD} \quad adjective \\
\text{VAL} \qquad\quad \begin{bmatrix} \text{SPR} \; \langle\rangle \end{bmatrix} \\
\text{C-CONT} \qquad \left\langle \begin{bmatrix} \text{PRED} \; redup\_up\_x\_rel \end{bmatrix} \right\rangle
\end{bmatrix}$$

sense to assume CR^{syn} to be a syntactic unit, because the base can be XP^{min}. But for Mandarin Chinese, the base can only be V. As Ghomeshi et al. (2004: 353) wrote: "when applying to its smallest scope, X inside of a word, it has the feel of other things that attach there, i.e., morphological affixes". It seems that it suffices to assume the reduplication in Mandarin Chinese to be a morphological phenomenon (cf. Section 2.3). We continue to call the second column "syntax" to preserve the consistency of the notations.

ORTHOGRAPHY: A → AA; (irregular AB → AABB)

$$(14) \quad \begin{bmatrix} \textit{redup-v-lr} \subset \textit{redup-type} \\ \text{CAT|HEAD} \quad \textit{verb} \\ \text{CONT|HOOK} \quad \begin{bmatrix} \text{ASPECT } \textit{non-aspect} \end{bmatrix} \\ \text{C-CONT} \quad \langle \begin{bmatrix} \text{PRED } \textit{redup\_down\_x\_rel} \end{bmatrix} \rangle \end{bmatrix}$$

ORTHOGRAPHY: A → AA; A → A-*yi*-A; (irregular AB → ABAB)

This approach provided a unified account for adjectival and verbal reduplication. Their commonalities are captured by inheritance hierarchies of the intensifier predicates and the lexical rules. In the case of verbal reduplication, A-*yi*-A is analyzed as an alternative orthographical form of AA. This correctly captured the intuition that AA and A-*yi*-A express the same meaning and only differ from each other phonologically/orthographically.

Nevertheless, this analysis has some shortcomings. To begin with, since the combination with aspect markers is completely forbidden, it is impossible for this approach to account for A-*le*-A. Moreover, as verbal reduplication is considered to express a delimitative aspectual meaning, it seems unconvincing to assume that there is no aspect information in its semantics. We consider a semantic explanation as described in Section 2.2 to be more reasonable for ruling out aspect markers other than *le*. Furthermore, this account can only deal with monosyllabic reduplication and handles ABAB and AAB as irregular forms, for the reason that ABAB and AAB reduplication of AB verbs is supposedly "not very productive in Chinese" (Fan et al. 2015: 102). However, this is not true. Basciano & Melloni (2017), Melloni & Basciano (2018), Xie (2020) and H. Xing (2000) all considered both AA and ABAB to be productive, and H. Xing (2000) concluded that AAB is productive as well. Therefore, ABAB and AAB should not be handled as irregular forms, but should be derivable from lexical rules.

The shortcomings of previous analyses lead us to propose a new HPSG analysis of verbal reduplication that formalizes its phonology, resolves the problem of *yi* and preserves the generalization on aspect marking.

4 A new HPSG analysis

In what follows, we suggest a new lexical-rule-based analysis of aspect marking and reduplication using Minimal Recursion Semantics (MRS) as the semantic representation formalism (Copestake et al. 2005).

The implicational constraint in (15) shows the constraints on all structures of type *verbal-reduplication-lr* for Mandarin Chinese. Such structures take a verb as LEX-DTR. The output reduplicates the phonology of the input verb with the possibility to have further phonological material in between. □ indicates an underspecified list which could be empty or not. A delimitative relation is appended to the RELS value of the input verb, and it takes the event index of the input verb as argument. The label of the output (☒) is identified with the label of the input and with the label

aspect-marking-lr

verbal-reduplication-lr   *perfective-lr*   *durative-lr*   …

non-perfective-reduplicaiton-lr   *perfective-reduplicaiton-lr*   *v-le-lr*

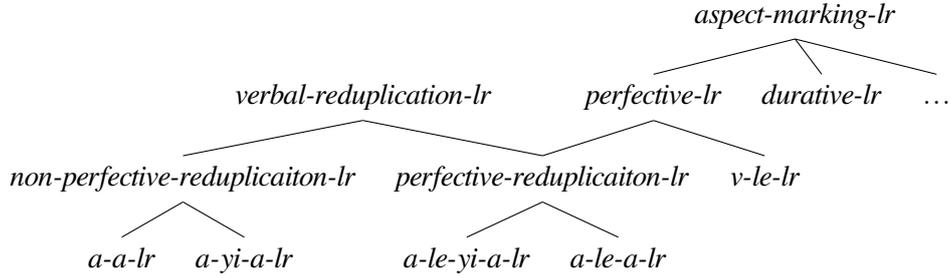*a-a-lr*   *a-yi-a-lr*   *a-le-yi-a-lr*   *a-le-a-lr*

Figure 3: Type hierarchy for lexical rules of verbal reduplication and *le*

of the delimitative relation, hence *delimitative-rel* is treated as a modifier. Further relations can be added at the beginning of the RELS list to allow for the additional perfective meaning in A-*le*-A and A-*le-yi*-A. The combination with the perfective will be elaborated on in the following paragraphs.

(15) *verbal-reduplication-lr* $\Rightarrow$

$$\begin{bmatrix} \text{PHON} & \boxed{1} \oplus \boxed{} \oplus \boxed{1} \\ \text{SYNSEM} & \left[\text{LOC|CONT} \begin{bmatrix} \text{LTOP} & \boxed{2} \\ \text{IND} & \boxed{3} \end{bmatrix} \right] \\ \text{RELS} & \boxed{} \oplus \boxed{4} \oplus \left\langle \begin{bmatrix} \textit{delimitative-rel} \\ \text{LBL} & \boxed{2} \\ \text{ARG0} & \boxed{3} \end{bmatrix} \right\rangle \\ \text{LEX-DTR} & \begin{bmatrix} \text{PHON} & \boxed{1} \\ \text{SYNSEM|LOC} & \begin{bmatrix} \text{CAT} & \left[\text{HEAD} \; \textit{verb} \right] \\ \text{CONT} & \begin{bmatrix} \text{LTOP} & \boxed{2} \\ \text{IND} & \boxed{3} \end{bmatrix} \end{bmatrix} \\ \text{RELS} & \boxed{4} \end{bmatrix} \end{bmatrix}$$

To account for the variations in the phonology of the reduplication as well as the combination with the phonology and semantics of the perfective aspect marker *le*, the type hierarchy of lexical rules in Figure 3 is put forward. Apart from the type *perfective-reduplication-lr*, which adds the inherited perfective relation, there is a subtype *non-perfective-reduplication-lr*, which does not add further relations. Hence, what is $\boxed{}$ in the RELS list in (15) is the empty list in (16):

(16) *non-perfective-verbal-reduplication-lr* $\Rightarrow$

$$\begin{bmatrix} \text{RELS} & \boxed{1} \oplus \left\langle [\,] \right\rangle \\ \text{LEX-DTR} & \left[\text{RELS} \; \boxed{1} \right] \end{bmatrix}$$

The RELS list of the output of the lexical rule ($\boxed{1}$) is the RELS list of the daughter plus one element. Since the element is specified in the supertype, it has not been specified in (16) again.

non-perfective-verbal-reduplication-lr has *aa-lr* and *a-yi-a-lr* as direct subtypes. (18) and (19) show *aa-lr* and *a-yi-a-lr*, respectively. As subtypes of *verbal-reduplication-lr* illustrated in (15), both inherit the constraints on the LEX-DTR and on the

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semantics of the output, and because of (16), no extra material is appended to the RELS value of the input verb and the list containing the *delimitative-rel*. In addition to the inherited constraints, *aa-lr* and *a-yi-a-lr* specify the phonology of the output differently. *aa-lr* determines that the ☐ between the two phonological copies in (15) is empty, whereas *a-yi-a-lr* specifies this list of phonological material as ⟨ *yi* ⟩:

(17)   Constraints on lexical rules of type *aa-lr* and *a-yi-a-lr*:

$aa\text{-}lr \Rightarrow$

$$\begin{bmatrix} \text{PHON} & \boxed{1} \oplus \boxed{1} \\ \text{LEX-DTR} & [\text{PHON} \ \boxed{1}] \end{bmatrix}$$

$a\text{-}yi\text{-}a\text{-}lr \Rightarrow$

$$\begin{bmatrix} \text{PHON} & \boxed{1} \oplus \langle\, yi \,\rangle \oplus \boxed{1} \\ \text{LEX-DTR} & [\text{PHON} \ \boxed{1}] \end{bmatrix}$$

The lexical rules with all inherited constraints are given in (18) and (19):

(18)   The AA lexical rule with all constraints inherited from the supertypes:

$$\begin{bmatrix} aa\text{-}lr \\ \text{PHON} & \boxed{1} \oplus \boxed{1} \\ \text{SYNSEM} & \left[\text{LOC|CONT} \ \begin{bmatrix} \text{LTOP} & \boxed{2} \\ \text{IND} & \boxed{3} \end{bmatrix} \right] \\ \text{RELS} & \boxed{4} \oplus \left\langle \begin{bmatrix} delimitative\text{-}rel \\ \text{LBL} & \boxed{2} \\ \text{ARG0} & \boxed{3} \end{bmatrix} \right\rangle \\ \text{LEX-DTR} & \begin{bmatrix} \text{PHON} & \boxed{1} \\ \text{SYNSEM|LOC} & \begin{bmatrix} \text{CAT} & [\text{HEAD} \ verb] \\ \text{CONT} & \begin{bmatrix} \text{LTOP} & \boxed{2} \\ \text{IND} & \boxed{3} \end{bmatrix} \end{bmatrix} \\ \text{RELS} & \boxed{4} \end{bmatrix} \end{bmatrix}$$
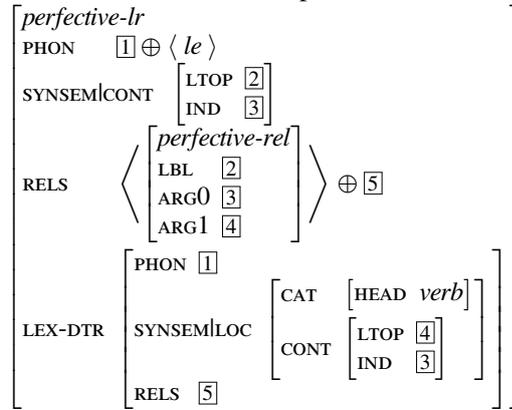
v-le-lr is a direct subtype of the *perfective-lr*. *perfective-reduplication-lr* inherits from both *verbal-reduplication-lr* and *perfective-lr* and has two subtypes, *a-le-yi-a-lr* and *a-le-a-lr* itself. *verbal-reduplication-lr* is already presented in (15). We now turn to the constraints on *perfective-lr* and its subtypes.

(19)   The A-*yi*-A lexical rule with all constraints inherited from the supertypes:

$$\begin{bmatrix} a\text{-}yi\text{-}a\text{-}lr \\ \text{PHON} & \boxed{1} \oplus \langle\, yi \,\rangle \oplus \boxed{1} \\ \text{SYNSEM} & \left[\text{LOC|CONT} \ \begin{bmatrix} \text{LTOP} & \boxed{2} \\ \text{IND} & \boxed{3} \end{bmatrix} \right] \\ \text{RELS} & \boxed{4} \oplus \left\langle \begin{bmatrix} delimitative\text{-}rel \\ \text{LBL} & \boxed{2} \\ \text{ARG0} & \boxed{3} \end{bmatrix} \right\rangle \\ \text{LEX-DTR} & \begin{bmatrix} \text{PHON} & \boxed{1} \\ \text{SYNSEM|LOC} & \begin{bmatrix} \text{CAT} & [\text{HEAD} \ verb] \\ \text{CONT} & \begin{bmatrix} \text{LTOP} & \boxed{2} \\ \text{IND} & \boxed{3} \end{bmatrix} \end{bmatrix} \\ \text{RELS} & \boxed{4} \end{bmatrix} \end{bmatrix}$$

Müller & Lipenkova (2013: 246) proposed the perfective lexical rule given in (20), adapted to the formalization adopted in the current paper. It takes a verb as LEX-DTR and appends ⟨ *le* ⟩ to its phonology. Further, it accounts for the change in semantics by appending the RELS value of the input verb to a *perfective-rel*.
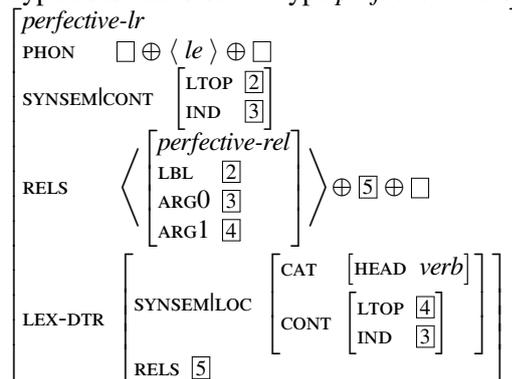
(20)   Perfective lexical rule adapted from Müller & Lipenkova (2013: 246):

$$
\begin{bmatrix}
\textit{perfective-lr} \\
\text{PHON} \quad \boxed{1} \oplus \langle\, \textit{le}\, \rangle \\
\text{SYNSEM|CONT} \begin{bmatrix} \text{LTOP} & \boxed{2} \\ \text{IND} & \boxed{3} \end{bmatrix} \\
\text{RELS} \quad \left\langle \begin{bmatrix} \textit{perfective-rel} \\ \text{LBL} & \boxed{2} \\ \text{ARG0} & \boxed{3} \\ \text{ARG1} & \boxed{4} \end{bmatrix} \right\rangle \oplus \boxed{5} \\
\text{LEX-DTR} \begin{bmatrix} \text{PHON} \ \boxed{1} \\ \text{SYNSEM|LOC} \begin{bmatrix} \text{CAT} \begin{bmatrix} \text{HEAD} \ \textit{verb} \end{bmatrix} \\ \text{CONT} \begin{bmatrix} \text{LTOP} & \boxed{4} \\ \text{IND} & \boxed{3} \end{bmatrix} \end{bmatrix} \\ \text{RELS} \ \boxed{5} \end{bmatrix}
\end{bmatrix}
$$

The event variables ($\boxed{3}$) of the input and the output verb are shared. The LTOP of the output of the lexical rule ($\boxed{2}$) is the label of the perfective relation, and this relation scopes over the embedded verb. The handle of the embedded verb ($\boxed{4}$) is the argument of the *perfective-rel*.

The lexical rule suggested in (20) only explains simple perfective aspect marking with *le*, where *le* immediately follows the verb. But it cannot account for the perfective aspect marking of a reduplicated verb, as *le* does not occur after the reduplication, nor can *le* be reduplicated together with the verb. It can only appear between the verb and the reduplicant. In order to accommodate *le* marking for both simple and reduplicated verbs, a general perfective lexical rule as in (21) and a subtype *v-le-lr* as in (22) are posited here. Besides adding a *perfective-rel* in the RELS list of the output as in (20), the *perfective-lr* in (21) allows an underspecified list to be appended at the end of the RELS list. The PHON value of the output makes it possible for further phonological material to occur both before and after ⟨ *le* ⟩.

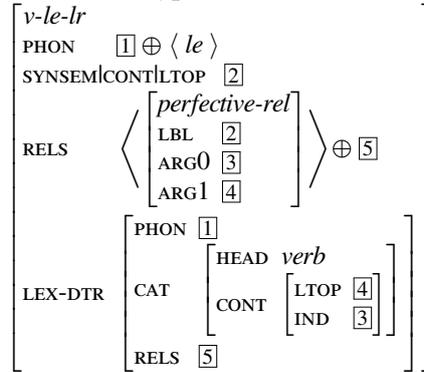(21)   Type constraints on the type *perfective-lr* from which other subtypes inherit:

$$
\begin{bmatrix}
\textit{perfective-lr} \\
\text{PHON} \quad \square \oplus \langle\, \textit{le}\, \rangle \oplus \square \\
\text{SYNSEM|CONT} \begin{bmatrix} \text{LTOP} & \boxed{2} \\ \text{IND} & \boxed{3} \end{bmatrix} \\
\text{RELS} \quad \left\langle \begin{bmatrix} \textit{perfective-rel} \\ \text{LBL} & \boxed{2} \\ \text{ARG0} & \boxed{3} \\ \text{ARG1} & \boxed{4} \end{bmatrix} \right\rangle \oplus \boxed{5} \oplus \square \\
\text{LEX-DTR} \begin{bmatrix} \text{SYNSEM|LOC} \begin{bmatrix} \text{CAT} \begin{bmatrix} \text{HEAD} \ \textit{verb} \end{bmatrix} \\ \text{CONT} \begin{bmatrix} \text{LTOP} & \boxed{4} \\ \text{IND} & \boxed{3} \end{bmatrix} \end{bmatrix} \\ \text{RELS} \ \boxed{5} \end{bmatrix}
\end{bmatrix}
$$

v-le-lr as given in (22) inherits from *perfective-lr* and specifies that the first element in the output PHON list is identified with the PHON value of the input verb and that nothing else comes after ⟨ *le* ⟩. Furthermore, no other list can be appended at the end of the RELS list of the output anymore. This corresponds to the proposal of Müller
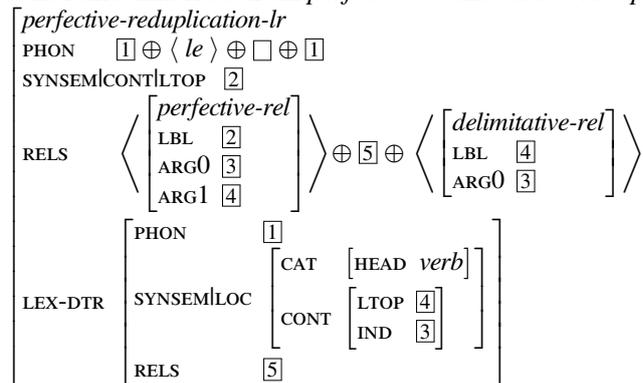
& Lipenkova (2013: 246) shown in (20), which accounts for the simple perfective marking of verbs.

(22) Structure of type *v-le-lr* with constraints inherited from *perfective-lr*:

$$
\begin{bmatrix}
v\text{-}le\text{-}lr \\
\text{PHON} \quad \boxed{1} \oplus \langle\, le \,\rangle \\
\text{SYNSEM|CONT|LTOP} \quad \boxed{2} \\
\text{RELS} \quad \left\langle \begin{bmatrix} perfective\text{-}rel \\ \text{LBL} \quad \boxed{2} \\ \text{ARG0} \quad \boxed{3} \\ \text{ARG1} \quad \boxed{4} \end{bmatrix} \right\rangle \oplus \boxed{5} \\
\text{LEX-DTR} \quad \begin{bmatrix} \text{PHON} \quad \boxed{1} \\ \text{CAT} \quad \begin{bmatrix} \text{HEAD} \quad verb \\ \text{CONT} \quad \begin{bmatrix} \text{LTOP} \quad \boxed{4} \\ \text{IND} \quad \boxed{3} \end{bmatrix} \end{bmatrix} \\ \text{RELS} \quad \boxed{5} \end{bmatrix}
\end{bmatrix}
$$

perfective-reduplication-lr inherits from both *verbal-reduplication-lr* and *perfective-lr*. The PHON value of the output reduplicates the phonology of the input verb and states that there is $\langle\, le \,\rangle$ in between, as well as potentially further phonological material. The RELS list of the output appends the *delimitative-rel* to the *perfective-rel* and the RELS value of the input verb. The arguments of both *perfective-rel* and *delimitative-rel* share the event index of the input verb ($\boxed{3}$) to ensure that they apply to the same event denoted by the input verb. The label of the *delimitative-rel* and the input verb are identified (*delimitative-rel* is a modifier) and this shared label is embedded under the *perfective-rel*.

(23) Perfective and reduplication combined: type *perfective-reduplication-lr* with constraints inherited from *perfective-lr* and *verbal-reduplication-lr*:

$$
\begin{bmatrix}
perfective\text{-}reduplication\text{-}lr \\
\text{PHON} \quad \boxed{1} \oplus \langle\, le \,\rangle \oplus \square \oplus \boxed{1} \\
\text{SYNSEM|CONT|LTOP} \quad \boxed{2} \\
\text{RELS} \quad \left\langle \begin{bmatrix} perfective\text{-}rel \\ \text{LBL} \quad \boxed{2} \\ \text{ARG0} \quad \boxed{3} \\ \text{ARG1} \quad \boxed{4} \end{bmatrix} \right\rangle \oplus \boxed{5} \oplus \left\langle \begin{bmatrix} delimitative\text{-}rel \\ \text{LBL} \quad \boxed{4} \\ \text{ARG0} \quad \boxed{3} \end{bmatrix} \right\rangle \\
\text{LEX-DTR} \quad \begin{bmatrix} \text{PHON} \quad \boxed{1} \\ \text{SYNSEM|LOC} \quad \begin{bmatrix} \text{CAT} \quad [\text{HEAD} \quad verb] \\ \text{CONT} \quad \begin{bmatrix} \text{LTOP} \quad \boxed{4} \\ \text{IND} \quad \boxed{3} \end{bmatrix} \end{bmatrix} \\ \text{RELS} \quad \boxed{5} \end{bmatrix}
\end{bmatrix}
$$

For example (9a), we get the following MRS representation, where h1 and h2 correspond to the handles $\boxed{2}$ and $\boxed{4}$ and e1 to the event variable $\boxed{3}$:

(24) h1 $\langle$ h1:perfective(e1,h2), h2:taste(e1,he,soup), h2:delimitative(e1) $\rangle$

So the delimitative relation is treated as an adjunct to the main relation of the verb, and the perfective relation scopes over both the main relation and the delimitative relation.

Two subtypes of *perfective-reduplication-lr* are posited: *a-le-yi-a-lr* and *a-le-a-lr*, as shown in (25). They take over the semantic change to the input from *perfective-reduplication-lr*, but specify the PHON value differently. Specifically, *a-le-yi-a-lr* specifies the middle phonological material as ⟨ *le, yi* ⟩, while *a-le-a* specifies it as ⟨ *le* ⟩ only.

$$(25) \quad \begin{bmatrix} \textit{a-le-yi-a-lr} \\ \text{PHON} \quad \boxed{1} \oplus \langle \textit{ le, yi } \rangle \oplus \boxed{1} \\ \text{LEX-DTR} \; \begin{bmatrix} \text{PHON} \; \boxed{1} \end{bmatrix} \end{bmatrix} \qquad \begin{bmatrix} \textit{a-le-a-lr} \\ \text{PHON} \quad \boxed{1} \oplus \langle \textit{ le } \rangle \oplus \boxed{1} \\ \text{LEX-DTR} \; \begin{bmatrix} \text{PHON} \; \boxed{1} \end{bmatrix} \end{bmatrix}$$

Since the above-described lexical rules do not constrain the number of syllables of the input verb, but simply reduplicate its phonology as a whole, they can also account for the ABAB and the AB-*le*-AB forms of reduplication, as long as the input verb is disyllabic. Notice that the lexical rules above also produce AB-*yi*-AB and AB-*le*-*yi*-AB for disyllabic input verbs. Although these forms are generally considered unacceptable (Basciano & Melloni 2017: 160, Hong 1999: 275–276, Li & Thompson 1981: 30, Yang & Wei 2017: 239), Fan (1964: 269) and Sui (2018: 143) considered AB-*yi*-AB and AB-*le*-*yi*-AB to be possible, even though they both recognized that these two forms are rare. Indeed, a few examples of AB-*yi*-AB and AB-*le*-*yi*-AB were found (26).

(26)   a. ta *weixiao-le-yi-weixiao*, you *mingxiang-le-yi-mingxiang*.[10]
       he smile-PFV-one-smile   and meditate-PFV-one-meditate
       'He smiled a little bit and meditated a little bit.'

   b. feichang yansu   de ba jinshi   yanjing
      very   seriously DE BA nearsighted glasses
      duanzheng-le-yi-duanzheng.[11]
      straighten-PFV-one-straighten
      '[He] very seriously straightened the nearsighted glasses quickly.'

   c. jiduo sanluan-zhe   de chuan li de dengguang, ye   huyinhumie de
      many scattered-DUR DE boat   in DE light   also flicker   DE
      bianhuan-le-yi-bianhuan weizhi.   (CCL)
      change-PFV-one-chang   position
      'Many scattered lights in the boats also changed their positions a little bit, flickering.'

This suggests that even though AB-*yi*-AB and AB-*le*-*yi*-AB might be degraded, they are not ungrammatical *per se*. The reason for this degradedness is probably phonological, since AB-*yi*-AB and AB-*le*-*yi*-AB contain too many syllables (Fan 1964: 274, Sui 2018: 143, Yang & Wei 2017: 239, Zhang 2000: 15), but we argue that it is not an issue of grammaticality. Thus, they can still be produced via the

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[10]Rou, Shi. 1975. *Roushi xiaoshuo xuanji [Selected novels of Roushi]*, 31. Beijing: People's Literature Publishing House.

[11]Li, Jieren. 1962. *Da bo [Great wave]*, 3rd band, 171. Beijing: The Writers Publishing House.

lexical rules posited above, but are ruled out or degraded due to a general phonological constraint.

AAB, A-*yi*-AB, A-*le*-AB, AA-*kan* and A-*kan-kan* can also be accounted for by the lexical rules proposed in this section. They can be analyzed as compounds consisting of a reduplicated monosyllabic verb and another element. Specifically, AAB, A-*yi*-AB and A-*le*-AB can be considered as the compound of a reduplicated monosyllabic verb (A) and a noun (B).[12] AA-*kan* can be regarded as the compound of a reduplicated monosyllabic verb (A) and the verb *kan* 'look', whereas A-*kan-kan* is the compound of a monosyllabic verb (A) and the reduplication of *kan* 'look'. A-*yi*-A-*kan* is also possible, though rare, presumably also due to its length. An inquiry in CCL found 55 hits of A-*yi*-A-*kan*. A sample is listed in (27).

(27) a. danshi dui fa   mei fa-guo   hege-zheng,   yijing shuo bu
          but   about issue not issue-EXP conformity-certificate already say not
          qing le, xuyao *cha-yi-cha-kan*.   (CCL)
          clealy PTC need check-one-chek-look
          'But one already cannot say it clearly anymore, whether a certificate of conformity is issued or not. One needs to have a check and see.'

      b. da-laoban-men yao *deng-yi-deng-kan*   (CCL)
          big-boss-PL   need wait-one-wait-look
          'Big bosses need to wait a little bit and see.'

      c. furen ni dao *shu-yi-shu-kan*,   zhe zhu hua   de huaduo
          madam you just count-one-count-look this CLF flower DE blossom
          gong you ji   zhong yanse.   (CCL)
          in.total have how.many CLF color
          'Madam, just try to count and see how many colors the blossom of this flower has in total.'

Due to the prominent tentative, trying meaning of AA-*kan* and A-*kan-kan*, they are not compatible with the perfective aspect marker *le* semantically, as one usually cannot try something that is already realized. Unacceptable structures such as A-*le*-A-*kan* and A-*kan-le-kan* are thus semantically ruled out.

The current analysis provides a unified account for all forms of delimitative verbal reduplication in Mandarin Chinese. Like in Fan et al. (2015), *yi* is handled as a phonological element which does not make any contribution to the semantics, and an inheritance hierarchy is used to capture the commonalities among different forms of reduplication. But the present proposal also reflects the connection between the reduplication and aspect marking via multiple inheritance. This account makes use of a semantic mechanism, which correctly rules out aspect marking with forms other

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[12]Huang (1984) and Her (1996; 2010) argued that some of this kind of structures are compounds, some are phrases, and some have dual status (both compounds and phrases). Following this approach, AAB, A-*yi*-AB and A-*le*-AB can (also) be considered as the phrasal combination of a reduplicated verb and its object.

than *le*. By providing a semantic explanation, this mechanism seems less *ad hoc* than the one used in Fan et al. (2015), which simply assumed that the reduplication cannot combine with aspect information. The present approach also has a broader coverage of the forms of verbal reduplication than the one in Fan et al. (2015). Furthermore, all the forms are derivable from the lexical rules proposed here, so that there is no need to resort to irregular lexicon entries, and the productivity of these forms is correctly captured. In sum, the analysis proposed in this paper possesses greater explanatory power and resolves the problems of previous studies.

5 Conclusion

The current study provides an HPSG account for verbal reduplication in Mandarin Chinese. We presented empirical evidence that reduplication is possible with all *Aktionsarten*. We gave a semantic explanation for the incompatibility of reduplication with aspect markers other than *le*. We argued that reduplication is a morphological rather than a syntactic process. We modeled reduplication as a lexical rule, and the different forms of reduplication are captured in an inheritance hierarchy using underspecified lists. The interaction between verbal reduplication and aspect marking is handled by multiple inheritance. This analysis is compatible with both mono- and disyllabic verbs, so that all productive forms of reduplication are derivable by lexical rules. The analysis is implemented as part of the CoreGram project (Müller 2015) in a Chinese grammar in the TRALE system (Meurers, Penn & Richter 2002; Penn 2004).

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