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A Featural Analysis of Mandarin Classifiers and Plural Morpheme *-Men* and Its Implications on the Semi-Lexicality of Mandarin Chinese

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Abstract This paper revisits the syntax and semantics of the plural morpheme *-men* in Mandarin Chinese. In previous literature, there are mainly three formal approaches to explain the distribution of *-men*: (i) *-men* is a plural morpheme and it is incompatible with classifiers due to the violation of Head Movement Constraint. (ii) *-men* is incompatible with classifiers because they compete for the same syntactic positions. (iii) *-men* is a group function local to nouns and its semantics is incompatible with individual classifiers. This paper shows that the first two analyses are empirically insufficient, and the third analysis is conceptually complicated. Instead, this paper is trying to defend a traditional descriptive generalization of *-men* that has not been given enough attention, namely *-men* can only co-occur with approximate quantity Lü (1980). This paper accounts for this generalization by arguing that in Mandarin, a multiplication relation holds between Numeral Phrase and Classifier Phrase. The numeral in the specifier of Numeral Phrase is a Multiplier and the numeral implied by the classifier is a Multiplicand. The distribution of *-men* is sensitive to the result of the multiplication. This paper aims to account for this generalization by employing the feature theory to grammatical number proposed by Harbour (2014) and developed by Martí (2020a,b). Different types of classifiers in Mandarin are realizations of different featural content: [+atomic] feature spells out individual classifiers; [-atomic, +minimal] spells out dual classifiers (that is, classifiers meaning 'couple'), and [-atomic, -minimal] spells out group classifiers. The [+atomic] feature entails the multiplicand to be 'one'; the combination of [-atomic, +minimal] entails 'two'; the combination of [-atomic, -minimal] leaves the multiplicand unspecified. The morpheme *-men* can merge into the structure only when the multiplication result of multiplier and multiplicand is an approximate quantity.

1 Introduction

In the past two decades, the research on the syntax and semantics of plurality in the nominal domain has made lots of progress. There are three major developments in the syntax of plurality. The first view is put forward by Borer (2005) who argues that plural is a division function. Borer has proposed a universal DP structure and instead of regarding the plural morpheme as a function for counting in Number Phrase, she argues that the plural is a division function, which divides mass nouns into countable units, which can be further counted by Number Phrase.

The second view argues that plural morphemes are distributed across the nominal spines, either merging as heads or adjuncts (Acquaviva 2008, Wiltschko 2008, Mathieu 2014, Kramer 2016). They hold the view that there are many types of plural cross-linguistically and they should not be treated in the same manner. Even in a single language, there could be different types of plurals. They could occupy different layers in the functional spine of noun phrases, such as D, Numeral, Division, n, root.

The third approach looks at the issue of plurality from the perspective of grammatical feature. Harbour (2014) proposed a featural analysis for grammatical number which aims to explain how grammatical number behaves cross-linguistically. Martí (2020a,b) further develops Harbour's system and uses several sets of primitive grammatical features to account for the behaviour and interpretation variations of number markings in languages such as Turkish, English, West Armenia, etc. Languages like Turkish and Hungarian are extremely interesting to the current paper for two reasons: first, there is a limited number of classifiers in these two languages; second, they both have a plural marker that cannot co-occur with numerals. These properties are, to some extent, similar to Mandarin Chinese.

A major concern when looking at *-men* is its categorial status. The first question is whether *-men* is a lexical item or a grammatical item. The second question is whether Mandarin has grammatical number or not. The current paper takes the view that Mandarin has grammatical Number head in its nominal spine and *-men* is a semi-lexical semi functional item which merges to the functional structure when the merging conditions are satisfied.

Corbett (2000) mentioned two languages that seem to have no number category: Piraha and Kawi (Old Javanese). These two languages don't have plural nouns, not even plural pronouns. In these two languages, number could be indicated by quantifiers such as 'many' and 'all' or by conjoining constructions. This is certainly not the case of Mandarin Chinese.

In Mandarin Chinese, the morpheme *-men* is used with pronouns and animate human nouns to express plural meaning explicitly, such as *xuesheng-men* ('the students'), or pronouns such as *ta-men* ('they'). Although *-men* cannot be used with all common nouns, unlike inflectional morpheme *-s* in English, but *-men* is highly productive among animate human nouns and pronouns. Besides, when *-men* is attached to human nouns, it conveys plurality. Thus, it is problematic to treat *-men* as either fully functional or fully lexical.

The in-between property of *-men* is an important starting point the current inquiry, namely, how do we capture this semi-lexical and semi-functional property in a syntactic theory which seems to embrace a fully functional structure. There are good reasons to take *-men* as semi-lexical items. According to Cavirani-Pots, De Belder & Klockmann (2021), semi-lexical items have unexpected or degraded morpho-syntactic behaviours compared to fully functional items. This is exactly the case for *-men* which has semantic constraints for nouns it combines with, and a plural meaning is implied when *-men* is attached.

Harbour (2014) proposed a featural theory on grammatical number which is further developed by Martí (2020a,b). Harbour and Martí's systems are intended to

explain number categories with purely inflectional properties. The plural morpheme *-men*, however, is not a fully inflectional morpheme, which means that we cannot apply Harbour's and Martí's systems to Mandarin Chinese directly. However, it does not mean that their theory is totally irrelevant when it comes to the number system of Mandarin Chinese because categories like classifiers and morpheme *-men* do not look purely lexical. To accommodate to the semi-lexical nature of Mandarin Chinese, we need to make some modifications of the featural theory at hand. After all, we do not want to throw the baby out with the bath water.

The structure of this paper will be as follows. Section 2 summarizes major properties of *-men*. In the meantime, I evaluate previous analyses of *-men* and propose a new descriptive generalization that can cover more empirical data. Then, I review some literature on the syntactic height of plural marking and argue that *-men* should be inserted under the Number head rather than little n.

In section 3, I introduce the theoretical background of the featural analysis of grammatical number. Then, I propose a featural analysis for Mandarin individual classifiers and group classifiers and argue that a multiplication relation holds between the numeral in Spec Number Phrase and the numeral implied by the classifier to account for the insertion constraints of *-men*. I provide three syntactic environments where *-men* can be inserted to derive different interpretations and uses, including plural marking, associative plural and lexical use of *-men*.

Section 4 concludes the main points argued in this paper, (i) A multiplication relation holds between the numeral in the Spec Number Phrase and the numeral implied by the Classifier head. (ii) The plural morpheme *-men* can be inserted when the result of the multiplication is an imprecise quantity. (iii) *-Men* is a semi-lexical item that can be merged into different syntactic environments to derive different interpretations as long as the merging conditions are satisfied.

2 Properties and Previous Analyses

In this section, I will summarize the properties of *-men*, including its animacy requirement, definiteness effect, interactions with numerals and classifiers, associative plural use, and lexical formation with kinship terms. Then, I will propose a new descriptive generalization on the distribution of *-men* which can cover more data. Finally, I will evaluate literature on the syntactic height of plural markings and argue that *-men* should be merged under the Number head.

2.1 Animacy

In Mandarin, *-men* can express plurality when it combines with human common nouns, as shown in (1). The translation shows that when *-men* combines with animate common nouns, it tends to have definite effect. This point will be elaborated later. Plants and animals like flowers and cats can take the morpheme *-men* to express plurality only when they are anthropomorphised, such as in fairy tales, shown in (2). Inanimate nouns do not take *-men* to express plurality as shown in (3).

(1) a. *xuesheng*

'student/students'

b. *xuesheng men*
student *men*

'the students'

(2) *huaer men zai weixiao*
flower *men* Prog smile

'The flowers are smiling.'

(3) * *zhuozi men hen xin*
table *men* very new

The morpheme -*men* is also employed to form plural pronouns, as shown in Table 1. When it combines with the 1st person singular pronoun, the result plural pronoun can denote a meaning either including the listener or excluding the listener, depending on the context.

	Singular	**Plural**
1st	Wo	Wo men
		(Inclusive/exclusive)
2nd	Ni	Ni men
3rd	Ta	Ta men

Table 1 Mandarin pronominal forms.

Based on the animacy requirement mentioned above, we tentatively assume that one of the insertion conditions of -*men* is [+human] feature (or [+animate] feature if plants and animals are included). Note that this is a semantic feature, not a syntactic feature. It is a semantic selection restriction on -*men*.

Typologically, the animacy requirement on plural marking is quite common. Based on the notion of Animacy Hierarchy given in (4) (see Comrie 1989: 185-200), Corbett (2000) proposed a constraint of the Animacy Hierarchy on the singular-plural distinction described in (5). As we can see, when it comes to the use of -*men* to distinguish singular and plural, the split is between the animate and inanimate.

(4) *Animacy Hierarchy*
1st person pronoun > **2nd person pronoun** > **3rd person pronoun** > **kin** > **human** > **animate** > inanimate

(5) *Constraint of the Animacy Hierarchy on the singular-plural distinction*
The singular-plural distinction in a given language must affect a top segment of the Animacy Hierarchy. (Corbett 2000: 56)

2.2 Definiteness effect

When *-men* combines with common animate nouns, it will give rise to a definite interpretation. It presupposes the existence of what the noun denotes. The definiteness effect can be tested in the existential sentences illustrated in (6).

(6) a. * *you xuesheng men zai shuohua*
have student men Prog talk

Intended: 'There are students talking.'

b. *you xuesheng zai shuohua*
have student Prog talk

'There is/are some student(s) talking.'

As shown in (6a), N-*men* cannot appear in an existential sentence. In order to express the meaning in (6a), the bare noun is used, and it denotes a general number, that is, the interpretation of the bare noun *xuesheng* ('student') is ambiguous between a singular reading and a plural reading.

2.3 Constraints on distribution

In this part, I will introduce the most significant morpho-syntactic restrictions on *-men* and show that these restrictions are empirically insufficient. Then I will reanalyse these data and propose a new descriptive constraint on the distribution of *-men*. The new generalization is in line with the traditional view of *-men* mentioned in descriptive grammar but might have long been overlooked in formal linguistic approaches.

2.3.1 View 1: -Men is incompatible with classifiers

Mandarin is known as a classifier language. When a noun occurs with a numeral, a classifier is often needed between the numeral and the noun to assist the counting process as in (7).

(7) *san ge xuesheng*
three CL student

'three students'

Unlike English plural morpheme *-s*, *-men* is infelicitous in counting constructions, as shown in (8). It is also impossible for *-men* to occur in a structure with classifiers as shown in (9).

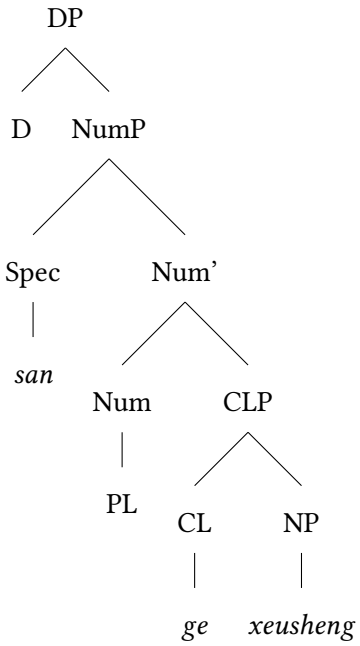
(8) * *san* *xuesheng* *men*
three student men

(9) * *san* *ge* *xuesheng* *men*
three CL student men

Li (1999)

In previous literature, there are mainly two ways to explain the ungrammaticality of *-men* in (9). First, Li (1999) argues that *-men* is a plural marker like English *-s*. The syntactic structure given by Li is demonstrated in (10). As we can see, both *-men* and *-s* are realizations of plural features (Pl) base generated under the Number head. The only difference between Mandarin and English lies in the presence or absence of the Classifier projection. In English, the Classifier projection is absent, thus the plural morpheme *-s* in Number head can lower down to attach to the NP. In Mandarin, where the Classifier projection is present, the plural morpheme *-men* cannot lower to NP due to the intervention of the Classifier head.

(10)



In addition, as mentioned earlier, *-men* is productively attached to pronouns and proper names to express plurality. Li (1999) and Huang, Li & Li (2009) hold the view that pronouns and proper names are base generated in D head. If *-men* can be attached to these D elements productively, it is expected that *-men* is suffixed to elements in D. In the cases where *-men* is attached to bare common nouns, it is the result of movement from N to D. In other words, *-men* is suffixed to a common noun only when it is raised from N to D.

Li's analysis has two advantages. First, by saying that *-men* moves to D, it accounts for the definiteness effect of *-men* directly. Second, it also explains why N-*men* is incompatible with classifiers. This is because the Classifier projection prevents N-to-D head movement of the common noun. It violates the Head Movement Constraint Travis (1984).

Bošković & Hsieh (2013)

The second approach to account for the incompatible between is Bošković & Hsieh (2013). Different from Li (1999), Bošković and Hsieh argues that *-men* could be a classifier. The spirit of this view could be traced back to Borer (2005) who proposed that plural marking in English and classifiers in Mandarin are realizations of the same feature, namely the division feature, the function of which is to divide the noun into portions that can be counted. This implies that plural marking and classifiers are in complementary distribution as they compete for the same position. The complimentary distribution of plural marking and classifiers has long been observed (see T'sou 1976, Doetjes 1997).

Bošković and Hsieh follow this line of thinking and argue that this is why *-men* is incompatible with numeral classifier sequence. For them, *-men* is a classifier that selects non-individuals. They explain the definiteness effect of N-*men* by following Cheng and Sybesma. Cheng & Sybesma (1999) argue that definiteness in Mandarin is syntactically localized in the classifier projection. The definiteness effect thus follows naturally if *-men* is base generated in the classifier position.

Now, let's evaluate these two analyses from an empirical point of view. Their starting point largely relies on the generalization that *-men* is incompatible with classifiers. I will show that the generalization does not hold.

Let's start by looking at (8) again, repeated here as (11) where classifiers are absent. If we follow Li's approach, would predict (9) to be grammatical because no head could intervene for N-to-D movement. If we follow Bošković and Hsieh's approach, classifiers are not there to compete for the same position with *-men*, thus the structure should be felicitous, *contra* to the fact.

(11) * *san* *xuesheng* *men*
three student men

In addition, Jiang (2017) mentions another two types of empirical data that challenge the two analyses mentioned above. First, *-men* can occur with individual classifiers when the number is approximate. In (12), *ji* means 'a few' and when it combines with nouns, it requires classifiers as normal numerals do. As we can see, in (12), *-men* can appear with individual classifiers.

(12) *ji* *ge* *haizi* *men*
a few CL-individual child

'a few children'

Second, as noted by Hsieh (2008) and Jiang (2017), -*men* can occur with group classifiers as shown in (13). Group classifiers like *qun* or *zu* means 'group' and 'team.' Group classifiers have quite similar syntactic distribution with individual classifiers. The null hypothesis thus is to treat group classifiers to be generated in the same syntactic position as individual classifiers, namely the Classifier head, with differences in semantic meaning. If -*men* can co-occur with group classifiers, it is problematic to say that -*men* occupies the Classifier head.

(13) *yi* *qun* *haizi* *men*
one CL-group child men

'a group of children'

From the discussion above, we can see that -*men* is compatible with group classifiers and even individual classifiers when the numeral is not specified. This shows that analyses that starting out with the assumption that -*men* and classifiers are incompatible misses the point. These analyses are empirically insufficient.

2.3.2 View 2: -Men is incompatible with numerals

In languages like Turkish and Hungarian, the plural morpheme cannot co-occur with numerals. This leads us to think whether this is also the case in Mandarin Chinese. First, it is crucial to make it clear what I mean by numeral here. Let's define it structurally. The numeral I am referring to is the specifier of Number Phrase. It is different from quantity. The distinction between numeral and quantity is important here. The view that -*men* is incompatible with numerals holds true if we look at (14):

(14) * *san* *xuesheng* *men*
three student men

However, if we consider the data including group classifiers, we find that -*men* can co-occur with numerals like one. Therefore, it is inaccurate to say that -*men* is incompatible with numerals. Example (15) also shows that -*men* does not agree with the numeral in the specifier of Number Phrase, otherwise -*men* cannot co-occur with numeral one, which is supposed to be compatible only with singular number.

(15) *yi* *qun* *xuesheng* *men*
one CL-group student men

'a group of students'

The above discussions show that -*men* is neither incompatible with classifiers nor numerals. In the following section, I will propose a new constraint on the distribution of -*men*.

2.3.3 The real constraint on -men

From the data above, we can see the view that *-men* is incompatible with classifiers or numerals both miss the point. This paper holds that the real constraint on the (non)-occurrence of *-men* is whether the quantity is precise or not. Many native speakers I consulted with shared this intuition and it has been mentioned in traditional descriptive grammar in Mandarin. However, it is not treated seriously in formal approaches.

It is particularly important to distinguish quantity and numerals in languages with classifiers because the semantic meaning of classifiers varies. Individual classifiers denote atoms whereas group classifiers do not. This leads to different values of quantity and numerals.

In this paper, I argue that quantity is the result of the multiplication of the numeral in Spec Number Phrase and the numeral implied by certain type of classifiers. The (non)-occurrence of *-men* is sensitive to the result of the multiplication, namely, the quantity. When the result is precise, *-men* cannot appear. When the result is imprecise, *-men* can appear. This constraint can account for all the data mentioned so far better than the constraints summarized in previous literature.

A good way to test this constraint is the dual classifier in Mandarin. In Mandarin, there is a dual classifier *dui* ('couple') which can be used as a classifier to denote a couple, as shown below. If we follow the constraint proposed above, we would predict that the structure in (16a) would be incompatible with *-men*. This is born out, as shown in (16b).

(16) a. *san* *dui* *qinglü*
three CL-couple couple
'three couples'

b. * *three* *dui* *qinglü* *men*
three CL-couple couple men

The reason that (16b) is ungrammatical is because the quantity is precise, that is, six. The multiplication of the numeral three and the numeral two implied by the dual classifier gives the result six, which is a precise quantity. Since *-men* can only be merged when the quantity is imprecise, (16b) is ungrammatical.

Let's refer to the numeral at the specifier of Number Phrase as a Multiplier and the numeral implied by the classifier as Multiplicand.[1] The value of the multiplier and the multiplicand can be specified or unspecified. This gives rise to four possibilities of the combination. If we add the possibility of bare nouns, then we have five possibilities in total, as demonstrated in Table 2.

[1] The idea that a multiplication relation holds between the Spec Number Phrase and the Spec Classifier Phrase has also been proposed by One-Soon Her in a series of articles (2010, 2012, 2017). She proposed that classifiers and measure words function as a multiplicand mathematically. The classifier's value is necessarily 1 and measure word's value is ¬1. This paper differs from her idea in that the classifier's value can be 1, 2 or unspecified.

Multiplier (Spec NumP)	**Multiplicand (Spec CLP)**	**Result**	***-men***
Specified (1, 2, 3…)	Specified (Individual or dual classifiers)	Specified	Banned
Specified (1, 2, 3…)	Unspecified (Group classifiers)	Unspecified	OK
Unspecified (*ji* 'a few')	Specified (Individual or dual classifiers)	Specified	OK
Unspecified (*ji* 'a few')	Unspecified (Group classifiers)	Unspecified	OK
None (bare noun)	None (bare noun)	Unspecified	OK

Table 2 Collectives, singulatives, and plural of singulatives in Arabic.

This table correctly captures the distribution of *-men* in the data mentioned so far. It shows that *-men* is banned in the structure when the quantity is precise, and the quantity is calculated through a multiplication relation.

In this section, we have reviewed two analyses on *-men*. We showed that they are empirically insufficient. Then we propose a new constraint on the distribution of *-men*. This constraint relies on a multiplication relation holding between the Number Phrase and the Classifier Phrase. In the next section, we will return to summarize the final property of *-men*.

2.4 Associative plural use of -men and multifunctionality

In the previous section, we mainly looked at data with -men attaching to common nouns to express plurality. However, it can also be attached to pronouns and sometimes proper names to express associative plural meaning. Associative plural constructions usually consist of a noun X, typically a human reference as a representative, and an associative plural marker to express the meaning 'X and other people associated with X' (Daniel & Moravcsik 2013). For instance, in (17), when the third person plural pronoun ta-men 'they' is used after a proper name *Xiaoqiang*, it means Xiaoqiang and his associates.

(17) *Xiaoqiang ta-men lai le*
Xiaoqiang he-men arrive Perf

'Xiaoqiang and his associates arrived.'

Some people also accept (18), where *-men* is directly attached to the proper name to express associative plural meaning. However, there are also people who found the associative interpretation of (18) rather unnatural (including me). The morpheme *-men* can be attached to proper names, but a more natural interpretation of *proper name -men* is a group of people who share the same property. For example, the most natural interpretation of (18) is interpretation 2, where *Xiaoqiang-men* denotes a

group of people who share the same property of being named as *Xiaoqiang*, similar to 'Johns' or 'Toms' in English

(18) *Xiaoqiang-men lai le*
Xiaoqiang-men arrive Perf

??Interpretation 1: 'Xiaoqiang and his associates arrived.'
Interpretation 2: 'People whose name is Xiaoqiang have arrived.'

The shared property does not have to be the person's name. It could be any salient property of the person that the proper name denotes. For instance, in (19), *Leifeng* is well known for his kind heart, thus we could use *Leifeng-men* to denote those ordinary people who share similar personalities with *Leifeng*. This usage is very similar to the cases when *-men* is attached to common nouns. It is likely that the proper name in (19) is base generated in the N position, just like common nouns, such as student, child, etc., and then being pluralized. It is hard to get the associative plural meaning for examples like (19). Therefore, I will only treat structures involving plural pronouns occurring after proper names in (17) as typical associative plural constructions.

(19) *Leifeng-men*
Leifeng (the name of a warm-hearted person)-men

'Ordinary people who are ready to help others without asking returns'

Another property of associative plural is that it can be followed by quantity phrase. This is different from N-*men*. In section 2.3, we spent a lot of time discussing the fact that *-men* cannot co-occur with precise quantity phrase like *san ge ren* ('three people'). However, in associative plural constructions, where *-men* precedes the quantity phrase, *-men* is obligatory when the numeral is larger than one.

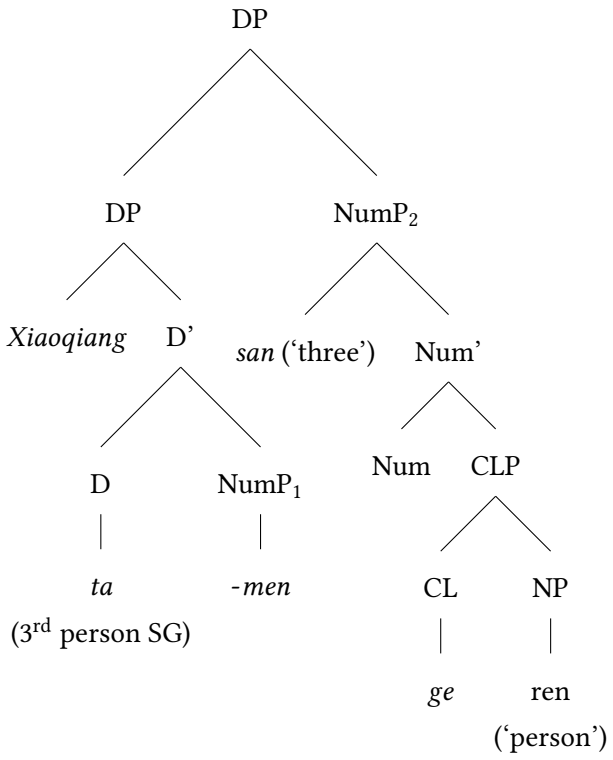
(20) *Xiaoqiang ta-men san ge ren*
Xiaoqiang he-men three Cl person

'Xiaoqiang and another two associates'

This reminds us of the generalization we reach on the distribution of *-men* in section 2.3.3. The generalization says that *-men* can only co-occur with imprecise quantity. However, in (20), the quantity being three is precise and *-men* can appear. In fact, *-men* is obligatory in (20). One way out of this is to say that what we see in (20) is an appositive structure, the numeral-classifier sequence following the pronoun is a non-restrictive modifier. It provides additional quantity information to the proper name and pronoun it modifies. The syntactic structure could be the one shown in (21), which is a modifying structure.[2]

[2] It is also possible to treat the associative plural construction in Mandarin as a single DP, as adopted in Huang et al. (2009). Currently, I have no sufficient reasons to choose one over another. I refer readers to Lewis (2021) in which the author proposed a new empirical generalization that languages with

(21)



In (21), the $NumP_2$ in the right adjunction is optional. It can be left out when the quantity of the associates is not important. In the left branch, -*men* can be inserted in under the $NumP_1$. This does not violate the constraint on -*men* we proposed earlier because no precise quantity is specified in $NumP_1$. Note that -*men* is obligatory in (21) when the quantity denoted by $NumP_2$ is larger than one. We could say that the obligatory appearance of -*men* is a semantic number agreement holding between DP and $NumP_2$.

So far, we have shown that -*men* can be attached to various types of noun phrases. When it is attached to common nouns and proper names, it denotes plural meaning. When it is attached to pronouns, it denotes associative plural meaning. This is an indication of the multifunctionality of this morpheme -*men*.

To further prove its multifunctionality, I would like to include another piece of data to elaborate on this point. The morpheme -*men* can be attached to some kinship terms to form new words, as shown in (22). Note it is not productive. The meaning of the formed words is not that transparent. It is more like a lexical process. A piece of evidence to show that this might be a lexical process is that these words are

identical additive and associative plural morphology lack free-standing definite articles. To account for this generalization, Lewis argues that there is an Associative Plural Phrase above DP. If languages do not project DP layer (languages without free-standing definite articles), the plural morpheme in Number head can move to the Associative Plural head without being blocked by the DP layer. If this observation holds true, we might want to have a single DP projection for associative plural constructions.

always pronounced with rhotacization, which might be an indication of the word boundary.

(22) a. *ge-men-r*
brother-men-Rhotacization

'Male best friend'

b. *jie-men-r*
sister-men-Rhotacization

'Female best friend'

c. *ye-men-r*
Grandfather-men-Rhotacization

'Manhood'

So far, we have summarized the major properties of *-men*. We also reviewed two syntactic analyses of *-men* and pointed out their empirical starting point is to some extent problematic. In addition, we showed that *-men* can appear in various linguistic environments to express different meaning, such as plural, associative plural, and opaque meaning when it is involved in a lexical formation process. Before we end this section, I'd like to review another essential paper on *-men* by Jiang (2017), who took into the empirical weakness of the previous accounts into consideration and proposed a unified analysis of *-men*. After summarizing her analysis, I'll show that we could make improvement both empirically and conceptually.

Jiang (2017)

There is a reason that I review Jiang's article after reviewing the associative plural use of *-men*. Jiang examines four types of structures as listed in (23), the specific examples of which have been covered in the previous discussion. Jiang proposed a unified analysis of *-men*. She argues that *-men* is an associative plural morpheme generated in little n, which is local to nouns and lower than numerals and classifiers. The syntactic structure given by Jiang is like the one in (24b).

(23) a. N + Men

b. Numeral + CL-group + N + Men

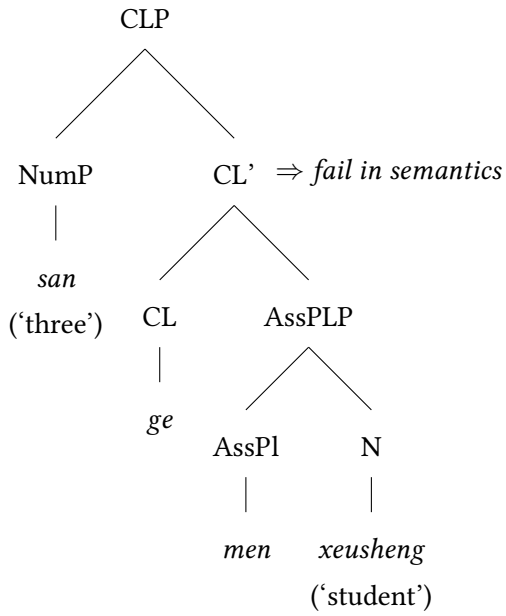
c. Numeral Approximation + CL + N + Men

d. N/Pronoun/Proper Name + Men + CL

(24) a. *san ge xuesheng men*
three CL student men

'three students'

b.



(25) $\text{-}men_{<e^k,<e,t>>} = \lambda k \lambda Y[^{\cup}k_{human}\ |Y| \geq 2 \wedge G \wedge (k) = Y\ ]$

Jiang argues that -*men* is an associative plural morpheme which maps a kind to a salient group. In (25), k_{human} means the noun selected by -*men* is a human kind. Y is a set of plural individuals and G is a group function mapping a kind to a salient group. The semantic type of -*men* is $<e^k, <e, t>>$, and it seeks kind-denoting terms. The result of N-*men* is thus <e, t>. Jiang holds the view that common nouns are regular kind and proper names or pronouns are individual kind. When -*men* combines with them, the output is type <e, t>, a predicate. To further turn the predicate into an argument, Jiang relies on iota operator or generic operator.

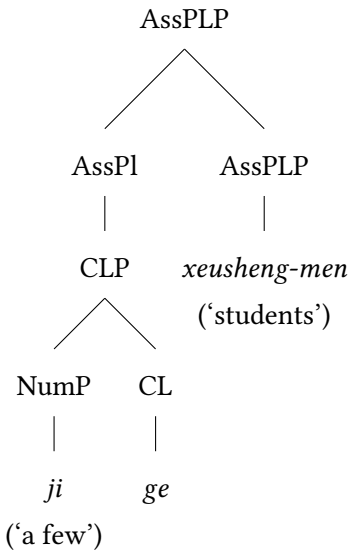
In the following section, I will point out two issues with this analysis. Jiang explains the ungrammaticality of Num-CL-Noun-*men* in (24) in the following way. The morpheme -*men* first combines with the common noun *xuesheng* ('student'). The result *xuesheng-men* denotes a salient group of plural individuals which cannot provide the correct semantics individual classifiers look for, as individual classifiers look for atoms.

However, we mentioned earlier that -*men* can co-occur with individual classifiers when the numeral is imprecise, such as *ji* ('a few'), repeated below in (26). In fact, Jiang took this possibility into consideration and assumed a modification structure for it as shown in (26). The numeral phrase is a right adjunction to the N-*men* phrase.

(26) *ji* *ge* *xuesheng* *men*
a few CL-individual student

'a few students'

(27)



For Jiang, when the numerical value is specific, like three, the classifier forms a constituent with the noun. When the numerical value is vague like a few, the classifier forms a constituent with the number. It is not very consistent. I think the new generalization mentioned earlier is better in this aspect. In my generalization on *-men*, I do not assume two different structures for numeral-classifier-noun phrase.

The second point I am taking issue with about Jiang's analysis is the syntactic position of *-men*. I think Mathieu's (2014) split analysis of plurality and plural typology, the main spirit of which is that there are different types of plurals and each occupies a different functional head, be it Number, Classifier (or Division head in Borer's 2005 term), or little n. Since Mathieu's (2014) paper is also of great importance to my analysis, I will review it in detail in the following section. In the meantime, I will show that although I am also adopting Mathieu's splitting view of plurality, I think *-men* occupies a higher functional head than little n.

2.5 Syntactic height of -men and Mathieu (2014)

Let's start with the core data Mathieu's analysis relies on. Mathieu examines the plural of singularized nouns in Arabic. Arabic has a series of collective nouns denoting groups that can be turned into individuals via singulative morphology. Once the collective has been turned into a singulative, the output can further be pluralized. Mathieu provided a list of such words and I selected some to present in Table 3.

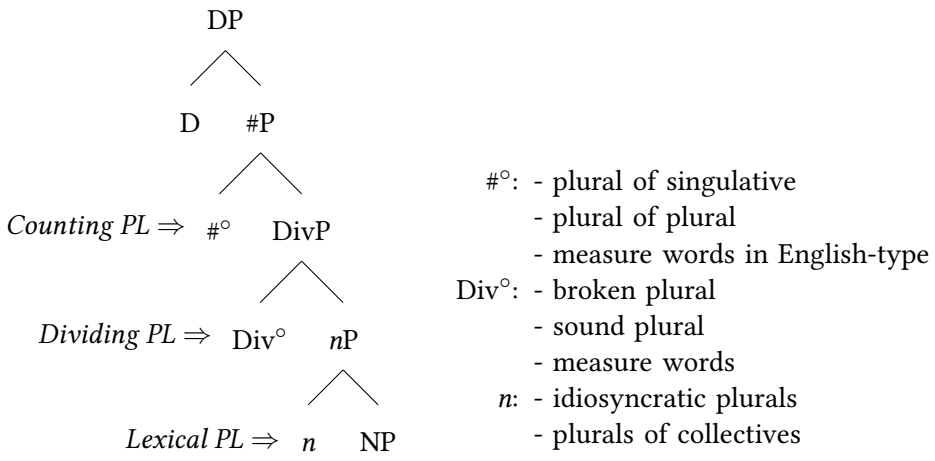
Mathieu assumes that collectives denote kinds and are weakly referential. They do not refer to entities. Following Borer (2005), Mathieu argues that singulatives in Arabic are classifying plural under the Division head, the function of which is to divide and classify. The plural of the singulative is a counting plural realized higher in the structure under the Number head. Once the singulative has been realized

Collective	**Singulative**	**Plural of singulative**
šajar (‘trees’)	šajara(h) (‘a tree’)	šajaraat (‘trees’)
ħajar (‘stones’)	ħajara(h) (‘a stone’)	ħajaraat (‘stones’)
burtogaal (‘oranges’)	burtogaala(h) (‘an orange’)	burtogaalaat (‘oranges’)

Table 3 Distrobution of -*men*

under the Division head, the counting plural can target the singulative. The tree in (28) illustrates the hierarchy of different plurals Mathieu & Zareikar (2015).

(28)



Mathieu & Zareikar (2015)

In (28), the plural or group meaning denoted by the collectives is realized at little n. The singulative morpheme and English plural morpheme -*s* are realizations of Division head. The plural of singulative is realized in the Number head (#°).

If we recall Jiang’s analysis, we may find it is not compatible with Mathieu’s framework in three aspects. First, if -*men* is the realization of little n, and individual classifiers are realizations of Division head, then we may wonder why individual classifiers in Mandarin cannot divide the N-*men* as Arabic singulatives do to the collective.

Second, Mathieu treats collective nP as kinds rather than predicates. In Jiang’s analysis, -*men* is a kind-seeking group function and the result of N-*men* is predicate, rather than kind. This is also different from Mathieu’s framework.

Third, Mathieu mentions that collectives in Arabic denote kinds. They are weakly referential and number neutral. They do not refer to uniquely identifiable entities. This is extremely different from the definite effect of N-*men* and the plurality interpretation it adds to the structure. In the following part, I will elaborate on the third point and show that -*men* should be analysed higher in the nominal spine.

Mathieu points out a possible connection between the height of the plural and the strength of its referentiality. Mathieu holds the view that classifying plural nominals are weakly referential and has an inclusive reading, whereas counting plural nominals are strongly referential and has an exclusive reading. In other words, the higher the plural is, the stronger its referentiality it becomes. Before we go further, let me explain briefly about the inclusive and exclusive reading of plural nominals.

It has been observed that in languages like English, the plural allows both inclusive reading and exclusive reading. The inclusive plural means one or more than one, which includes both singular and plural individuals. The exclusive reading means more than one only, which introduces only plural individuals. For example, in (29), the plural form *children* could only mean more than one child. However, in (30), the plural form can take the interpretation of 'one' or 'more than one', which is an instance of inclusive plural reading.

(29) I have children.
Exclusive reading only: I have more than one child.

(30) a. Do you have children?
Yes, I have one.

b. I didn't eat apples.

Mathieu has noticed a similar contrast of inclusive and exclusive reading in Arabic. He points out that collectives and singulatives are used in inclusive reading environment whereas plural of singulative is only used exclusively. For instance, in (31a), the plural of the singulative *šaʕraat* ('strands of hair') is ungrammatical in an inclusive reading environment. Instead, the collective form is used as shown in (31b).

(31) a. * ʕ*indah* *šaʕraat?*
has-he hair

'Does he have strands of hair?'

b. ʕ*indah* *šaʕar?*
has.he hairCOL

'Does he have hair?'

Mathieu provides a series of environment to the test the inclusive and exclusive contrasts and conclude that the plural of singulative (the counting plural in Number head) always get the exclusive plural reading whereas the collective (nP) and the singulative (the dividing plural) always get inclusive plural reading. He also holds the view that there is a connection between the strength of referentiality and the availability of exclusive reading. The counting plural is strongly referential and is possible for exclusive plural reading only.

Now, let's come back to -*men* again. I would like to argue that -*men* is only possible with the exclusive reading. As for the inclusive reading environment, Mandarin usually use bare nouns. For instance, in (32), the Mandarin counterpart of (29) and (30), we find that -*men* is incompatible with an inclusive reading environment. Also, in Mandarin, bare nouns are regarded as number neutral, that is, bare nouns can be interpreted as 'one' or 'more than one'. However, when -*men* appears with the noun, the noun is interpreted as plural only, namely 'more than one'.

(32) a. *ni you hazi ma*
you have child question particle

'Do you have children?'

b. **ni you haizi-men ma*
you have child-men question particle

The strong referentiality and the exclusive plural reading of -*men* remind us of the counting plural in Arabic. Therefore, it makes more sense to put -*men* higher in the structure rather than little n as Jiang argued.

I would like to add a further thought on Mathieu's work. It is interesting to think if it is possible that the counting plural in Number head is sensitive to a multiplication relation and the dividing plural is sensitive to an addition relation. If we assume that -*men* merges at the Number head when its semantic requirement is satisfied, that is, the result of the multiplication of Spec Numeral Phrase and the Spec of Classifier Phrase is an imprecise quantity, we may wonder whether such a multiplication relation holds between the two heads in Arabic or not. Well, it could be, but we cannot tell. The reason is that the Division head in Arabic is realized by singulatives, thus the numeral implied by the Division head is always one. The result would be the same regardless of whether we take a multiplication relation or an addition relation between Numeral Phrase and Division Phrase. It is possible that the English type of plural, that is, the classifying plural under Division head, is sensitive to the addition relation, whereas the plural of singulative in Arabic and Mandarin -*men* in Number head are sensitive to the multiplication relation.

3 Proposal

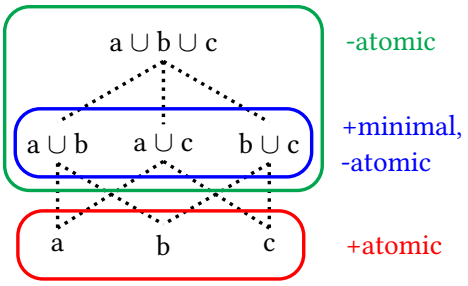
3.1 Theoretical background: a feature account of grammatical number

Harbour's (2014) theory postulates a small set of primitive features that derive possible number systems and explains impossible ones. It also provides explanations on the interpretation and morphological realization of these features. In what follows, I will summarize Martí's im plementation of Harbour's grammatical number theory. Martí's (2020a, 2020b) analysis relies on four primitive features: [±atomic] and [±minimal] to account for the typology of grammatical number and account for the properties of the numeral noun constructions.

[±Atomic] is sensitive to atoms vs non-atoms. [±Minimal] is sensitive to whether there is minimal part in the semi-lattice or not. [±minimal] is relative notion, it depends on what else is in the set. These features play a role in morpho-syntax and semantics.

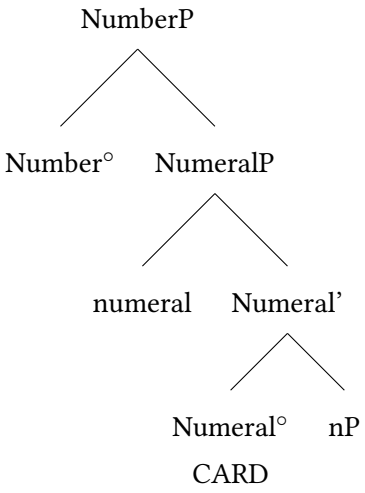
When we apply these two sets of features independently, the result is the same. They distinguish the singular vs plural noun phrases. However, it is not the case that [±minimal] always gives the same result as [±atomic]. A strong argument for this is the existence of dual. The feature combination gives rise to the following grammatical numbers:

(33) [+minimal, +atomic] = singular
[+minimal, -atomic] = dual
[-minimal, -atomic] = plural
[-minimal, +atomic] = empty set



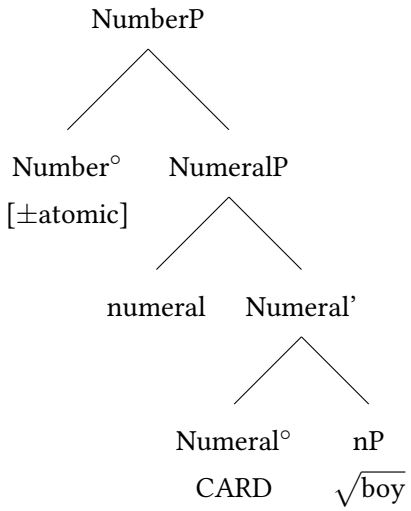
Feature repetition is also constrained to avoid over-generating grammatical numbers that are not attested. Harbour's system only allows the feature to be repeated if the value of the feature is not the same. The syntactic structure is as follows:

(34)



Martí proposed that languages, such as English, are [±atomic] systems. Let's look at how Martí explains the number system in English.

(35)



a. $[\![[+\text{attomic}][_{\text{nP}}\ \text{boy}]]\!] = \lambda x.[\![[_{\text{nP}}\ \text{boy}]]\!](x)$ and atom(x) → boy

b. $[\![[-\text{attomic}][_{\text{nP}}\ \text{boy}]]\!] = \lambda x.[\![[_{\text{nP}}\ \text{boy}]]\!](x)$ and ¬atom(x) → boys

c. #$[\![[+\text{attomic}][\text{two CARD}\ [_{\text{nP}}\ \text{boy}]]]\!]$ → ~~two boys~~

d. $[\![[-\text{attomic}][\text{two CARD}\ [_{\text{nP}}\ \text{boy}]]]\!] = \lambda x.[\![[_{\text{nP}}\ \text{boy}]]\!](x)$ & card(x) = 2 → two boys

e. $[\![[+\text{attomic}][\text{one CARD}\ [_{\text{nP}}\ \text{boy}]]]\!] = \lambda x.[\![[_{\text{nP}}\ \text{boy}]]\!](x)$ & card(x) = 1 → one boy

f. #$[\![[-\text{attomic}][\text{one CARD}\ [_{\text{nP}}\ \text{boy}]]]\!]$ → ~~one boys~~

Martí assumes that numerals are intermediate between the noun and the functional projection holding the grammatical features. In other words, the sequence is grammatical number feature > numeral > NP. (35c) is ungrammatical because when the numeral *two* combines with the NP *boy*, it selects all the elements that contain two atoms {ab, ac, bc…} and when this set further combines with [+atomic] feature, the result is an empty set because there is no single atom in that set. Similarly, (35c) is ungrammatical because the numeral one has already selected the atomic elements and form a set {a, b, c…}, and when this set combines with [-atomic] feature, the result is empty set.

Martí's framework is important for my analysis below. Martí's featural system implies the relationship between the number and the feature it can combine with. For instance, [+atomic] feature implies numeral *one*, [+minimal, -atomic] implies numeral *two*. In the following part, I will propose that although the numerals implied by these features are not expressed overtly in Mandarin, they can serve as the multiplicand. The numerals generated in the specifier of Number phrase are, on the other hand, multiplier.[3]

[3] My application of Martí's framework differs from her original proposal in some ways. A crucial point Martí argues for is that numerals are provided with a uniform semantics cross-linguistically. In my analysis, however, there are two types of numerals: one is Spec Number Phrase, and the other is in

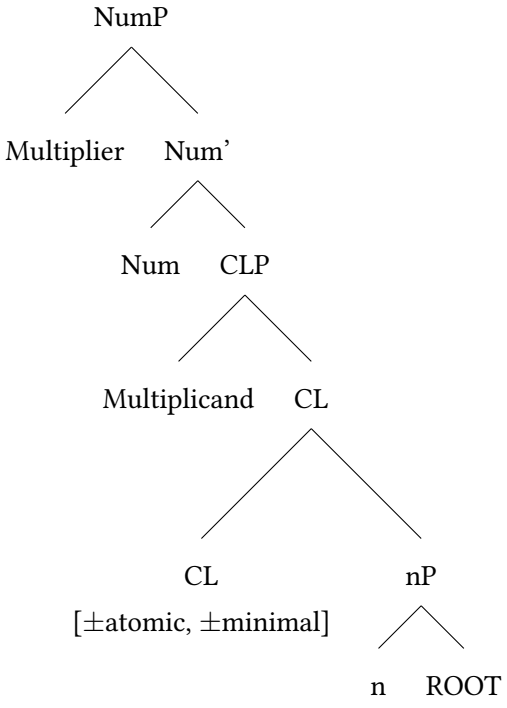
3.2 Proposal for -men

In the following section, I will propose that individual classifiers in Mandarin are realizations of [+atomic] feature, group classifiers are realizations of [-minimal, -atomic] features, and dual classifiers are realizations of [+minimal, -atomic] features. I will argue that morpheme *-men* is a semi-lexical item and it is specified with insertion condition [+person, +def, imprecise quantity]. Note that the feature imprecise quantity can be formalized as the following equation: $\mathbf{n} \times \mathbf{m} = \mathbf{?}$ The letter **n** stands for the numeral in Spec Number Phrase. The letter **m** stands for the multiplicand implies by the classifier. The question marker **?** stands for an imprecise result.

Let's look at again the feature sets Martí uses to derive different numeral values, as shown below. When we look at the individual classifiers, dual classifiers and group classifiers, it maps well the following features. The individual classifiers are realizations of [+atomic] features which pick out sets of atoms. The dual classifiers are realizations of [-atomic, +minimal]. The group classifiers are realizations of [-minimal, -atomic] feature. The tree representation is shown in (37).

(36) [+atomic] = individual classifier
[+minimal, -atomic] = dual classifier
[-minimal, -atomic] = plural classifier
[-minimal, +atomic] = empty set

(37)



Spec Classifier Phrase. I refer readers to Martí's original work for detailed and enlightening analysis on the numeral noun construction in Turkish, Western Armenian and English. If I misinterpret or do not do justice to her theory, all errors are my own.

The number value of the multiplicand is never overtly expressed. It is only implied by the classifiers we use. The multiplier is the numerals used in the numeral noun phrase. The morpheme -*men* can be merged under the Number head when three conditions are satisfied. First, the nP has semantic person feature. Second, the result of the multiplication between multiplier and multiplicand is imprecise quantity, namely $\mathbf{n \times m = ?}$. Third, the insertion of -*men* could give the structure a definite interpretation.[4]

This structure also indicates the difference between English numerals and Mandarin numerals. According to this structure, Mandarin numerals occupy the Multiplier position, whereas English numerals occupy the Multiplicand position. English plural -*s* is sensitive to the additive plural, whereas Mandarin -*men* is sensitive to the multiplication plural.

In the above discussion, I have accounted for the distribution of -*men* with individual classifiers and group classifiers. In the following section, I will discuss the associative plural use of -*men*. I propose an adjunction structure for associative plural construction. There are two reasons for doing so. First, -*men* can only get associative plural interpretation when it is attached to pronouns. Second, when -*men* is used as an associative plural, it can appear with precise quantity phrase. These two properties are different from the plural use of -*men* when it is attached to common nouns and proper names.

(38) *Zhangsan men* proper name

'the people whose name are Zhangsan'

(39) *xuesheng men* common noun
student men

'the students'

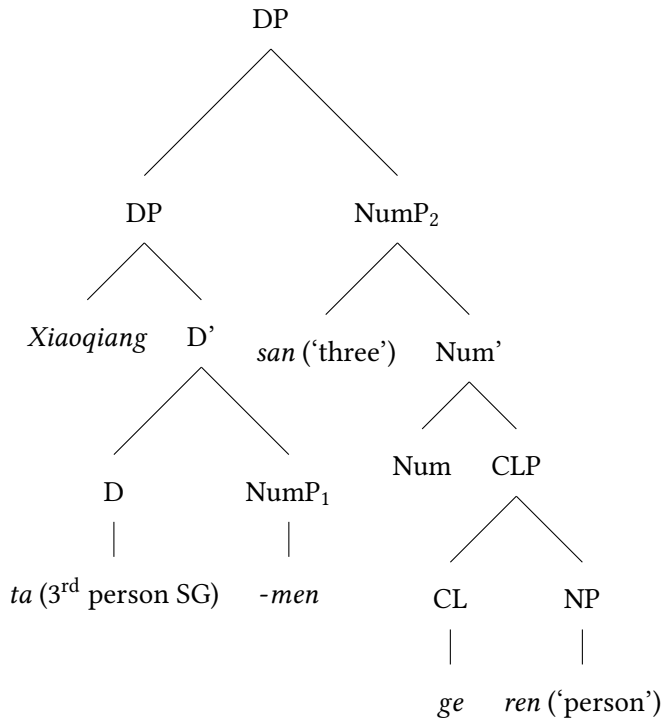
(40) *Zhangsan ta-men san ge ren* pronoun
Zhangsan he-men three CL person

'Zhangsan and his two associates'

The structure I propose for the associative plural is demonstrated below in (41). The numeral phrase serves as modifiers of the associative plural DP, adding complementary information to the structure, namely specifying the number of people involved. Since the numeral phrase is a modifier, it can be freely omitted. In the left branch, the quantity is not specified, thus -*men* can be inserted into the structure. The insertion condition of -*men* can remain the same as previously mentioned. It is desirable to keep the insertion condition the same.

[4] It has been pointed out to me that my analysis cannot account for the word order of Numeral-CL-Noun-*men*. If -*men* is inserted under the Number head, combining -*men* with the noun will violate head movement constraint. This is a valid question and I do not have a satisfying answer to it now.

(41)



Finally, I will explain the last piece of data, namely the lexical use of *-men.* In previous parts, we mentioned that *-men* can be attached to some kinship terms to form new words although the process is highly limited. The words are repeated as follows:

(42) a. *ge-men-r*
brother-men-Rhotacization

'Male best friend'

b. *jie-men-r*
sister-men-Rhotacization

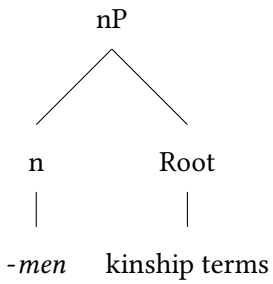
'Female best friend'

c. *ye-men-r*
Grandfather-men-Rhotacization

'Manhood'

I would like to propose that *-men* in these words is inserted in little n and first merges with the Root. These words do not necessarily convey plural meaning. They are number neutral like bare nouns. I take the little category as the derivational domain. The semantic composition of components is not as transparent as in inflectional domain above nP. Besides, the rhotacization could also be seen as an indication of the word boundary.

(43)



In this part, I have proposed structures for three types of constructions involving -*men*, they are: 1) Num CL Nouns *men*; 2) Associative plural use of -*men*; 3) Kinship terms with -*men*. The morpheme -*men* can be inserted into the structure when certain conditions are satisfied. First, the quantity expressed by the structure should be approximate and imprecise. Second, -*men* s-selects for human or animate nouns. Interestingly, as we can see from the above analysis, -*men* can be inserted into three types of structures and derive different meanings, although the insertion condition remains the same. This is in line with literature on semi-lexical items (Cavirani-Pots et al. 2021).

Semi-lexical items can be inserted in different syntactic structures to serve various functions. They are semi-lexical and semi functional. This renders the functional structure necessary because the structure will impose some insertion condition for the semi-lexical item. On the other hand, the meaning of the semi-lexical items also imposes a semantic selection constraint for the environment they merge into. These semi-lexical items are not pure functional items that can be merged under the functional head to give rise to the interpretation directly.

4 Implications And Conclusion

In this article, we have seen that -*men* can co-occur with individual classifiers, group classifiers, and numerals, contra to the constraints proposed in the previous analyses. We have defended the traditional descriptive constraint on the distribution of -*men*, namely -*men* can only co-occur with imprecise quantity. The descriptions can be captured if we assume a multiplication relation holds between the Number Phrase and the Classifier Phrase in Mandarin. The morpheme -*men* can only be inserted in the structure when the result of the multiplication is imprecise. Also, if we follow Mathieu's (2014) hypothesis on the connection between the referentiality and the height of the plural, we would like to say that -*men* is merged under the Number head. This also explains the exclusive plural reading of -*men*.

In the meantime, if we accept Mathieu's view of split plurality, it seems possible that the counting plural in Number head is sensitive to a multiplication relation whereas the classifying plural is sensitive to an addition relation. This may also lead to different semantics in numerals in different languages. For instance, numerals in Mandarin can only merge in Spec Number Phrase position and numerals in English can merge in Spec Division Phrase. However, such a proposal is highly hypothetical and needs empirical support in future research.

Last but not the least, this article treats *-men* as a semi-lexical item. On the one hand, it has insertion conditions which need to be satisfied. On the other hand, we could see that semi-lexical items can be inserted into the different syntactic environments and various meanings can be derived. The insertion conditions are purely semantic. In the meantime, my analysis shows that a functional category like Number Head is needed in Mandarin. Although Mandarin does not have an English type of plural morpheme that seems purely syntactic, it does have a plural morpheme that can have a clear-cut form-meaning distinction when inserted into the structure.

Abbreviations

CL	Classifier	CL-individual	Individual Classifier
CL-group	Group Classifier	CL-couple	Dual Classifier
SG	Singular	PL	Plural
Perf	Perfect	Prog	Progressive

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