Silent Determiners and Pluractional Sequence Comparatives in Mandarin Chinese

Abstract

This article investigates the syntax and semantics of pluractional sequence comparatives in Mandarin Chinese such as *Naxie haizi yi-ge bi yi-ge gao* 'Each of those children is taller than the other'. We argue that the two parallel *yi*-Cl (classifier) phrases have a more complex structure than appears on the surface because each contains a different covert determiner. The silent determiner for the first *yi*-Cl is a universal quantifier like *mei* 'every', whereas the silent determiner for the second *yi*-Cl is a spatial-temporal determiner such as *qian* 'previous' or *shang* 'last', which contains another hidden pronominal argument bound syntactically and semantically by the first *yi*-Cl. Inspired by Beck and von Stechow's (2007) and Beck's (2012) works on English pluractional adverbs and comparisons, we propose that the Chinese comparative construction in question activates a sequence pluralization operation that may apply to relations between individuals, times, locations, and events. Because of the interaction between the silent components of the two *yi*-Cls and sequence pluralization, a number of comparisons can be expressed by a single syntactic construction.

Keywords: pluractional comparisons, sequence comparatives, silent Determiners, pluralization

1. Introduction

Bi-comparatives have been the focus of Chinese linguistics for decades (see Lin 2022 for a recent review). One unique *bi*-comparative construction, however, has received far less attention, with two parallel *yi*-Cl's 'one-classifier' serving as the standard and the target of comparison, respectively. In this construction, the number word can only be *yi* 'one' and the classifier can be a time classifier like *tian* 'day' in (1), a verbal classifier like *ci* 'time' in (2), an individual classifier like *ge* in (3) or a location classifier like *chu* 'place' in (4).

(1) Ru xia yilai tianqi yi tian bi yi tian re
enter summer since temperature one day than one day hot
'Since summer, the temperature has been hotter each day.'

(2) Ta yi ci bi yi ci diu de yuan
he one time than one time throw DE far

'He threw it farther every time.'

(3) Tamen jia de haizi yi ge bi yi ge gao
their family DE children one Cl than one Cl tall
'Each child of his family is taller than the other.'

(4) Suiran li jia yi zhan bi yi zhan geng yuan, tiaojian yi chu
Though away.from home one stop than one stop more far condition one place
bi yi chu geng cha, dan xinnian yi nian bi yi nian geng jianding
than one place more bad but belief one year than one year more firm
'Although every stop is farther than the other and the conditions are worse every place, our belief is firmer every year.'

Lü (1992) notes in his article "shilun hanyou qianhou huying de liangge [yi N] de Juzi" (試論含有兩個[一 N]的句子) that this construction conveys degree acceleration. Similarly, Li (1986) says that this construction conveys successive comparisons with accelerating degrees.

Xiang (1993), on the other hand, observes that the "*yi*-Cl *bi yi* Cl" construction has an additional universal non-comparative meaning. According to him, when the classifier is a time classifier such as *nian* 'year', *yue* 'month', *ri* 'day', a verbal classifier such as *ci* 'time', *tang* 'time', or the sentence contains a temporal expression, it has a comparative meaning. When the classifier is an individual classifier or when the sentence lacks a temporal category, it is a universal claim instead of a statement of actual comparisons. Xiang (1993: 24), for example, uses the following examples to demonstrate his point.

(5) a. Bu yao gen zhe-xie ren dajiaodao, tamen yi-ge bi yi-ge huai
not want with these people make.friends they one-Cl than one-Cl bad
'Do not make friends with these people. Every one of them is bad.'

b. Yuanzi li de shu zhang de yi-ke bi yi-ke gaoda
garden in DE tree grow DE one-Cl than one-Cl tall.and.big
'Every tree in the garden is tall and big.'

(5a) is a generalization about these people. The speaker is not required to make one-to-one comparisons between all of them. Similarly, without actually comparing the trees, (5b) asserts that they are all tall and big. Notice that the *yi*-Cls in (5a) and (5b) are individual classifiers and the people and trees talked about co-exist. However, this is not to say that individual-denoting classifiers always result in universal non-comparative reading. Consider (6) from Xiang (1993: 45). Despite the fact that the *yi*-Cls in this sentence denote time-ordered referents, the sentence has a comparative reading.

(6) Zhe-wei xuezhe henyou fazhang qiantu, ta xie de lunwen, yi-pian bi
This-Cl scholar has development future he write DE article one-Cl than
bi yi-pian piaoliang
than one-Cl beautiful
'This scholar has a development future. Every article that he writes is better than the previous one.'

On the other hand, a "*yi*-Cl *bi yi*-Cl" sentence can obtain a comparative degree-accelerating reading even if the individuals talked about do not have a natural temporal order. For example, the comparative reading of (7) does not have to decide which of the three boxes in (7) appears first.

(7) Zhe san-ge xiangzi, yi-ge bi yi-ge da
these three-Cl box one-Cl than one Cl big
'Each of these three boxes is bigger than the other.'

We conclude that all types of classifiers, including individual classifiers, can give rise to a comparative reading.

Although previous studies of the "*yi*-Cl *bi yi*-Cl" construction made numerous interesting and significant observations, their analyses were insufficiently concrete. It is unclear, in particular, how the meaning of the construction is derived from its surface syntax. The purpose of this article is to bridge that gap by focusing on comparative degree-accelerating reading and leaving non-comparative universal reading for another occasion.

As previously stated, the "*yi*-Cl *bi yi*-Cl"construction conveys a series of comparisons, with the two parallel *yi*-Cls serving as the compared items. Take (3) as an example. Assume their family has a, b, c, d children in (3). Then (3) conveys the following three comparisons:

(8) Yi-ge bi yi-ge gao = a is taller than b, b is taller than c, c is taller than d.

Therefore, to comprehend the meaning of the "*yi*-Cl *bi yi*-Cl" construction, one must explain how the plural comparison events and the sequence readings are derived. This leads to the following questions: What do the two parallel *yi*-Cls denote? Do they both mean the same thing? Is the interpretation existential or universal? This article will look at how the syntax of the "*yi*-Cl *bi yi*-Cl" construction maps to the semantics, providing the first formal analysis of this construction in the literature.

2. Literature Review

There is no western literature on the "*yi*-Cl *bi yi*-Cl" construction that I am aware of, and almost all discussions of this construction have been published in Mainland China. This could be because English comparatives do not exactly correspond to the Chinese comparative construction under consideration. The closest translations of the "*yi*-Cl *bi yi*-Cl" construction use expressions such as *every/each…the other*, *day by day*, *hour after hour*, *-er…every time*, and so on.

2.1 Chinese Literature

Among the Chinese authors who have worked on the "*yi*-Cl *bi yi*-Cl" construction are Lu (1988), Xiang (1993), Chen (2002), Xu (2005), Liu (2005), Wu (2010), Wu (2011), Yuan (2012), Lü (2013), Chen & Zhao (2015), and Li (2019). Lu (1988) was the first to notice that the two *yi*-Cls refer to two adjacent individuals. Thus, the two *yi-nian*s in the sentence *Zhangsan yi-nian bi yi-nian shuailao* 'Zhangsan is more senile every year' refer to two consecutive years that increase in number. Assume the *yi-nian* that comes after *bi* is 1999. The *yi-nian* before *bi* must then be the year 2000. The following is my English translation of Liu's (2005) generalization of the meaning of the "*yi*-Cl *bi yi*-Cl' construction:

> Assume the members of the set X are x_0, x_1, x_2, x_3,…x_n. The term "members" can refer to either specific individuals or points in time on the timeline. Let's use ">" to represent a greater-than relationship of the degree of "VP" between two x's and "∧" to represent a logical conjunction. In that case, the grammatical meaning of "*yi*-Cl *bi yi*-Cl" is as follows:
>
> $x_1 > x_0 \wedge x_2 > x_1 \wedge x_3 > x_2 \wedge \ldots\ldots x_n > x_{(n-1)}$: which can be abbreviated as $x_n > x_{(n-1)}$ with $n > 0$. (Liu 2005: 25)

In other words, the set of elements being compared must have an ordered structure in order for the "*yi*-Cl *bi yi*-Cl" construction to have a comparative meaning. The imposed order on the members of the set X, according to Liu, is based on their logical order in the real world. When the *yi*-Cl referent is time-related, a time-related sequence naturally emerges. As a result, he defines the meaning of the "*yi*-Cl *bi yi*-Cl" construction as an increase in the degree of VP along with the linearly ordered sequence from x_0 to x_n.

Although insightful, Liu's elucidation of the meaning of "*yi*-Cl *bi yi*-Cl" construction remains merely descriptive. It is unclear how the syntactic structure and sentence components contribute to the meaning of the construction. This is the goal of Fregean compositional semantics, and it is what this article will accomplish.

2.2 English literature

Beck & von Stechow (2007) discussed pluractional adverbs in English such as *one after the other*, *dog after dog*, and *piece by piece*, which are related to the meaning of the Chinese "*yi*-Cl *bi yi*-Cl" construction. Pluractional adverbs, they claim, can activate event pluralization by dividing a larger event into linearly ordered subevents. For instance, the meaning of (9a) can be stated as (9b).

(9) a. These three dogs entered the room one after the other.
$D3 \rightarrow D2 \rightarrow D1$
b. These three dogs entered the room, and the entering can be divided into a sequence of subevents in each of which one of the dogs enters in one of the subevents. (Beck & von Stechow 2007: 216)

Beck & von Stechow (2007: 218) propose that the domain of individuals (D_e) and the domain of events (D_v) both have a part-whole structure ordered by "≤".

(10) a. x and y overlap iff they have some common part:
$x \circ y$ iff $\exists z[z \leq x \ \& \ z \leq y]$
b. x and y are distinct if they do not overlap.

(11) Let M be a subset of D_σ, where $\sigma = e$ or $\sigma = v$.
ΣM is the fusion of the elements of M if it has all of them as parts and has no part that is distinct from each of them:
$\Sigma M = \text{that } x \in D_\sigma\ (\forall y \in M)[y \leq x \ \& \ \neg(\exists z)[z \leq x \ \& \ (\forall u \in M)[z \text{ is distinct from } u]]$

(12) If M is the finite set $\{x_1,\ldots,x_n\}$, we write ΣM as $x_1+\ldots+x_n$.

They also presume that predicates can be pluralized or cumulated. The most basic is pluralization (cumulation) of predicates of type <e,t> such as (13a).

(13) a. Zhangsan han Lisi zou-le
Zhangsan and Lisi leave-Asp

'Zhangsan and Lisi left.'
b. Zhangsan left and Lisi left.

The cumulative or distributive reading of this example can be accounted for using Link's (1983) pluralization star operator * defined below. Assume P is a predicate of type <e,t> that represent a collection of atomic entities. P can then be pluralized as follows:

(14) a. P $\subseteq$ *P
b. If $\alpha \in$ *P and $\beta \in$ *P, then also $\alpha \cup \beta \in$ *P.
c. Nothing else is in *P.

As an example, suppose the extension of *zou* 'leave' is {ZS, LS}. Then the extension of **zou* is {ZS, LS, ZS$\cup$LS}. *P applies to a plural individual if and only if P applies to each subpart of that plural individual.

(15) a. [[Zhangsan han Lisi] [*[zou-le]]]
b. ZS$\cup$LS $\in$ *λx[x left]
c. $\forall$x[x $\in$ ZS$\cup$LS $\rightarrow$ x left]

2-place predicates can also be pluralized, using the double star operator **, defined below (cf. Krifka 1989; Sternfeld 1998; Beck and Sauerland 2000; Beck 2012, among others).

(16) For R a set of pairs, **R is the smallest superset of R such that R $\subseteq$ **R and if $\langle\alpha,\beta\rangle \in$ R** and $\langle\alpha',\beta'\rangle \in$ **R, then also $\langle\alpha\cup\alpha', \beta\cup\beta'\rangle \in$ **R.

To illustrate, when the operator ** is applied to the set $\{\langle a_1,b_1\rangle, \langle a_2,b_2\rangle\}$, the result is $\{\langle a_1,b_1\rangle,\langle a_2,b_2\rangle,\langle a_1\cup a_2,b_1\cup b_2\rangle\}$. To put it another way, the effect of the operator ** is to turn the original relation R between atomic entities into a relation **R that applies to two pluralities A, B such that for every atomic element x in A, there is at least one atomic element y in B that makes xRy hold, and for every atomic element y in B, there is at least one atomic element x in A such that xRy. Consider the following example from Beck (2012), which is ambiguous between reading (17b) and reading (17c).

(17) a. Sue and Amy read 'Fried Green Tomatoes' and 'The L-shaped Room'.
b. Each of Sue and Amy read each of FGT and L.

c. Each of Sue and Amy read one of FGT and L, and each of the books was read by one of the women.

According to Beck (2001: 80), reading (17b) can be derived via the * operator as shown below, assuming that both plural noun phrases in (18a) undergo quantifier raising.

(18) a. Each of Sue and Amy read each of FGT and L.

b. [[Sue and Amy] [*[[1 FGT and L] [*2 [t_1 read t_2]]]]

c. S&A $\in$ *λx[FGT&L $\in$ *λy[x read y]]

d. $\forall$x $\leq$ S&A: $\forall$y $\in$ FGT&L: x read y

Reading (17c), on the other hand, is a cumulative reading in which the verb's two noun phrase arguments are subject to the '$\forall\exists\ldots\forall\exists$' quantification:

(19) a. Sue and Amy read 'Fried Green Tomatoes' and 'The L-shaped Room'.

b. [[S&A] [[**read] [FGT&L]]]

c. <S&A, FGT&L> $\in$ **λyλx[x read y]

d. $\forall$x $\leq$ S&A: $\exists$y $\leq$ FGT&L: x read y & $\forall$y $\leq$ FGT&L: $\exists$x $\leq$ S&A: x read y

Beck & von Stechow, like Schwarzschild (1996), assume that pluralization involves a contextual partitioning of pluralities into salient covers, which is defined as follows:

(20) Cover (mereological version):

Cov is a cover of x if Cov is a set such that $\sum$Cov = x.

(21) a. A cover Cov is a partition iff for any x, y $\in$ Cov: x and y don't overlap.

b. PART(Cov,x):= 1 iff Cov is a partition (and a cover) of x.

c. Cov[x] = {y: y$\in$ Cov & y $\leq$ x}

Note that the symbols 'Cov[x]' and 'Cov(x)' have different meanings. While the former refers to the set of all the members of Cov, the latter declares that x is a member of Cov.

The use of covers is necessary because, even if one assumes (23), the two distributive readings (22a,b) can't be explained. However, the concept of Cover can explain them.

(22) a. The cows and the pigs filled the barn to capacity.

"The cows filled the barn, and so did the pigs."

b. The young animals and the old animals filled the barn to capacity.
   "The young animals filled the barn, and so did the old animals."

(23) [[the cows and the pigs]] = [[the young animals and the old animals]] = [[the animals]].

The concept of Cover is also capable of explaining regular distributive meanings such as (24), where the salient partitions are those composed of singular atomic individuals.

(24) a. The children weigh 40 kg.
   b. [[the children][*[Cov [1 [t_1 weigh 40 kg]]]]]
   c. $C \in *[\lambda x.\text{Cov}(x)\ \&\ x \text{ weigh } 40\text{kg}]$[1]

When event arguments are taken into account, the meaning of (24) becomes (25), which means that for every child *x* in *C* (children), there is a subevent *e* in *E* such that *x* weighs 40 kilograms, and for every subevent *e* in *E*, there is a child *x* such that *x* weighs 40 kilograms in *e*.

(25) $\langle C,E\rangle \in **[\lambda x'.\lambda e'.\text{Cov}(x')\ \&\ \text{Cov}(e')\ \&\ x' \text{ weigh } 40\text{kg in } e'] = 1$ iff
   $\forall x[x \leq C\ \&\ \text{Cov}(x) \rightarrow \exists e[e \leq E\ \&\ \text{Cov}(e)\ \&\ x \text{ weighs 40 kg in } e]\ \&\ \forall e[e \leq E\ \&\ \text{Cov}(e) \rightarrow \exists x[\ x \leq C\ \&\ \text{Cov}(x)\ \&\ x \text{ weighs 40 kg in } e]]$

The above truth conditions can be obtained by using the PL operator in (26), which pluralizes 2-place predicates of type $\langle e,\langle v,t\rangle\rangle$, requiring the individual and event arguments to be Cov members, as illustrated in (27).

(26) $[\![\text{PL}]\!] = \lambda \text{Cov}.\lambda R_{\langle e,\langle v,t\rangle\rangle}.\lambda x.\lambda e\text{: PART(Cov, } e + x).$
   $**[\lambda x'.\lambda e'.\text{Cov}(e')\ \&\ \text{Cov}(x')\ \&\ R(x')(e')](x)(e)$

(27) a. $g(\text{Cov})[C+E] = \{\text{John, Bill}, e_1, e_2\}$ with $E = e_1 + e_2$ and $C = \text{John} + \text{Bill}$
   b. $[\![\text{weigh 40kg}]\!] = \{\langle \text{John}, e_1\rangle, \langle \text{Bill}, e_2\rangle\}$

In addition, Beck & von Stechow define the concepts of the relevant predecessor events and the immediately preceding event (see (29)-(31)) as follows:

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[1] '[Cov [1 [t_1 weigh 40 kg]]' is combined via the Predicate Modification rule (Heim & Kratzer 1998)。

(i) Predicate Modification (PM)
If α is a branching node with daughters $\{\beta, \gamma\}$, and $[\![\beta]\!]$ and $[\![\gamma]\!]$ are both in $D_{\langle e,t\rangle}$, then $[\![\alpha]\!] = \lambda x \in D_e.[[\![\beta]\!](x) = [\![\gamma]\!](x) = 1]$

PM can be generalized to conjoin two predicates in $D_{\langle \alpha,t\rangle}$ (see (57) in the text).

(28) Min entered the room after Katie.

(29) a. λe. Min enters the room in e & $\tau(e) > \tau(\iota e'$: Katie enters the room in e')

b. λe. Min enters the room in e & Katie enters the room in pred(e)

pred(e) = the relevant predecessor of e

(30) ⟦after Katie⟧ = $\lambda R_{<e,<v,t>>}.\lambda x.\lambda e.R(x)(e)$ & R(Katie)(pred(e))

(31) ordering relation on events:

e is before e': e $\angle$ e' iff $\tau(e) < \tau(e')$

(32) the immediate predecessor of e:

Pred(e) = $\iota e'$: e' $\angle$ e & $\forall$e"[e" $\angle$ e $\rightarrow$ e" = e' or e" $\angle$ e']

Not only events but individuals can be ordered in a sequence, as defined and illustrated below:

(33) ordering relation on individuals:

x $\angle$ y iff $\exists$e[x is in e and $\forall$e'[y is in e' $\rightarrow$ e $\angle$ e']

x is before y iff x occurs in a relevant event before y does.

(34) the immediate predecessor of x:

Pred(x) = ιy: y $\angle$ x & $\forall$z [z $\angle$ x $\rightarrow$ z = y or z $\angle$ y]

(35) Cov[x] is a sequence iff Cov[x] = {x_1,…x_n} and for any x_i, x_{i+1}: $x_i \angle x_{i+1}$

e.g.

Cov[these 3 dogs] = {x_1, x_2, x_3} such that for any x_i, x_{i+1}: $x_i \angle x_{i+1}$: {D1,D2,D3}

(36) Cov[e] = {e_1,…e_n} such that for any e_i, e_{i+1}: $e_i \angle e_{i+1}$

Based on the above notions, the truth conditions of (9a) can be expressed as (37).

(37) a. <3D,e> $\in$ **[$\lambda x.\lambda e'$.Cov(x) & Cov(e') & x enters the room in e' & pred(x) enters the room in pred(e')]

b. $\forall$x[x $\leq$ 3D & Cov(x) $\rightarrow$ $\exists$e'[e' $\leq$ e & Cov(e') & x enters the room in e' & pred(x) enters the room in pred(e') & $\forall$e'[e' $\leq$ e & Cov(e') $\rightarrow$ $\exists$x[x $\leq$ 3D & Cov(x) & x enters the room in e' & pred(x) enters the room in pred(e')]]

Beck & von Stechow proposed that the truth conditions in (37) be obtained using the sequence pluralization operator PL^{seq}, which requires the covers of the relevant entities and events to be a sequence.

(38) ⟦PL^{seq}⟧ = $\lambda Cov.\lambda R.\lambda z.\lambda e$.Cov[e] is a sequence & Cov[z] is a sequence & **[$\lambda z'.\lambda e'$.Cov(z') & Cov(e') & R(z')(e')](z)(e)

According to this analysis, the logical form and semantic computation of (9) are as follows (Beck & von Stechow 2007: 225-226).

(39) these 3 dogs [PL^{seq}_{Cov} λx [$_{vt}$ x [$_{evt}$ entered the room]
[$_{(evt)(evt)}$ one after the other x]]]
anaphor

(40) ⟦one after the other x⟧^{g} = λR.λy.λe. R(y)(e) & R(pred(g(x)))(pred(e))

(41) ⟦(39)⟧^{g} =
λe.<3D,e> ∈ ⟦PL^{seq}_{Cov}⟧(λx.λe'. x enters the room in e' & pred(x) enter the room in pred(e')])
= λe.Cov[3D] is a sequence & Cov[e] is a sequence & <3D,e> ∈
**[λx.λe'.Cov(x) & Cov(e') & x enter the room in e' & pred(x) enter the room in pred(e')]

Finally, Beck & von Stechow observed that explaining the meaning of (39) in terms of the individual sequence would run into the first dog problem, which is that the first member in a sequence is not preceded by another member in the sequence. As a result, (41) can never be true. They proposed using the pragmatic mechanism of domain restriction (C), which is commonly used for quantifiers in natural language, to solve this problem. In (42), for example, the universal quantifier *everyone* must be understood as *everyone but Arnim*, excluding *Arnim* from the domain of universal quantification, that is, C' = C – {Arnim}.

(42) Every$_{C}$ one has a faster computer than Arnim.
every(C)(A)(B) = 1 iff for every x such that C(x) & A(x): B(x).

They refer to this operation as "domain subtraction". (43) is another illustrative example with C' = C – {the 1st sentry}.

(43) 20 Wachposten sind so in einer Reihe aufgestellt, dass jeder den vorherigen sehen kann.
'20 sentries are standing in a row such that each can see the one before him.' (Beck & von Stechow 2007: 226)

In response to the first dog problem, Beck & von Stechow slightly revise their semantics of the PL^{seq} operator, incorporating domain subtraction into the logical representation. I omit the revision to simplify the logical representations and direct the reader to Beck & von Stechow's (2017: 227-228) original analysis. The reader only needs to remember that domain subtraction can solve the first dog problem.

Although the Chinese "*yi*-Cl *bi yi*-Cl" construction is not the same as constructions with pluractional adverbials, Beck & von Stechow's suggested analysis of them and Beck's (2012) analysis of English comparatives in (44) to be presented below shed light on how to analyze the former.

(44) a. Otto ran faster and faster. (Beck 2012: 80)
b. Otto ran faster every time. (Beck 2012: 83)

According to Beck (2012: 80), (44a) can be paraphrased as (45), with the truth conditions given in (46).

(45) The situation can be divided into a sequence of relevant subevents such that in each of them, Otto's speed exceeded his speed in the predecessor event.
(46) a. $\lambda E.E \in [{}^*\lambda e.Cov(e)\ \&\ Speed_e(Otto) > Speed_{pred(e)}(Otto)]$
b. $\forall e \in Cov[E]: \exists! e' \in Cov[E]: e' = pred(e)$

To get the result in (46), (44) must include the PL^{seq} operator in (47) and an implicit first argument of *-er*, which Beck takes to be internally complex, consisting of an event and a function *f* that maps events to Otto's speed in them.

(47) $[[PL^{seq}\ Cov]\ [_{\alpha}\ \lambda e\ [[-er\ f(pred(e))\ [\lambda d.Otto\ ran\ d\text{-}fast\ in\ e]]]]]$
(48) a. $[-er\ f(pred(e))\ [\lambda d.\ Otto\ ran\ d\text{-}fast\ in\ e]) = Speed_e(Otto) > f(pred(e))$
b. $f: e \rightarrow Speed_e(Otto)$
c. $Speed_e(Otto) > Speed_{pred(e)}(Otto)$
"Otto ran faster in e than in e's predecessor event"

The definition of the PL^{seq} operator is defined by Beck as (49). The application of this operator to its sister interpretation (a predicate of events) then yields the truth conditions in (50) for (44):

(49) $[\![PL^{seq}]\!] = \lambda Cov.\lambda P.\lambda E.Cov[E]$ is a sequence & $E \in [{}^*\lambda e.Cov(e)\ \&\ P(e)]]$
(50) $[[PL^{seq}\ Cov]\ [\lambda e\ [[-er\ f(pred(e)\ [\lambda d.Otto\ ran\ d\text{-}fast\ in\ e])] =$
$\lambda E.Cov[E]$ is a sequence & $E \in {}^*\lambda e.[Cov(e)\ \&\ Speed_e(Otto) > Speed_{pred(e)}(Otto)]$
"The situation can be divided into a sequence of relevant subevents such that in each of them, Otto's speed exceeded his speed in the predecessor event."
(Beck 2012: 81)

Sequence pluralization can also be applied to relations between individuals and events such as (51a), whose logical representation is (52).

(51) a. The conference was a bit boring in the beginning, but the talks got better and better.
b. “The situation and the talks can be divided into a sequence of relevant subparts such that in each subsituation, the talk in that subsituation was better than the predecessor talk in the predecessor event.”
(Beck 2012: 82)

(52) [[[the talks] [[PL^{seq} Cov] [λxλe [[-er f(pred(e)(pred(x)) [λd. x was d-good in e]]]]]
=
λE.Cov[E] is a sequence & Cov[T] is a sequence & <T,E> ∈ [**λxλe.Cov(e) & Cov(x) & $Quality_e$(x) > $Quality_{pred(e)}$(pred(x))]]
(where $Quality_e$(x) stands for max(λd.x was d-good in e)) (Beck 2012: 82)

According to Beck (2012: 83), reduplicative comparisons allow for exceptions. Therefore, even if Otto occasionally failed to run faster in the case of (44a) and there were one or two talks that did not get better during the conference in the case of (51a), they could still be true. In contrast, universal comparisons like (44b) do not allow for exceptions, Beck claims.

(53) The situation can be divided into a sequence of relevant subevents/”times” such that in each of them, Otto’s speed exceeded his speed in the predecessor event, and together the “times” cover/exhaust the situation. (Beck 2012: 83)

Thus, in order to capture the meaning of universal comparisons, Beck proposed to analyze *every time* and the like as functioning similarly to Brisson’s (1998) *all* with a good-fitting requirement on the cover, i.e., the condition ‘∪Cov[E] = E’ in (54).

(54) λE.Cov[E] is a sequence & E ∈ [*λe.(e) & $Speed_e$(Otto) > $Speed_{pred(e)}$(Otto) & ∀e ∈ Cov[E]:time(e) & ∪Cov[E] = E (Beck 2012: 84)

More specifically, Beck (2012: 84) suggests that *every time*/*year* is the outermost element in the logical representation as shown in (55 = 44b), and has the semantics in (56).

(55) [[every time Cov] [[PL^{seq} Cov] [λe [[-er f(pred(e)) [λd. Otto ran d-fast in e]]]]]

(56) ⟦every time/year⟧ = λCov.λE.$\forall$e $\in$ Cov[E]: time/year(e) & $\cup$Cov[E] = E

"all time/year parts of E are in the cover"

$\approx$ "Cov partitions E into times/year"

In (55), the phrase *every time Cov* and the pluralized event properties following it are both expressions of type <v,t> , rendering functional application inapplicable. However, as shown below, a generalized version of the Predicate Modification rule (see footnote 1) can conjoin two predicates of type <v,t> to produce a new predicate of type <v,t>.

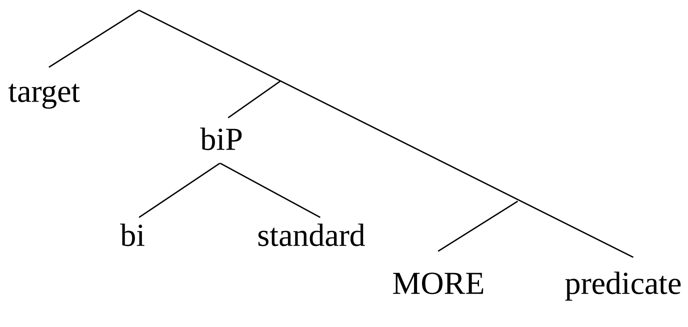
(57) [[$_{<v,t>}$ every time$_{Cov}$] [$_{<v,t>}$ [PL^{seq}_{Cov}][λe [[-er f(pred(e) [λd. Otto ran d-fast in e])]]] =
λE. Cov[E] is a sequence & $\forall$e $\in$ Cov[E]: time(e) & $\cup$Cov[E] = E & E $\in$
[*λe.Cov(e) & Speed$_e$(Otto) > Speed$_{pred(e)}$(Otto)]]

3. Theoretical Foundation for Chinese Comparatives

There are two main approaches to Chinese *bi*-comparatives in the literature: the clausal approach, as proposed by Liu (1997; 2011; 2014), Hsieh (2017), and Erlewine (2018), and the phrasal approach, as adopted by Lin (2009). These analyses are reviewed in depth by Lin (2022). I won't reiterate his remarks on the various analyses, but I will utilize his phrasal technique because it can cope with the *bi*-comparatives more elegantly.

In Lin's (2009, 2022) opinion, Chinese *bi*-comparatives are used to compare arguments. Therefore, any argument in a gradable predicate's argument structure, such as people, events, places, and times, can be used as comparison items, and several arguments can be compared at the same time in a single *bi*-comparative. This article, following Lin's works, assumes the syntactic structure in (58).

(58)



The morpheme MORE in (58) is comparable to the English *-er* morpheme. The combination of MORE and predicate will result in a 2-place comparative predicate, with the standard (the first argument) and the target (the second argument) serving as comparison items. *Bi* simply serves to introduce the standard item. The denotations of *bi* and MORE are given as follows:

(59) a. biP → [bi XP]

b. $[\![\text{bi}]\!] = \lambda x.\, x$

c. $[\![\text{biP}]\!] = \lambda x.x([\![\text{XP}]\!]) = [\![\text{XP}]\!]$

(60) a. comparative predicate → [MORE predicate]

b. $[\![\text{MORE}]\!] = \lambda \wp_{<d,<e,t>>}\lambda x \lambda y[\iota_{max}\, d.\wp(d)(y) > \iota_{max}\, d.\wp(d)(x)]$

c. $[\![\text{predicate}]\!] = \lambda d \lambda x.$ x is d-predicate (x's degree of predicate-ness)

d. $[\![\text{MORE predicate}]\!]$

$= \lambda x \lambda y[\iota_{max}\, d.\text{predicate}(d)(y) > \iota_{max}\, d.\text{predicate}(d)(x)]$

Based on the definitions in (59) and (60), the meaning of a simple *bi*-comparative like (61a) has the meaning in (61b).

(61) a. Zhangsan bi Lisi gao

b. $\iota_{max}\, d.\text{tall}(d)(\text{Zhangsan}) > \iota_{max}\, d.\text{tall}(d)(\text{Lisi})$

"Zhangsan's maximal degree of height is greater than Lisi's maximal degree of height."

4. A semantic Analysis of the "Yi-Cl bi Yi-Cl" construction

One distinguishing feature of the "*yi*-Cl_1 *bi yi*-Cl_2" construction is that it frequently contains an overt plural XP phrase that restricts the domain from which the two *yi*-Cl phrases can select their referents. As an illustration, the referents of the two *yi-ge* in the sentence *Tamen jia de na san-ge nüer yi-ge bi yi-ge gao* 'Each of the three daughters in his family is taller than the other' must be chosen from the plural noun phrase *tamenjia de na san-ge nüer* 'the three daughters in his family'. When an overt XP is absent from the structure, one can always infer a covert one from the context. From a semantics point of view, the plural XP is functionally like a subject, whereas the "*yi*-Cl_1 *bi yi*-Cl_2 AP" functions as a predicate predicative of the plural XP.

As mentioned in the introduction, a comparison of two *yi*-Cls must involve two adjacent items in a sequence such that the referent of the *yi*-Cl_1 phrase comes after the referent of the *yi*-Cl_2 phrase. Very interestingly, the data from online sources reveal that the word *qian* 'previous' can occasionally appear overtly before *yi*-Cl_2, as illustrated below.

(62) a. Jiu zheyang, yi tian bi qian yi tian duo pao yi duan,…
so this.way one day than previous one day more run one section
'So I ran more distance every day,…'
b. Yejiushishuo, yi ci bi yi ci nengli geng qiang, danshi yi ci bi
that.is.to.say one time than one time ability more strong but one time than
qian yi ci suo yao chengshou de tongku geng qiang
previous one time SUO must bear Re pain more strong
'That is, the ability becomes stronger every time, but the pain that one has to endure also does.'
c. Xuduo shihou tamen bixu yi shi-ge huang lai yanshi qian yi-ge huangyan,
many times they must with ten-Cl lie to mask previous one-Cl lie
jieguo shi yi ge bi qian yi ge hai lipu
as.a.result be one Cl than previous one Cl even.more go.too.far
'Frequently they have to tell ten lies to mask the previous lie. As a result, each lie is more ridiculous than the other.'

On the other hand, we find that the universal quantifier *mei* 'every' may occasionally appear before *yi*-Cl_1 without altering the meaning of the statement.

(63) a. Jiexialai, mei yi tian bi yi tian leng, yifu yi jian bi yi jian chuan
and.then every one day than one day cold cloth one Cl than one Cl wear
de hou
DE thick
'Then, one wears thicker clothing every day, as the temperature gets colder each day.'
b. Buguo wulun ruhe ni hui kanjian haizi mei yi ci bi yi ci
but no.matter how you will see children every one time than one time
geng hao de biaoxian
more good DE performance
'No matter what, you will see the children perform better every time.'
c. Ta yongyou wu qian duo chu gudai yanhua yizhi, mei yi
it own five thousand more place ancient petroglyph ruins every one
chu dou bi qian yi chu geng yinrenrusheng
location all than previous location more attractive

‘There are more than five thousand ancient petroglyph ruins, and each of them is more attractive than the last.’

As evidenced by the examples in (64), there are also cases where both *mei* and *qian* appear in the same “*yi*-Cl_1 *bi yi*-Cl_2” construction.

(64) a. Zhiyao women mei yi tian bi qian yi tian geng hao, buguan
As.long.as we every one day than previous one day more good regardless
da shi xiao shi dou you suo jinbu, na jiu shi mei de
big matter small matter all have SUO progress that then be beautiful DE
‘As long as we make more progress every day, it is beautiful regardless of big or small matter.’

b. Zhangwo shuzi cai nenggou manman mei yi ci bi qian yi
grasp number only can slowly every one time than previous one
ci jinbu
time progress
‘Only when one grasps numbers can he slowly make more progress every time.’

c. Danshi shijishang zhe-ge saidao you wushu-ge juli zucheng, erqie
but in.fact this-Cl track from countless-Cl distance constitute and
mei yi-ge bi qian yi-ge chang
every one-Cl than previous one-Cl long
‘But in fact, this track is made up of countless distances, and each one of them is longer than the other.’

d. Zheli you daliang butong de jingguan, mei yi chu dou bi qian yi
here have lots.of different DE landscapes every one place all than previous one
chu geng meili
place more beautiful
‘There are lots of different landscapes here. Each place is more beautiful than the other.’

The above examples in (62) through (64) indicate that the *yi*-Cl_1 phrase in the “*yi*-Cl_1 bi *yi*-Cl_2” construction has a universal interpretation. Evidence in support of it can be adduced from expressions that occur with a universal quantifier. It is common knowledge that the universal quantifier *mei* in Mandarin Chinese typically requires the adverb *dou* ‘all’, as in the sentence *mei-ge ren *(dou) hen congming* ‘Everyone is smart’. Interestingly, *dou* may appear after *yi*-Cl_1 in the “*yi*-Cl_1 *bi yi*-Cl_2” construction, as attested by the following online examples.

(65) Xiandai shehui renmen dui wuzhi de zhuiqiu shi yi tian dou bi yi tian gao
Modern society people to material DE pursuitbe one day all than one day high
'In modern society, people's pursuit of materials is higher every day.'

(66) Mei yi ci de tian hai zao lu dou puohuai-le haiyang shengtai,
every one time DE fill sea make land all destroy-Asp marine ecology
qie yi ci dou bi yi ci hai gao
and one time all than one time even high
'Every land reclamation destroyed marine ecology and the destruction was more serious every time.'

(67) Zhongguo xinnian yuanlai yi-ge dou bi yi-ge piaoliang
Chinese bride turn.out one-Cl all than one-Cl beautiful
'Each Chinese bride turns out to be more beautiful than the other.'

Another argument in favor of the *yi*-Cl_1 phrase's universal interpretation is the presence of the adverb *jihu* 'almost' before *yi*-Cl_1 like the examples in (68) below. This adverb is most frequently used with a universal expression. Thus, while saying *jihu mei yi ge ren dou lai-le* 'almost everyone came' is acceptable, it is improper to say **jihu henduo/yixie/yi-ge ren lai-le* 'almost many people/some people/one person came'. The possibility of *jihu* occurring before *yi*-Cl_1 thus confirms the universality of *yi*-Cl_1.

(68) a. Ben zhou jihu yi tian bi yi tian hai re
this week almost one day than one day more hot
'It has been getting hotter every day this week.'

b. Wo ting-guo de hen duo rensheng gushi, jihu yi-ge bi yi-ge
I hear-Asp Rel very many life story almost one-Cl than one-Cl
can
miserable
'Almost every life story that I have heard is more miserable than the last.'

c. Jihu yi chu bi yi chu rang ren yanjie da kai
almost one place than one place make people eyes big open
'Almost every place is more eye-opening than the last.'

In light of the above discussions, I conclude that the *yi*-Cl_1 phrase in the "*yi*-Cl_1 *bi yi*-Cl_2" construction has a universal interpretation, whereas the *yi*-Cl_2 phrase has an adjacency requirement. To explain why the two *yi*-Cls are interpreted differently, I contend that the *yi*-Cl_1 and *yi*-Cl_2 phrases each contain a different covert determiner.

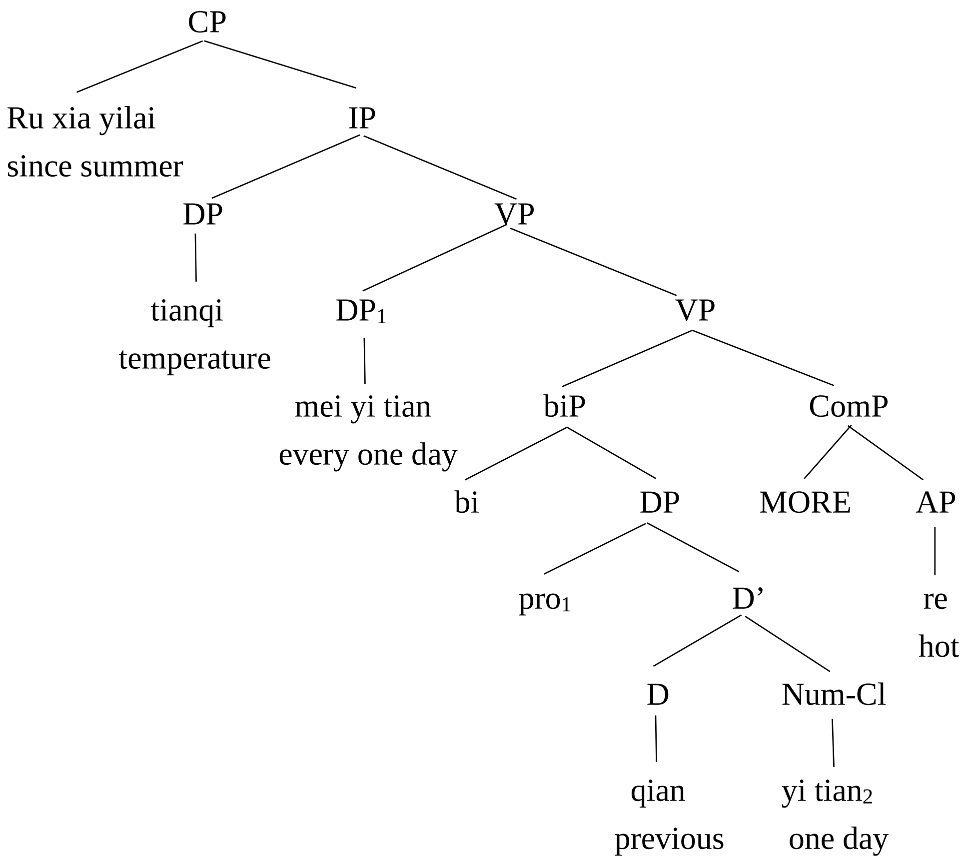
The silent determiner for the former is a covert universal determiner equivalent to *mei*, hence the universal interpretation of *yi*-Cl$_1$ and the possible presence of *dou* and *jihu*.

On the other hand, because *qian* may be overtly present in the *yi*-Cl$_2$ phrase, I propose that a silent spatial-temporal determiner analogous to *qian* ‘previous’ or *shang* ‘last’ occupies the determiner head. Additionally, this determiner head comes with another hidden pronominal argument that is syntactically and semantically bound by the *mei yi*-Cl$_1$ phrase. I assume that the pronominal argument is located in the specifier position. Take, for example, *yi tian$_1$ bi yi tian$_2$*. Its structure is more accurately represented as (69).

(69) [[mei yi-tian]$_1$ [bi [pro$_1$ [qian yi-tian]$_2$] MORE-predicate]]

It is worth noting that an overt time expression such as the word *shengdanjie* ‘Christmas’ in the phrase *shendanjie qian yi tian* ‘the day before Christmas’ or the word *hunli* ‘wedding’ in the phrase *hunli qian yi tian* ‘the day before the wedding’, may come before the determiner *qian*. Given this, it is reasonable to say that pro$_1$ in (69) is at the exact same position as *shengdanjie* or *hunli*. Under these assumptions, the actual structure of example (1) is (70).

(70)



It is not unusual to propose a complex structure with a hidden pronominal argument. Similar suggestions have been made for various structures by Cooper (1979), Chierchia (1993), von Fintel (1994), Marti (2003), and Beck (2012). In fact, Mandarin Chinese has another construction of the form "*yi*-Cl_1 Verb *yi*-Cl_2" with two parallel *yi*-Cls, which communicates comparable universal interpretations and the adjacency requirement. Here are a couple of examples.

(71) a. Chi zhitongyao ye meiyou xiaoyong, qi tengtong shi yi ci sheng-guo
eat painkillers also not effect the pain be one time exceed-Asp
yi ci
one time
'Taking painkillers is also of no use. The pain has gotten worse each time.'

b. Women shou qian shou, yi-ge qian-zhe yi-ge
we hand in hand one-Cl hold-Asp one-Cl
'We were hand in hand with each one holding the other.'

c. Tamen zhongzhongdi shuailuo, yi-ge die-zhe yi-ge
they heavily fall one-Cl pile-Asp one-Cl
'They fell heavily with each one piling on top of the other.'

The first *yi*-Cls in (71), like the "*yi*-Cl_1 *bi yi* Cl_2" construction, have a universal interpretation, whereas the second *yi*-Cls have the immediate adjacency requirement. It is reasonable to say that silent determiners and hidden pronominal arguments are also present in the "*yi*-Cl_1 Verb *yi*-Cl_2" construction.

The postulation of the silent head *qian* enables us to explain the adjacency interpretation in a very natural way. Consider the phrase *shendanjie qian yi tian* 'the day before Christmas'. This phrase refers to the 24-hour period immediately preceding Christmas, not any other 24-hour period preceding Christmas. A similar requirement holds in English. Consider the phrase *the three hours before the trial*. Despite the fact that there exist many three-hour periods before the trial, only the one that comes right before it starts is indicated by the phrase, according to Móia (1998: note 5). In other words, both *before* in English and *qian* in Chinese are subject to the immediate adjacency requirement. Therefore, the phrase pro_1 *qian yi* $tian_2$ in (69) must refer to the day immediately preceding the day denoted by pro_1. Since pro_1 is bound by *yi* $tian_1$, the day denoted by *yi* $tian_2$ must come right before the day denoted by *yi* $tian_1$.

Given the above assumptions, the structure (70) conveys (72a), which can be visually represented as (72b).

(72) a. (70) describes a plural event E that can be divided into many subevents $e_1 \ldots e_n$ such that the interval denoted by *ru xia yilai* ‘since summer’ is partitioned into a sequence of days $D_1 \ldots D_n$. The maximal degree of temperature d_i on each day D_i in subevent e_i is greater than the maximal degree of temperature d_{i-1} on D_{i-1} in event e_{i-1}.

b. ⟶

| --e_1/D_1--| -- e_2/D_2 --| --e_3-/D_3--| --e_4/D_4-- |

$\iota_{max}\, d_1 < \iota_{max}\, d_2 < \iota_{max}\, d_3 < \iota_{max}\, d_4$

| ------------------------E-----------------------|

To obtain the meaning in (72), let us assume that *mei yi tian* in (70) undergoes quantifier raising, leaving a trace, as shown by (73).

(73) [$_{CP}$ since summer [$_{IP}$ every one day$_1$ [λ_1 [$_{IP}$ temperature [t_1 [pro$_1$ [bi [qian yi tian$_2$]] re]]]]]

After the plural PL^{seq} operator is inserted to (73), the logical representation is (74), with the event argument being disregarded for the time being.

(74) [since summer] [[every one day Cov] [[PL^{seq} Cov] [λt_1. ι_{max} d.hot(d)(t_1)(the temperature) > ι_{max} d.hot(d)(the day immediately preceding t_1)(the temperature)]]]]

Because *the day immediately preceding t_1* is equivalent to *pred*(t_1) in (74), (74) can be simplified as (75).

(75) [[Since summer] [[every one day Cov] [[PL^{seq} Cov] [λt_1. ι_{max} d.hot(d)(t_1)(the temperature) > ι_{max} d.hot(d)(pred(t_1))(the temperature)]]]]

When the sequence pluralization operator PL^{seq} in (75) is used to pluralize its sister denotation, the logical form (76) is produced, resulting in a new predicate of times.

(76) [[PL^{seq} Cov] [λt_1[ι_{max} d.hot(d)(t_1)(the temperature) > ι_{max} d.hot(d)(pred(t_1))(the temperature)]]]

= λI.Cov[I] is a sequence & I $\in$ [*λt_1.Cov(t_1) & ι_{max} d.hot(d)(t_1)(the temperature) > ι_{max} d.hot(d)(pred(t_1))(the temperature)]

Next, we have to consider what *every one day Cov* in (75) denotes. Recall that in Beck's (2012) analysis of universal comparisons such as *Otto ran faster every time/year*, the function of *every time/year* is to partition a plural event E into subevents that are times and years (cf. (56)). Taking a departure from Beck's analysis, I assume that the plurality that is partitioned by *mei yi*-Cl is not necessarily a plurality of events but can also be a plurality of locations or individuals, depending on which classifier is present. Thus, the function of *every one day* in (75) is to partition a plurality of intervals into a cover consisting of a sequence of day parts, and all day parts of the interval are included in the cover as specified in (77a):

(77) a. ⟦mei yi tian⟧ = $\lambda Cov.\lambda I.\forall t_i \in Cov[I]: day(t_i)\ \&\ \cup Cov[I] = I$
"all day parts of I are in the cover"
≈ "Cover partitions I into days"
b. ⟦ mei yi tian Cov⟧ = $\lambda I.\forall t_i \in Cov[I]: day(t_i)\ \&\ \cup Cov[I] = I$

When (77a) is applied to a cover, it produces (77b), another expression of type <i,t>. Because (77b) and its sister denotation in (76) are both expressions of type <i,t>, functional application cannot apply. Nonetheless, they can be combined as a new predicate of type <i,t> by way of the Generalized Predicate Modification rule to two expressions of type <i,t> (see footnote 1 and (82b) for the definition of this rule).

(78) [[every one day Cov] [[PL^{seq} Cov] [$\lambda t_1.\iota_{max}$ d[hot(d)(t_1)(the temperature) > ι_{max} d [hot(d)(pred(t_1))(the temperature)]]]
= $\lambda I.\forall t_i \in Cov[I]: day(t_i)\ \&\ \cup Cov[I] = I$ & Cov[I] is a sequence & I ∈ [*λt_1.Cov(t_1) & ι_{max} d.hot(d)(t_1)(the temperature) > ι_{max} d.hot(d)(pred (t_1))(the temperature)]

Assuming that *ru xia yilai* 'since summer' refers to the interval SU of type <i>, this interval can then be used as the argument of (78). Or, to put it another way, the predicate in (78) denoting properties of times is predicative of the interval referred to by SU.

(79) [[since summer] [[every one day Cov] [[PL^{seq} Cov] [$\lambda t_1.\iota_{max}$ d.hot(d)(t_1)(the temperature) > ιmax d.hot(d)(pred(t_1))(the temperature)]]]]
= [$\lambda I.\forall t_1 \in Cov[I]: day(t_1)\ \&\ \cup Cov[I] = I$ & Cov[I] is a sequence & I ∈ [*λt_1.Cov(t_1) & ι_{max} d.hot(d)(t_1)(the temperature) > ι_{max} d.hot(d)(pred (t_1))(the temperature)]] (SU) = 1 iff
= $\forall t_1 \in Cov[SU]: day(t_1)\ \&\ \cup Cov[SU] = SU$ & Cov[SU] is a sequence & SU ∈

$[{}^*\lambda t_1.Cov(t_1)\ \&\ \iota_{max}\ d.hot(d)(t_1)(\text{the temperature}) > \iota_{max}\ d.hot(d)(pred\ (t_1))(\text{the temperature})]$

What the truth conditions in (79) amount to is the following: Each of the day parts that comprise SU's cover has a higher maximum temperature than the day before it. Such truth conditions can never, strictly speaking, be met because SU's first day has no predecessor day. Therefore, the first day of SU must not be taken into account. This is the familiar first dog problem that was previously mentioned and can be resolved using the domain subtraction method suggested by Beck & von Stechow (2007). In what follows, I will skip over this concern.

In our discussion of (76) through (79), we did not address the event argument. The addition of an event argument should not significantly change the logical representation. Assume that v and v', respectively, are the target and standard events. Because the standard event v' occurs immediately before the target event v, it can be rewritten as pred(v). Consequently, the logical representation of the structure (70) is (80) with the event argument added.

(80 [[since summer] [[every one day Cov] [[PL^{seq} Cov] $[\lambda t_1.\lambda v.\iota_{max}\ d.hot(d)(t_1)(\text{the temperature})(v) > \iota_{max}\ d.hot(d)(pred(t_1))(\text{the temperature})(pred(v))]]]]$

The sequence pluralization operator PL^{seq} in (80) applies to a time-event relation of type <i,<v,t>>, resulting in the representation (81), which is another relation between times and events.

(81) [[PL^{seq} Cov]$[\lambda t_1.\lambda v.\iota_{max}\ d.hot(d)(t_1)(\text{the temperature})(v) > \iota_{max}\ d.hot(d)(pred(t_1))(\text{the temperature})(pred(v)]]$

$= \lambda I.\lambda V.$ Cov[I] is a sequence & Cov[V] is a sequence & $\langle I,V\rangle \in$ $[{}^{**}\lambda t_1.\lambda v.Cov(t_1)\ \&\ Cov(v)\ \&\ \iota_{max}\ d.hot(d)(t_1)(\text{the temperature})(v) > \iota_{max}\ d.hot(d)(pred(t_1))(\text{the temperature})(pred(v))]$

The next step is to combine (81) with *every one day Cov*. However, functional application cannot be used due to a type mismatch because the former is an expression of type <i,<v,t>> but the latter has a semantic type of <i,t>. It is clear from our previous discussion of (79) that the <i> argument of <i,t> and the <i> argument of <i,<v,t>> be identified with one another. One way to approach this is to say that the theory of grammar has a rule of time identification as shown in (82a), which is conceptually similar to Kratzer's (1996) event identification rule. This rule can actually be more broadly applied, as in (82b), to deal with other types of argument identification, such as people, things, locations, and events.

(82) a. Time Identification

f	g	$\rightarrow$	h
<i,t>	<i, <v,t>>		<i,<v,t>>
			$\lambda t \lambda e_v[g(t)(e) \wedge f(t)]$

b. Generalized Argument Identification

f	g	$\rightarrow$	h
$<\alpha,t>$	$<\alpha, <v,t>>$		$<\alpha,<v,t>>$
			$\lambda u_\alpha \lambda e_v[g(u)(e) \wedge f(u)]$

Given the above argument identification rule, *every one day Cov* in (80) can then be combined with its sister, i.e., the meaning in (81), yielding (83)

(83) $\lambda I.\lambda V.\forall t_1 \in$ Cov[I]: day(t_1) & $\cup$Cov[I] = I & Cov[I] is a sequence & Cov[V] is a sequence & <I,V> $\in$ [**$\lambda t_1.\lambda v$.Cov(t_1) & Cov(v) & ι_{max} d.hot(d)(t_1)(the temperature)(v) > ι_{max} d.hot(d)(pred(t_1))(the temperature)(pred(v))]

(83) can then be applied to the pair <SU,E> deriving the final outcome (84) with the '$\forall\exists\ldots\forall\exists$' quantification over the pair <SU,E>. (84) is explained in prose right below the representation.

(84) $\forall t_1 \in$ Cov[SU]: day(t_1) & $\cup$Cov[SU] = SU & Cov[SU] is a sequence & Cov[E] is a sequence & <SU,E> $\in$ [**$\lambda t_1.\lambda v$.Cov(t_1) & Cov(v) & ι_{max} d.hot(d)(t_1)(the temperature)(v) > ι_{max} d.hot(d)(pred(t_1))(the temperature)(pred(v))]

"The plural event E and interval SU can be divided into a sequence of relevant subparts such that in each subevent of E, there is a day part in SU on which its temperature is greater than the temperature of that day part's predecessor day, and for each day part of SU, there is a subevent e of E in which the day's temperature is greater than the predecessor day's temperature in the predecessor event."

The above illustration shows how the "yi-Cl_1 bi yi-Cl_2" construction should be analyzed when the classifier is a time classifier. The same analysis can be applied to individual and location classifiers. As mentioned, the proposed analysis of *mei yi-Cl* is not exactly the same as Beck's analysis of *every time/year* for English universal pluractional comparisons. According to her analysis of *every time/year*, events are divided into subevents that are times and years. However, it does not make sense in the "yi-Cl_1 bi yi Cl_2" construction to say that a plural event is divided into a series of individuals or locations when the classifier is an individual or location classifier like (85). As mentioned, I assume that the plurality that is partitioned by *mei yi*-Cl is not necessarily a plurality of events but can be a plurality of locations or individuals, depending on which classifier is present. For example, when the classifier is an individual classifier such as *ge*, the meaning of *mei yi ge* is (85):

(85) $[\![\text{mei yi ge Cov}]\!] = \lambda X.\forall x_i \in \text{Cov}[X]\text{: Individual}(x_i) \; \& \cup\text{Cov}[X] = X$

Now consider (87), which is (86)'s logical form, with NOP standing for next opponents.

(86) Jiexialai de duoshou, yi-ge hui bi yi-ge qiang
next DE opponent one-Cl will than one-Cl strong
'Each next component is stronger than the other.'

(87) [[NOP] [[mei yi-ge Cov] [[PL^{seq} Cov] [$\lambda x_1.\lambda v.\iota_{max}$ d.strong(d)(x_1)(v) > ι_{max} d.strong(d)(pred(x_1))(pred(v))]]]]

In (87), after the sequence pluralization operator PL^{seq} is applied to its sister node, which is a predicate of type <e,<v,t>>, the result is (88):

(88) [$\lambda X.\lambda V$.Cov[X] is a sequence & Cov[V] is a sequence & $\langle X,V \rangle \in$ [$^{**}\lambda x_1.\lambda v$.Cov($x_1$) & Cov(v) & ι_{max} d.strong(d)(x_1)(v) > ι_{max} d.strong(d)(pred(x_1))(pred(v))]]

The combination of (85) with (88) by the Generalized Argument Identification rule yields the result in (89), which in turn takes the plural individual NOP and the contextually provided plural event E, as its argument, as shown by (90):

(89) $\lambda X\lambda V.\forall x_i \in$ Cov[X]: Individual(x_i) & $\cup$Cov[X] = X & Cov[X] is a sequence & Cov[V] is a sequence & $\langle X,V \rangle \in$ [$^{**}\lambda x_1.\lambda v$.Cov($x_1$) & Cov(v) & ι_{max} d.strong(d)(x_1)(v) > ι_{max} d.strong(d)(pred(x_1))(pred(v))]

(90) $\forall x_i \in$ Cov[NOP]: Individual(x_i) & $\cup$Cov[NOP] = NOP & Cov[NOP] is a sequence & Cov[E] is a sequence & $\langle NOP,E \rangle \in$ [$^{**}\lambda x_1.\lambda v$.Cov($x_1$) & Cov(v) & ι_{max} d.strong(d)(x_1)(v) > ι_{max} d.strong(d)(pred(x_1))(pred(v))]

(90) means something similar to (84). Therefore, I will not go over it again. I conclude that given appropriate syntactic and semantic assumptions, the semantics of the "*yi*-Cl_1 *bi yi*-Cl_2" construction can be compositionally derived.

5. Conclusion

This article presents the first in-depth semantic analysis of the "*yi*-Cl_1 *bi yi*-Cl_2" construction in the literature. It is argued that the two parallel *yi*-Cl phrases have a more intricate structure than appears at first glance because they each contain a covert determiner. The silent determiner for *yi*-Cl_1 is a universal quantifier like *mei* 'every', whereas the silent determiner for *yi*-Cl_2 is a spatial-temporal determiner such as *qian* 'previous' or *shang* 'last', which has an additional hidden pronominal argument bound syntactically and semantically by *yi*-Cl_1. The more accurate structure for the "*yi*-Cl_1 *bi yi*-Cl_2" construction thus is "[*mei yi* Cl_1] bi [pro_1 *qian yi*-Cl_2]". According to this analysis, the "pro_1 *qian* yi-Cl_2" refers to the entity that comes immediately before pro_1. Since pro_1 is bound by "*mei yi*-Cl_1", this means that the referent of *yi*-Cl_2 comes right before that of *yi*-Cl_1. Furthermore, the "*yi*-Cl_1 *bi yi*-Cl_2" construction activates sequence pluralization over individuals, times, places, and events, as well as their combinations. It is the interaction of the silent components of the two *yi*-Cls, as well as sequence pluralization, that allows for a number of comparisons to be expressed by a single syntactic structure.

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