

The Semantics of *yue...yue* in Mandarin Chinese

Xiao Li¹ and Carlos A. Fasola²

¹Queens College, CUNY, ²Rutgers University

In this paper, we argue that *yue...yue* in Mandarin Chinese can mark two semantically distinct comparative structures: comparative correlatives and adverbial comparatives. Comparative correlatives are sentences where the first copy of *yue* precedes a gradable predicate (typically adjectives), and adverbial comparatives are sentences where the first copy of *yue* precedes a non-gradable predicate (typically verbs). Comparative correlatives and adverbial comparatives are truth-conditionally distinct. The latter has an obligatory temporal reading absent in the former. Based on the semantic difference of these two types of *yue...yue* comparatives, we argue that gradable predicates (typically adjectives) contain a degree argument in their semantics, but lack a time argument; non-gradable predicates (typically verbs) have a time argument, but lack a degree argument.

1. Introduction

It has been observed that sentences in Mandarin Chinese marked by the form of *yue...yue*, with *yue* preceding either an adjective, e.g. (1a), or a verb, e.g. (1b), correspond to so-called comparative correlatives in other languages, such as the English translations (Chao 1968, Li and Thomas 1981, Hsiao and Tsao 2002, Lin 2007, Liu 2008).

- (1) a. Pingguo *yue* da yue tian.
Apple big sweet
'The bigger an apple is, the sweeter it is.'
- b. John *yue* xihuan Mary, Jane yue gaoxing.
like happy
'The more John likes Mary, the happier Jane is.'

However, it has rarely been noticed that when the first *yue* precedes a certain class of predicates, which we characterize as non-gradable predicates, such as *pao* 'run' in (2a), the sentence receives a different interpretation from typical comparative correlatives and instead receives an interpretation like so-called adverbial comparatives, as in the English translations in (2).

- (2) a. John *yue* pao yue kuai.
 John run fast
 ‘John ran faster and faster.’
- b. John *yue* chang ge, xinqing *yue* hao.
 John sing songs mood good
 As John was singing, his mood became better and better.

The goal of this paper is two-fold. First, we want to establish that comparative correlatives like (1) and adverbial comparatives like (2) are truth-conditionally distinct. The latter has an obligatory temporal interpretation absent in the former. This will be discussed in detail in section 2.

Second, we will propose an analysis which captures the difference in semantic content between comparative correlatives and adverbial comparatives. Our analysis crucially refers to the distinction between gradable and non-gradable predicates. Comparative correlatives have the first occurrence of *yue* appearing in front of a gradable adjective, e.g. *da* ‘big’ in (1a), or a gradable verb, e.g. *xihuan* ‘like’ in (1b). Adverbial comparatives, on the other hand, have the first *yue* occurring in front of a non-gradable verb, e.g. *pao* ‘run’ in (2a) and *chang* ‘sing’ in (2b). The gradability of a predicate can be decided by (i) whether it can be modified by a degree modifier such as *hen* ‘very’, e.g. (3) and (5), and (ii) whether it can be used directly in the *bi*-comparative¹, e.g. (4) and (6).

- (3) a. John hen gao.
 very tall
 ‘John is very tall.’
- b. John hen xihuan zhongguo.
 very like China
 ‘John likes China very much.’
- (4) a. John bi Mary gao.
 tall
 ‘John is taller than Mary.’

¹ The syntax and semantics of the *bi*-comparative have been studied in detail in Li and Thompson (1981), Liu (1996), Xiang (2003, 2005), Erlewine (2007), Lin (2009), Li (2009) and references therein.

- b. ‘John bi Mary xihuan Zhongguo.
like China
‘John likes China more than Mary does.’
- (5) a. *John hen pao
very run
- b. *John hen chang ge.
very sing song
- (6) a. *John bi Mary pao.
run
- b. *John bi Mary chang ge
sing song

Based on the semantic difference between these two types of *yue...yue* comparatives, we argue that gradable predicates (typically Adjectives) do not contain a time argument in their semantics while non-gradable predicates (typically Verbs) do, and, on the other hand, gradable predicates do contain a degree argument, while non-gradable predicates do not.

2. The semantic difference between Comparative correlatives and adverbial comparatives

In this section, we show that comparative correlatives and adverbial comparatives are truth conditionally distinct. To begin with, let us consider the truth condition of a comparative correlative. A comparative correlative is true iff an increase of the degree of the property indicated by the predicate after the first *yue* is accompanied by an increase of the degree of the property indicated by the predicate after the second *yue* (Lin 2007, Liu 2008). For instance, the comparative correlative in (1a) is true iff an increase of an apple’s size correlates with an increase of its sweetness. This meaning is illustrated by the scenario in (8a), in which (1a) is intuitively true.

- (8) a. The scenario in which (1a) is true

Apples’ size

Apple’s degree of sweetness

Apple A: 6 cm in radius
Apple B: 5 cm in radius
Apple C: 4 cm in radius



A’s sweetness: 10
B’s sweetness: 7
C’s sweetness: 5



(1a) is false if an increase of an apples' size does not correlate with an increase of its sweetness, as shown by the scenario in (8b):

(8) b. The scenario in which (1b) is false

Apples' size		Apple's degree of sweetness	
Apple A: 6 cm in radius	↑	A's sweetness: 7	↑
Apple B: 5 cm in radius		B's sweetness: 10	
Apple C: 4 cm in radius		C's sweetness: 5	

By the same token, (1b) means an increase of John's liking of Mary is accompanied by an increase of Jane's happiness.

On the other hand, the truth condition of an adverbial comparative is different from the truth condition of a comparative correlative. An adverbial comparative is true iff the degree of the property indicated by the predicate after the second *yue* increases *over time*. For instance, the adverbial comparative in (2a) is true iff John's running speed increases *over time*. This meaning is illustrated by the scenario in (9a), where (2a) is intuitively true.

(9) a. The scenario in which (2a) is true

Temporally ordered running events		Average Speed	
3 rd week of running	↑	His average speed was 6 mph	↑
2 nd week of running		His average speed was 5 mph	
1 st week of running		His average speed was 4 mph	

(2b) is false if John's speed does not increase over time, as illustrated by the scenario in (9b):

(9) b. The scenario in which (2a) is false

Temporally ordered running events		Average Speed	
3 rd week of running	↑	His average speed was 3 mph	↑
2 nd week of running		His average speed was 6 mph	
1 st week of running		His average speed was 4 mph	

It's worth noting that in evaluating the truth value of (8b) in (9), we do not need to take

into consideration how many times that John ran, unlike what we did in comparative correlatives. All we need to know is whether his speed increases over time.

The truth-conditional difference between comparative correlatives and adverbial comparatives can be further seen by comparing the near minimal pair of the comparative correlative in (10a) and the adverbial comparative in (10b).

- (10) a. John pao-de *yue* duo, ta (jiu) pao-de *yue* kuai.
run-de much he (then) run-de fast
‘The more John ran, the faster he went.’
- b. John *yue* pao *yue* kuai.
run run fast
‘John ran faster and faster.’

In (10a), the first copy of *yue* precedes a gradable adjective *duo* ‘much’. The sentence is based on the two non-comparative sentences—*John pao-de hen duo* ‘John ran a lot’ and *John pao-de hen kuai* ‘John ran fast.’ Semantically, (10a) describes a correlation between the ‘quantity’ of John’s running and the speed he achieved.

The example in (10b), repeated from (2a), is an adverbial comparative as the first copy of *yue* precedes the non-gradable verb *pao* ‘run’. Semantically, (10b) means that John’s running speed increases *over time*. Let us compare the truth-values of (10a) and (10b) in the scenario described in (11):

(11) Scenario: John did marathon training for 3 weeks. In the 1st week, John ran 7 times, and his average running speed was 6 mph. In the 2nd week, John ran 5 times, and his average running speed was 5 mph. In the 3rd week, John ran 3 times, and his average running speed was 4 mph.

Time	Number of Times	Average Speed
Week 3 ↑	John ran 3 times.	His average speed was 4 mph ↓
Week 2 ↑	John ran 5 times.	His average speed was 5 mph ↓
Week 1 ↑	John ran 7 times	His average speed was 6 mph ↓

The comparative correlative in (10a) is ambiguous between two readings. On one reading, it says that the number of times that John ran each week (the second column in 11), correlates with his average speed per week (the third column in 11). Under this reading, (10a) is intuitively true in (11), because as the number of times that John ran per week decreases, his average running speed per week also decreases.

Besides this reading, (10a) has another reading, according to which, (10a) means that there is a correlation between a running total of the number of times that John ran (the

second column in 11'), and his average speed (the third column in 11'). We will refer to this reading as the cumulative reading, and the previous reading as the non-cumulative reading.

(11') Time	Running Total	Average Speed
Week 3 + week 2 + week 3	John ran 3 + 5 + 7 times	His average speed was 5.2 mph
Week 2 + week 1	John ran 5 + 7 times.	His average speed was 5.5 mph
Week 1	John ran 7 times	His average speed was 6 mph

Under the cumulative reading, (10a) is intuitively false, because as the total number of times that John ran increasing, his average speed decreases, as shown in the table in (11').

Comparing (10b) to (10a), (10b) has only one reading, which expresses a correlation between John's running speed (the third column in 11), and time (the first column in 11). Intuitively (10b) is false in (9), because as time moves forward, John's running speed decreases. Let us refer to this reading as the temporal reading.

From the examples in (10a) and (10b), we conclude that the temporal reading is not the same as the non-cumulative reading of comparative correlatives, as they do not yield the same truth value in the given scenario in (11). However, a question arises as to whether the temporal reading of adverbial comparatives is equivalent to the cumulative reading of comparative correlatives. If the answer to the question is yes, then this will invalidate the distinction that we have been trying to make between comparative correlatives and adverbial comparatives. In what follows, we will present two sets of evidence to show that the temporal reading of adverbial comparative is distinct from the cumulative reading of comparative correlatives.

First, the cumulative reading of a comparative correlative is truth-conditionally weaker than the temporal reading of an adverbial comparative correlative. That is, the former can be true in scenarios where the latter is false. This is shown by the tables in (12) and (12').

(12) Scenario: John did marathon training for 3 weeks. In the 1st week, John ran 3 times, and his average running speed was 6 mph. In the 2nd week, John ran 5 times, and his average running speed was 7 mph. In the 3rd week, John ran 3 times, and his average running speed was 6.7 mph.

Time	Number of Times	Average Speed
Week 3 ↑	John ran 7 times ↑	His average speed was 6.7 mph ↑
Week 2 ↑	John ran 5 times ↑	His average speed was 7 mph ✗
Week 1 ↑	John ran 3 times ↑	His average speed was 6 mph ↑

According to the scenario in (12), the adverbial comparative in (10b) is intuitively *false*, because John's speed does not increase over time. However, the comparative correlative in (10a) is *true* in (12') under the cumulative reading, because with an increase of the total number of times that John ran, his average speed increases.

(12') Time	Running Total	Average Speed
Week 3 + week 2 + week 3	John ran 3 + 5 + 7 times	His average speed was 6.66 mph
Week 2 + week 1	John ran 5 + 3 times.	His average speed was 6.6 mph
Week 1	John ran 3 times	His average speed was 6 mph

Second, not every adverbial comparative can be paraphrased by a comparative correlative. Let us look at the examples in (13) below:

- (13) a. (fan), John yue chi yue shao.
 rice eat few
 'John ate less and less (rice).'
- b. (huazhuang pin), Mary yue mai yue pianyi.
 cosmetics buy cheap
 'Mary bought cheaper and cheaper cosmetics.'
- c. yu yue xia yue xiao.
 rain fall little
 'It was raining lighter and lighter.'

(13) are examples of adverbial comparatives. The first yue precedes a non-gradable verb, and the second yue precedes a negative adjective— *shao* 'few' (13a), *pianyi* 'cheap' (13b), and *xiao* 'small' (13c). The sentence in (13a) means: the degree of fewness of the quantity of the rice that John consumed *increases* over time, or, the quantity of rice that John consumed *decreases* over time. (13a) is intuitively true in a situation like the following:

(14) Scenario: John is on a diet. On the 1st day, he ate 3 bowls of rice; on the 2nd day, he ate 2 bowls of rice; on the 3rd day, he only ate 1 bowl of rice.

Time	Quantity of rice
Day 3	1 bowl of rice
Day 2	2 bowls of rice
Day 1	3 bowls of rice

When we evaluate the truth value of (13a) in (14), we compare the quantity of the rice that John consumed in each temporally ordered eating event. If the quantity of rice that John ate decreases over time, then (13a) is true in (14), which is indeed the case here. (13a) cannot be paraphrased by a cumulative reading of a comparative correlative, because with the ‘quantity’ of eating increasing, the rice consumed necessarily increases, as shown by the table in (14’).

(14’) **Time**

Quantity of rice

Day 3 + Day 2 + Day 1	↑	1+2+3 bowls of rice	↑
Day 2 + Day 1	↑	2+3 bowls of rice	↑
Day 1		3 bowls of rice	

(13b) and (13c) illustrate the same idea. (13b) says that the price of the cosmetics that Mary bought in each buying situation decreases over time. *Pianyi* ‘cheap’ is a property that applies to the cosmetics that Mary bought each time, instead of the total price she paid for all her buying. (13c) means that the volume of rain falling decreases over time. They both have a reading which cannot be paraphrased by the cumulative reading of a comparative correlative.

Let us recap. In this section we have discussed the semantic difference between the two types of truth-conditionally distinct comparative structures marked by *yue...yue*: adverbial comparatives and comparative correlatives. We have shown that the former has a temporal reading, which is lacking in the latter. In the following section, we will review Lin (2007)’s analysis of *yue...yue* comparatives. We show that as Lin’s analysis of *yue...yue* does not differentiate between comparative correlatives and adverbial comparatives, it fails to capture the semantic difference between them.

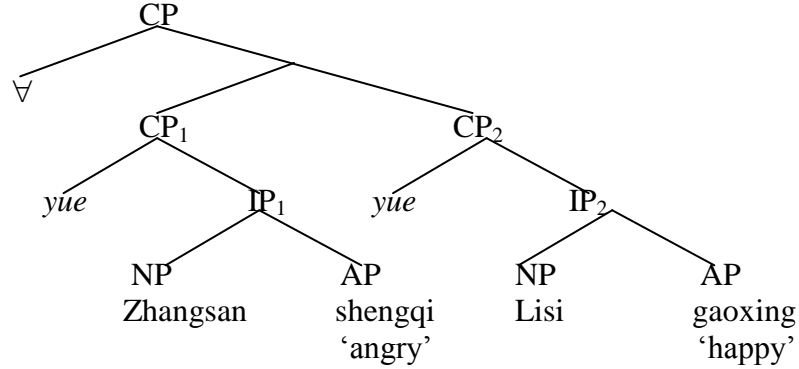
3. Lin (2007)’s analysis of *yue...yue* comparatives

Lin (2007), following Beck (1997)’s semantic analysis of English comparative correlatives, argues that *yue...yue* constructions in Mandarin Chinese uniformly express a correlation between two pairs of degrees provided by the two subordinate clauses marked by *yue*. Let us take (15) as an example, and look at the details of his analysis.

- (15) Zhangsan yue shengqi, Lisi yue gaoxing.
 angry happy
 ‘The angrier Zhangsan is, the happier Lisi is.’

Lin assumes that *yue...yue* constructions have a quantificational structure like a conditional. He proposes that the sentence in (15) has the logical form in (16)

(16)



According to (16), (15) consists of two subordinate clauses CP_1 and CP_2 . In each clause, *yue* takes a sentential complement IP. A covert universal quantifier \forall takes both CP_1 and CP_2 as its semantic arguments. CP_1 provides the domain of quantification for \forall and CP_2 provides a nuclear scope. The interpretations of some main components in (16) are provided in (17):

- (17) a. $\| shengqi \| = \lambda x_e \lambda d_d \lambda s_s \text{angry}'(x)(d)(s)$
- b. $\| yue \| = \lambda P_{\langle d, s, t \rangle} \lambda g_1 \lambda g_2 \lambda s_1 \lambda s_2 [P(g_1)(s_1) \wedge P(g_2)(s_2) \wedge g_2 > g_1]$
- c. $\| \forall \| = \lambda G_{\langle d, \langle d, \langle s, \langle s, t \rangle \rangle \rangle} \lambda Q_{\langle d, \langle d, \langle s, \langle s, t \rangle \rangle \rangle} \forall g_1 g_2 s_1 s_2 [G(g_1)(g_2)(s_1)(s_2)] \rightarrow \exists g_3 g_4 s_3 s_4 [Q(g_1)(g_2)(s_1)(s_2)]$
- d. $\| Zhangsan yue shengqi, Lisi yue gaoxing \| =$
 $\forall g_1 g_2 s_1 s_2 [\text{angry}'(Zhangsan)(g_1)(s_1) \wedge \text{angry}'(Zhangsan)(g_2)(s_2) \wedge g_2 > g_1]$
 $\rightarrow \exists g_3 g_4 s_3 s_4 [s_1 \leq s_3 \wedge s_2 \leq s_4 \wedge R \langle \langle g_1, s_1 \rangle, \langle g_3, s_3 \rangle \rangle \wedge R \langle \langle g_2, s_2 \rangle, \langle g_4, s_4 \rangle \rangle$
 $\wedge \text{happy}'(Lisi)(g_3)(s_3) \wedge \text{happy}'(Lisi)(g_4)(s_4) \wedge g_4 > g_3]$

(16d) reads as: For any pair of degrees g_1 and g_2 , and any pair of situations s_1 and s_2 such that Zhangsan is angry to degree g_1 in s_1 , and Zhangsan is angry to degree g_2 in s_2 , and g_2 is greater than g_1 , there exists a pair of degrees g_3 and g_4 , and a pair of situations s_3 and s_4 such that s_3 is an extended situation of s_1 and s_4 is an extended situation of s_2 . Lisi is happy to degree g_3 in s_3 , and Lisi is angry to degree g_4 in s_4 . g_4 is greater than g_3 . Moreover, g_1 in s_1 has a causative relation— R relation with g_3 in s_3 . g_2 in s_2 has a causative relation— R relation with g_4 in s_4 . In short, (17d) conveys the meaning that with an increase of Zhangshan's anger, there is an increase of Lisi's happiness.

Although Lin's analysis successfully accounts for comparative correlatives like (15), his analysis does not extend easily to adverbial comparatives like (18). For one thing, it is a rather debatable claim that non-gradable verbs like *pao* 'run' have a degree argument, just like gradable adjectives. In particular, in Mandarin Chinese, gradable and non-

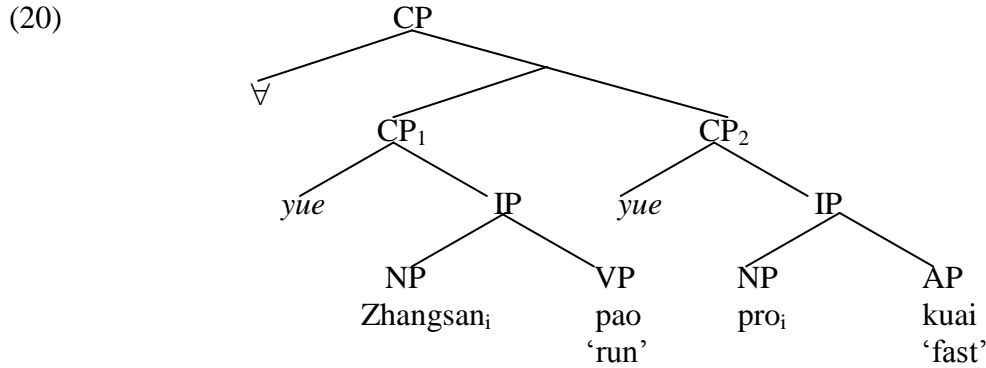
gradable predicates can be clearly defined by whether they can be modified by a degree modifier such as *hen* ‘very’, as in (4) and (6), and whether they can be used in *bi*-comparatives directly, as in (5) and (7).

Nevertheless, Lin follows Doetjes (1997) in assuming that non-gradable verbs have a ‘quantity’ argument, parallel to the degree argument of gradable adjectives. For instance, *pao* ‘run’ has the semantics in (19a), where $\text{run}'(x)(d)(s)$ means x has done d -quantity of running in situation s , parallel to the semantics of adjectives like *shengqi* ‘angry’ (19b).

- (18) John_i *yue* *pao* pro_i *yue* *kuai*.
 run fast
 ‘John ran faster and faster.’

- (19) a. $\| \text{pao} \| = \lambda x_e \lambda d_d \lambda s_s \text{run}'(x)(d)(s)$ $\langle e, \langle d, \langle s, t \rangle \rangle \rangle$
 b. $\| \text{shengqi} \| = \lambda x_e \lambda d_d \lambda s_s \text{angry}'(x)(d)(s)$ $\langle e, \langle d, \langle s, t \rangle \rangle \rangle$

If we incorporate this assumption into his analysis, the adverbial comparative in (18) (repeated from 10b) would have the structure in (20) and the interpretations in (21).



- (21) a. $\| \text{pao} \| = \lambda x_e \lambda d_d \lambda s_s \text{run}'(x)(d)(s)$
 b. $\| \text{yue} \| = \lambda P_{\langle d, \langle s, t \rangle \rangle} \lambda g_1 \lambda g_2 \lambda s_1 \lambda s_2 [P(g_1)(s_1) \wedge P(g_2)(s_2) \wedge g_2 > g_1]$
 c. $\| \text{John}_i \text{ yue } \text{pao } \text{pro}_i \text{ yue } \text{kuai} \| =$
 $\forall g_1 g_2 s_1 s_2 [\text{run}'(\text{John})(g_1)(s_1) \wedge \text{run}'(\text{John})(g_2)(s_2) \wedge g_2 > g_1] \rightarrow$
 $\exists g_3 g_4 s_3 s_4 [s_1 \leq s_3 \wedge s_2 \leq s_4 \wedge R \langle \langle g_1, s_1 \rangle, \langle g_3, s_3 \rangle \rangle \wedge R \langle \langle g_2, s_2 \rangle, \langle g_4, s_4 \rangle \rangle \wedge$
 $\text{fast}'(\text{John})(g_3)(s_3) \wedge \text{fast}'(\text{John})(g_4)(s_4) \wedge g_4 > g_3]$

(21c) reads as: For any pair of degrees g_1 and g_2 , and any pair of situations s_1 and s_2 such that John has done g_1 -quantity of running in s_1 , and John has done g_2 -quantity of running in s_2 , and g_2 is greater than g_1 , there exists a pair of degrees g_3 and g_4 , and a pair of

situations s_3 and s_4 such that s_3 is an extended situation of s_1 and s_4 is an extended situation of s_2 . John is fast to degree g_3 in s_3 , and John is fast to degree g_4 in s_4 . g_4 is greater than g_3 . Moreover, g_1 in s_1 has a causative relation—R relation with g_3 in s_3 . g_2 in s_2 has a causative relation—R relation with g_4 in s_4 . In short, (21c) expresses a correlation between the quantity of John's running and his speed.

However, given our discussion in the previous section, (21c) does not express the meaning of (15). Instead, it conveys the meaning of (22)(repeated from (10a)).

- (22) John pao-de **yue** duo, ta (jiu) pao-de **yue** kuai.
 run-de much he (then) run-de fast
 'The more John ran, the faster he went.'

In view of this flaw in his analysis, in the following section, we will provide a new analysis for yue...yue which aims to capture the semantic difference between adverbial comparatives and comparative correlatives.

4. The Semantics of yue...yue

Let us start with preliminaries. We assume that gradable predicates (typically adjectives) contain a degree argument in their semantics, but lack a time argument; non-gradable predicates (typically verbs) have a time argument, but lack a degree argument. Following this assumption, the non-gradable predicate like *pao* 'run' has the interpretation in (23a), where $\text{run}'(x)(t)(s)$ reads as: x runs in situation s and at time t . It differs from the interpretation of gradable predicates like (23b) in that it does not contain a degree argument.

- (23) a. $\| \text{pao} \| = \lambda x_e \lambda t_i \lambda s_s \text{run}'(x)(t)(s)$ $\langle e, \langle i, \langle s, t \rangle \rangle \rangle$
 b. $\| \text{gaoxing} \| = \lambda x_e \lambda d_d \lambda s_s \text{happy}'(x)(d)(s)$ $\langle e, \langle d, \langle s, t \rangle \rangle \rangle$

We propose that *yue* has two interpretations, as shown in (24a) and (24b).

- (24) a. $\| \text{yue} \| = \lambda P_{\langle d, \langle s, t \rangle \rangle} \lambda s_1 \lambda s_2 \exists g_1 \exists g_2 [P(g_1)(s_1) \wedge P(g_2)(s_2) \wedge g_2 > g_1]$
 b. $\| \text{yue} \| = \lambda P_{\langle i, \langle s, t \rangle \rangle} \lambda s_1 \lambda s_2 \exists t_1 \exists t_2 [P(t_1)(s_1) \wedge P(t_2)(s_2) \wedge t_2 > t_1]$

(24a) is the interpretation of *yue* when it combines with a gradable predicate in comparative correlatives. This meaning essentially follows Lin's analysis of comparative correlatives in Mandarin Chinese. In (24a), *yue* takes a property of degrees— $P_{\langle d, \langle s, t \rangle \rangle}$, and a pair of situations— s_1 and s_2 . It returns a proposition which is true iff P is true of g_1 in s_1 and P is true of g_2 in s_2 . g_2 is greater than g_1 .

The interpretation in (24b) is our proposed interpretation of *yue* when it is combined with a non-gradable predicate in adverbial comparatives. It minimally differs from (24a) in the type of the first argument that *yue* takes. $P_{\langle i, \langle s, t \rangle \rangle}$ in (24b) denotes a property of

times. Both degrees and times are orderable types, that is, allow an order to be defined on the elements in their type domain. The result of applying the meaning of *yue* in (24b) to the three arguments— $P_{\langle i, \langle s, t \rangle \rangle}$, s_1 and s_2 , is a proposition true iff P is true of t_1 in s_1 and P is true of t_2 in s_2 . t_2 temporally follows t_1 .

The dual interpretation of *yue* in (24a) and (24b) can successfully capture the semantic difference between the adverbial comparative in (10a) (repeated in 25) and the comparative correlative in (10b). Let us look at (25) first.

- (25) John *yue* pao *yue* kuai.
 run fast
 ‘John ran faster and faster.’

Syntactically, we propose that (25) has a monoclausal structure, which is different from the biclausal structure of comparative correlatives. The evidence for this proposal comes from the following evidence. First some adverbial comparatives, which are structurally parallel to (25), do not allow an insertion of an overt subject and the morpheme *jiu* ‘then’ in front of the second *yue*, while maintaining their original meanings.

- (26) Comparative Correlatives
 a. John yue shengqi, Mary *jiu* yue gaoxing.
 angry then happy
 ‘The angrier John is, the happier Mary is.’
- Adverbial Comparatives
 b. John_i yue tiao, ta_i *jiu* yue gao.
 jump he then fast
 (i) ??‘John jumps higher and higher.’
 (ii) ‘John becomes taller and taller from jumping.’

Second, comparative correlatives like (26a), which are clearly bi-clausal, allow an insertion of a future aspect marker in front of the second *yue*, and receive a future interpretation. However, if we do so with the adverbial comparative in (26b), the sentence receives a different meaning rather than just a future interpretation.

- (27) Comparative Correlatives
 a. John yue shengqi, Mary (jiu) *hui* yue gaoxing.
 angry then will happy
 ‘The angrier John is, the happier Mary will be.’

- b. *John *hui* yue shengqi, Mary jiu yue gaoxing.
 will angry then happy

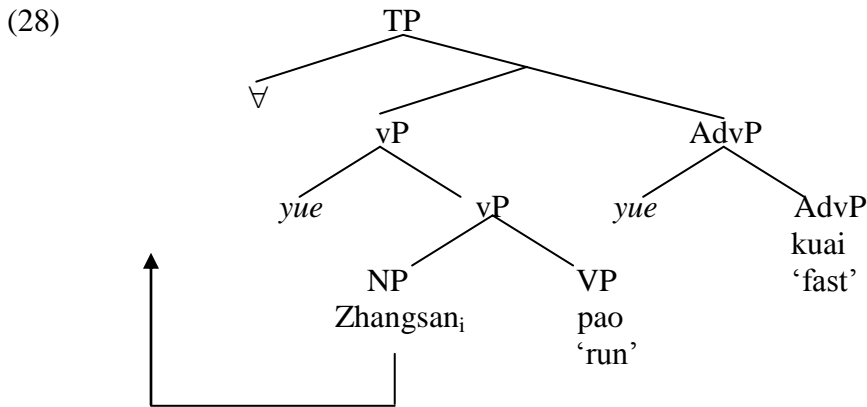
Adverbial Comparatives

- c. John yue tiao, jiu *hui* yue gao.
 run then will fast.

- (i) ??‘John will jump higher and higher’
 (ii) ‘John will become taller and taller from jumping.’

- d. John *hui* yue tiao yue gao.
 will run high
 ‘John will jump higher and higher.’

Based on the above evidence, we propose that (25) has the LF in (28):



The structure in (28) differs from Lin’s structure in (20) in that (28) has a monoclausal structure. The predicate following the first *yue—pao* ‘run’ is the main predicate, and the predicate following the second *yue—kuai* ‘fast’, is an adverb. The subject *John* is raised out of the vP to the spec of TP to receive a nominative case.

Semantically, the vP in (28) denotes a set of temporally ordered situations in which John ran. The AdvP denotes a set of situations ordered based on John’s running speed. The universal quantifier takes the vP and the AdvP as its semantic arguments and returns a proposition true iff John’s speed increases over the temporally ordered running’ situations. The step-by-step interpretation of (28) is provided below:

- (29) a. $\| pao \| = \lambda x_e \lambda t_i \lambda s_s, \text{run}'(x)(t)(s)$
 b. $\| John\ pao \| = \lambda t_i \lambda s_s \text{run}'(\text{John})(t)(s)$

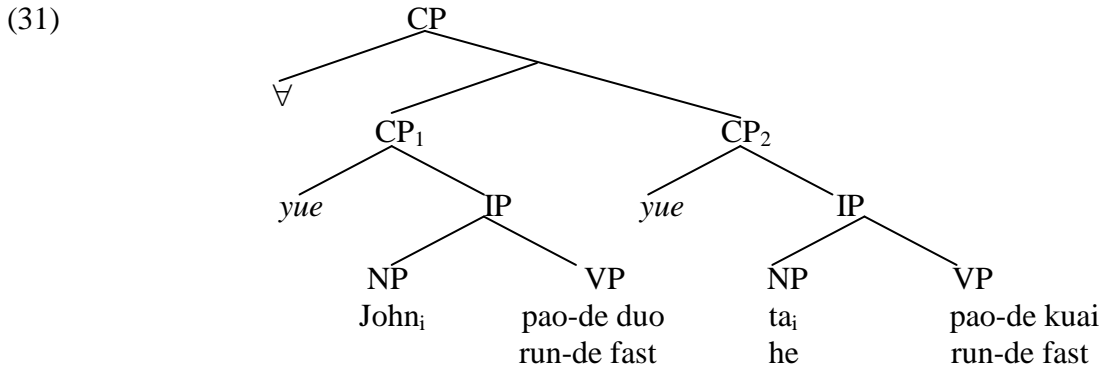
- c. $\| yue \| = \lambda P_{\langle i, \langle s, t \rangle \rangle} \lambda s_1 \lambda s_2 \exists t_1 \exists t_2 [P(t_1)(s_1) \wedge P(t_2)(s_2) \wedge t_2 > t_1]$
- d. $\| yue \text{ John pao} \|$
 $= \lambda s_1 \lambda s_2 \exists t_1 \exists t_2 [\text{run}'(\text{John})(t_1)(s_1) \wedge \text{run}'(\text{John})(t_2)(s_2) \wedge t_2 > t_1]$
- e. $\| kuai \| = \lambda d_d \lambda s_s \text{fast}'(d)(s)$
- f. $\| yue \| = \lambda P_{\langle d, \langle s, t \rangle \rangle} \lambda s_1 \lambda s_2 \exists g_1 \exists g_2 [P(g_1)(s_1) \wedge P(g_2)(s_2) \wedge g_2 > g_1]$
- g. $\| yue \text{ kuai} \| = \lambda s_1 \lambda s_2 \exists g_1 \exists g_2 [\text{fast}'(g_1)(s_1) \wedge \text{fast}'(g_2)(s_2) \wedge g_2 > g_1]$
- h. $\| \forall \| = \lambda P_{\langle s, \langle s, t \rangle \rangle} \lambda Q_{\langle s, \langle s, t \rangle \rangle} \forall s_1 s_2 [P(s_1)(s_2) \rightarrow Q(s_1)(s_2)]$
- i. $\| \forall yue \text{ Zhangsan pao } yue \text{ kuai} \| =$
 $\forall s_1 s_2 [\exists t_1 \exists t_2 [\text{run}'(\text{John})(t_1)(s_1) \wedge \text{run}'(\text{John})(t_2)(s_2) \wedge t_2 > t_1] \rightarrow \exists g_1 \exists g_2$
 $[\text{fast}'(g_1)(s_1) \wedge \text{fast}'(g_2)(s_2) \wedge g_2 > g_1]]$

(29i) says that for any pair of situation s_1 and s_2 , which are runnings by John, and such that s_2 is later than s_1 , s_2 is faster than s_1

The comparative correlative in (10b), repeated below in (30), has a different interpretation. It means an increase of the ‘quantity’ of John’s running correlates with an increase of his speed. Let us calculate how this meaning is derived by incorporating the meaning of *yue* in (24a).

- (30) Johni pao-de **yue** duo, tai (jiu) pao-de **yue** kuai.
run-de much he (then) run-de fast
‘The more John ran, the faster he went.’

Syntactically, (30) has the biclausal structure in (31), following Lin (2007):



- (32) a. $\|pao\|^g = \lambda x_e \lambda s_s \text{run}'(x)(t)(s)$
- b. $\|John\ pao\|^g = \lambda s_s \text{run}'(\text{John})(t)(s)$
- c. $\|duo\|^g = \lambda d_d \lambda s_s \text{much}'(d)(s)$
- d. $\|John\ pao\text{-}de\ duo\|^g = \lambda d_d \lambda s_s [\text{run}'(\text{John})(t)(s) \wedge \text{much}'(d)(s)]$
- e. $\|yue\|^g = \lambda P_{\langle d, \langle s, t \rangle \rangle} \lambda s_1 \lambda s_2 \exists g_1 \exists g_2 [P(g_1)(s_1) \wedge P(g_2)(s_2) \wedge g_2 > g_1]$
- f. $\|yue\ John\ pao\text{-}de\ duo\|^g = \lambda s_1 \lambda s_2 \exists g_1 \exists g_2 [[\text{run}'(\text{John})(t)(s_1) \wedge \text{much}'(g_1)(s_1)] \wedge [\text{run}'(\text{John})(t)(s_2) \wedge \text{much}'(g_2)(s_2)] \wedge g_2 > g_1]$
- g. $\|ta_i\|^g = g(i) = \text{John}$
- h. $\|ta_i\ pao\|^g = \lambda s_s \text{run}'(\text{John})(t)(s)$
- i. $\|kuai\|^g = \lambda d_d \lambda s_s \text{fast}'(d)(s)$
- j. $\|ta_i\ pao\text{-}de\ kuai\|^g = \lambda d_d \lambda s_s [\text{run}'(\text{John})(t)(s) \wedge \text{fast}'(d)(s)]$
- k. $\|yue\ ta_i\ pao\text{-}de\ kuai\|^g = \lambda s_1 \lambda s_2 \exists g_1 \exists g_2 [[\text{run}'(\text{John})(t)(s_1) \wedge \text{fast}'(g_1)(s_1)] \wedge [\text{run}'(\text{John})(t)(s_2) \wedge \text{fast}'(g_2)(s_2)] \wedge g_2 > g_1]$
- l. $\|\forall\|^g = \lambda P_{\langle s, \langle s, t \rangle \rangle} \lambda Q_{\langle s, \langle s, t \rangle \rangle} \forall s_1 s_2 [P(s_1)(s_2) \rightarrow Q(s_1)(s_2)]$
- m. $\|\forall\ yue\ John\ pao\text{-}de\ duo, ta\ yue\ pao\text{-}de\ kuai\|^g = \exists t \forall s_1, s_2 \exists g_1 \exists g_2 [[\text{run}'(\text{John})(t)(s_1) \wedge \text{much}'(g_1)(s_1)] \wedge [\text{run}'(\text{John})(t)(s_2) \wedge \text{much}'(g_2)(s_2)] \wedge g_2 > g_1] \rightarrow \exists g_3 \exists g_4 [[\text{run}'(\text{John})(t)(s_1) \wedge \text{fast}'(g_3)(s_1)] \wedge [\text{run}'(\text{John})(t)(s_2) \wedge \text{fast}'(g_4)(s_2)] \wedge g_4 > g_3]$

(32m) says: For any two situations s_1 and s_2 which are runnings by Zhangsan and such that the quantity of running in s_2 is greater than that in s_1 , s_2 is also faster than s_1 .

So far we have seen how the proposed interpretations of *yue* account for the semantic difference between the adverbial comparative in (25) and the comparative correlative in (30). Before we conclude, some more explanations of adverbial comparatives are in order. First, though we have only examined the semantics of the monoclausal adverbial comparative in (25), adverbial comparatives can be biclausal as well. Below, let us take a brief look at some examples of biclausal adverbial comparatives.

- (33) a. John yue pao, shengti yue jiankang.
run body healthy
‘As John was running, his body became healthier and healthier.’
- b. John yue chang ge, xinqing yue hao.
John sing songs mood good
As John was singing, his mood became better and better.

The examples in (33) are clearly biclausal. (33a) means that John’s health improved over the time while he was running. It does not express a correlation between the ‘quantity’ of John’s running and his degree of healthiness, as shown by the scenario depicted in (34).

(35) The scenario in which (33a) is intuitively true

Time	Mileage	Degree of healthiness
Day 3 ↑	John ran 2 miles ↑	5 ↑
Day 2 ↑	John ran 1 mile ✕	4 ↑
Day 1 ↑	John ran 3 miles ↑	3 ↑

Neither does (33a) express a cumulative reading--a correlation between a running total of the ‘quantity’ of John’s running and his average degree of healthiness. As we have shown earlier (12&12’), the cumulative reading of a comparative correlative usually has a weaker truth-condition than the temporal reading of an adverbial comparative.

Second, the temporal reading of adverbial comparatives has a distinct status from the ‘time’ reading that Lin (2007) has attributed to comparative correlatives like (35):

- (35) Tianqi yue re, wo jiu yue bushufu.
weather hot I then uncomfortable
‘The hotter the weather is, the more uncomfortable I feel.’

The meaning of (35) is represented by the formula in (36). It says: for *all* time pairs t_1 and t_2 , if the weather is hotter at t_2 than it is at t_1 , then I feel more uncomfortable at t_2 than at t_1 .

- (36) $\forall t_1 t_2 [\exists d_1 d_2 [\text{the weather is } d_1\text{-hot at } t_1 \wedge \text{the weather is } d_2\text{-hot at } t_2 \wedge d_2 > d_1] \rightarrow \exists d_3 d_4 [\text{I am } d_3\text{-comfortable at } t_1 \wedge \text{I am } d_4\text{-comfortable at } t_2 \wedge d_4 > d_3]]$

Compare this meaning in (36) to the meaning of (37) in (38):

(37) John *yue* pao *yue* kuai.
 run fast
 ‘John ran faster and faster.’

(38) $\forall s_1 s_2 [\exists t_1 t_2 [\text{John runs at } t_1 \text{ in } s_1 \wedge \text{John runs at } t_2 \text{ in } s_2] \wedge t_2 > t_1] \rightarrow$
 $\exists d_1 d_2 [\text{John's running is } d_1\text{-fast in } s_1 \wedge \text{John's running is } d_2\text{-fast in } s_2 \wedge d_2 > d_1]$

Though both formulas make use of time variables, they have difference status. In (37), time variables are used as an ordering source such that situations are ordered temporally. In (36), degrees, rather than times, are used as an ordering source, such that times are ordered based on degrees rather than based on their temporal orderings.

5. Conclusion

To conclude, in this paper, we have shown that yue...yue in Mandarin can mark two types of comparatives—the comparative correlative and the adverbial comparative, and these two types of yue...yue comparatives are semantically distinct. The adverbial comparative has a necessary temporal reading, which is absent in the comparative correlative. We proposed that non-gradable predicates, mostly verbs, have a time argument, but no degree argument; gradable predicates, mostly adjectives, have a degree argument, but no time argument. We formulated two meanings for yue, depending on whether it combines with a gradable or non-gradable predicate. Our semantics for the comparative correlative maintains Lin’s account, but it extends to the semantics of the adverbial comparative, which the previous analyses do not capture.

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References

- Beck, S. 1997. On the semantics of comparative conditionals. *Linguistics and Philosophy* 20 (3), 229–271. [2]
- Erlewine, M. 2007. A New Syntax and Semantics for the Mandarin bi-Comparatives. Master’s thesis, University of Chicago.
- Doetjes, J. S. 1997. Quantifiers and Selection: On the Distribution of Quantifying Expressions in Fresh, Dutch and English. Doctoral dissertation, Leiden University.
- Hsiao, H.-Y. 2003. On proportional correlative constructions in Chinese and Mongolian. *Journal of Taiwanese Language and Literature*, 1:243-272.

- Li, C and Thompson, S.1981. *Mandarin Chinese: A functional reference grammar*, University of California Press.
- Li, X. 2009. *Degreeless Comparatives*. Rutgers Dissertation
- Lin, J.W., 2007. On the semantics of comparative correlatives in Mandarin Chinese. *Journal of Semantics* 24 (2), 169–213.
- Lin, J (2009). Chinese comparatives and their implicational parameters. *Natural Language Semantics* 17: 1-27.
- Liu, C.S. L. 2008. The view from yue: Chinese comparative correlatives. *Lingua* 118, 1033-1061.
- Xiang, M. 2003. A phrasal analysis of Chinese comparatives. In *Proceedings of the 39th Annual Meeting of the Chicago Linguistic Society*.
- Xiang, M. 2005. *Some Topics in Comparative Constructions*. Doctoral dissertation, Michigan State University.