The Semantics of *yue … yue* in Mandarin Chinese: an implication for the argument structure of verbs

Introduction. Li and Carlos (2011) observe that *yue…yue* in Mandarin Chinese marks not only a type of comparative structure that corresponds to the *-er …-er* (or '*the more… the more*') construction in English (i.e., the comparative correlative), but also a structure that corresponds to the '*–er and –er*' (or *more and more*) construction (i.e., iterative comparative), exemplified in (1) and (2).

(1)   Zhangsan   pao-de   ***yue₁***   duo,   ta   (jiu)   pao-de   ***yue₂***   kuai.
                          run-de   much he   (then) run-de   fast
        'The more Zhangsan ran, the faster he went.'
(2)   Zhangsan   ***yue₁***   pao   ***yue₂***   kuai.
                                         run   fast
        'Zhangsan ran faster and faster.'

The key difference between the comparative correlative in (1) and the iterative comparative in (2) lies in that the first *yue* in (1) precedes a gradable adjective, *duo* 'many', whereas the first *yue* in (2) precedes a non-gradable verb, *pao* 'to run'. (1) and (2) are truth-conditionally distinct: (2) expresses a necessarily temporal reading that (1) does not have. Given the scenario in (8), (1) is intuitively true, but (2) is not, because the former describes a correlation between the amount of Zhangsan's running and his speed, while the latter expresses a correlation between Zhangsan's running and time: his speed increases over time.

(3)   Scenario: Zhangsan runs on treadmill every day. When he runs 5 miles, he sets his speed at 5 mph; when he runs 4 miles, he sets his speed at 4 mph; when he runs 3 miles; he sets his speed at 3 mph.

In view of the semantic distinction between (1) and (2), Li and Carlos propose that non-gradable verbs such as *run* possess a time argument but lack a degree argument (e.g., 4a), while adjectives possess a degree argument but lack a time argument (e.g., 4b). On this analysis, when *yue₁* in (2) composes with the VP projection *Zhangsan pao*, it returns a set of pairs of running situations ordered based on their temporal precedence, as shown in (5).

(4)   a. $[[pao]] = \lambda x_e \boldsymbol{\lambda t_i} \lambda s_s \, run(x)(t)(s)$ b. $[[duo]] = \lambda x_e \boldsymbol{\lambda d_d} \lambda s_s \, (x)(t)(s)$

(5) $[[yue_1 \; Zhangsan \; pao \,]] = [[yue]]([[Zhangsan \; pao]])$
        $= [\lambda P_{<i, \, <s, \, t>>} \lambda s_1 \lambda s_2 \exists t_1 \exists t_2 [P(t_1)(\, s_1) \wedge P(t_2)(s_2) \wedge t_2 > t_1]](\lambda s_s \, run(Zhangsan)(t)(s))$
        $= \lambda s_1 \lambda s_2 \exists t_1 \exists t_2 [run(Zhangsan)(t_1)(\, s_1) \wedge P(Zhangsan)(t_2)(s_2) \wedge t_2 > t_1]$

Although this analysis successfully captures the semantic distinction between the iterative comparative and the comparative correlative, it leaves several important questions open. One of them is: why it is the case that adjectives cannot take a time argument? (See Lin (2009) argues for an opposite view.)
Analysis. In this talk, we propose an alternative analysis that accounts for the semantic difference between (1) and (2) without stipulating an extra degree or temporal argument for non-

gradable verbs. This analysis is built upon the idea that events can be ordered based on the part-whole relation (<) like degree intervals on a degree scale, as shown below.

(6)   a. Event Scale   b. Degree Scale
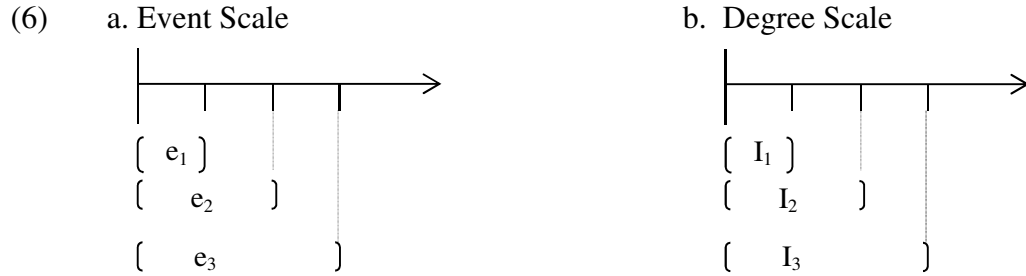
(6a) is an event scale consisting of an ordering relation, a dimension (e.g., Zhangsan's running) and events that share the same initial point, like intervals. We define a function, *Extension* ($<_{ext}$), to captures the relation that holds among events (and intervals) on the scales, as shown below:

(7) e' is an *extension* of e ($e <_{ext} e'$) iff e' and e share the same starting point and e is a part of e'.

We argue that *yue* is ambiguous between the semantics in (8a) and (8b). When it combines with a VP projection, it creates a set of pairs of situations ordered based on the extension relation of situations (e.g., 9b). When it combines with an adjectival or an adverbial projection, it creates a set of pairs of situations ordered based on the extension relation of degree intervals (e.g., 9d). (2) has the truth-conditions in (10e), which says: for every pair of situations of Zhangsan's running s_1 and s_2, if s_2 is an extension of s_1, s_2 is related to speed I_1; s_2 is related to speed I_2; I_2 is an extension of I_1.

(8)   a. $[[yue]] = \lambda P_{<s, t>}\lambda s_1\lambda s_2 [P(s_1) \wedge P(s_2) \wedge s_1<_{ext} s_2]$ Non-gradable
       b. $[[yue]] = \lambda P_{<d, <s, t>>}\lambda s_1\lambda s_2 \exists I_1 I_2[P(I_1)(s_1) \wedge P(I_2)(s_2) \wedge I_1<_{ext} I_2]$ Gradable

(9)   a. $[[pao]] = \lambda x_e \lambda s_s \, run(x)(s)$
       b. $[[yue_1 \, Zhangsan \, pao]] = \lambda s_1\lambda s_2 [run(Zhangsan)(s_1) \wedge run(Zhangsan)(s_2) \wedge s_1<_{ext} s_2]$
       c. $[[kuai]] = \lambda I_d \lambda s_s \, fast(I)(s)$
       d. $[[yue_2 \, kuai]] = \lambda s_1\lambda s_2 \exists I_1 I_2[fast(I_1)(s_1) \wedge fast(I_2)(s_2) \wedge I_1<_{ext} I_2]$
       e. $[[\forall Zhangsan \, yue \, pao \, yue \, kuai]] = \forall s_1 s_2[run(Zhangsan)(s_1) \wedge run(Zhangsan)(s_2) \wedge$
       $s_1<_{ext} s_2] \rightarrow \exists I_1 I_2[fast(I_1)(s_1) \wedge fast(I_2)(s_2) \wedge I_1 <_{ext} I_2]$

Our analysis predicts that in the iterative comparative the VP following *yue₁* must have cumulative reference, as the property it denotes holds for situations that stand in a part-whole relation. This prediction is indeed borne out. The example in (10) shows that a transitive verb cannot take a 'quantized' object, such as 3 apples.

(10)   Zhangsan yue chi √pingguo/*san ge pingguo, yue gaoxing.
                    eat apple   3   cl apple   happy
        'Zhangsan becomes happier and happier.

References: Li & Carlos (2011), the semantics of *yue…yue* in Mandarin Chinese, Proceedings of the 22nd North American Conference on Chinese Linguitics (NACCL-22).