

Are Degree Achievements Really Achievements?

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Abstract

This paper, which builds on the work of Hay, Kennedy, and Levin (1999), examines the puzzling aspectual behavior of so-called degree achievements. Drawing evidence from Mandarin Chinese, I argue that degree achievements without difference values denote punctual events, i.e., they are true achievements. I present an analysis that is consistent with facts from both English and Mandarin; to explain the complex aspectual behavior of degree achievements, my account appeals to coercion operators that are licensed to resolve type clashes. It differs from previous theories in that complex aspectual behavior arises from interactions between predicates and other sentential elements, and not from properties inherent to the predicates themselves. Cross-linguistic differences can be attributed to the availability of these operators, which is a parameter of Universal Grammar.

1 Introduction

So-called “degree achievements”, a class of verbs that includes *widen*, *cool*, *warm*, and *dry*, display interesting distributional characteristics with respect to telicity and present challenges for theories of argument structure based on aspectual properties, e.g., (Dowty, 1979, 1991; Tenny, 1992, 1994). In this paper, I extend the work of Hay, Kennedy, and Levin (1999), which draws interesting connections between boundedness of the difference value in a degree achievement and the telicity of the denoted event. While I agree with their basic claim that the event is telic if the difference value is bounded, and atelic if not, the facts are more complicated than has been suggested. Drawing evidence from both Mandarin Chinese and English, I will argue that degree achievements without explicit difference values are punctual events, i.e., they are true achievements, and different aspectual readings arise through coercion effects. Cross-linguistic differences can be captured by the availability of different coercion operators, which is a parameter of Universal Grammar.

To begin, consider English degree achievements with explicit difference values:

- (1) a. The gap widened 3% in a year/*for a year.
b. The soup cooled 5 degrees in an hour/*for an hour.

The aspectual behavior of these sentences are straightforwardly explained by the theory of Hay, Kennedy, and Levin. Degree achievements impose a homomorphism between the temporal progress of the event and the gradable property underlying the verb; if the difference value is bounded, the event is correspondingly bounded, hence telic. As a historic note, the term “degree achievement”, attributed to Dowty (1979), is actually somewhat of a misnomer—the examples above suggest that such verbs are actually accomplishments. For consistency, however, I will continue to employ the label “degree achievement” to refer to this class of verbs.

In Mandarin Chinese, degree achievements arise from the addition of the particle *le* to a stative verb (note that since Mandarin lacks the adjective/verb distinction, the stative verb is the analog of the English adjective):

- (2) a. *shu*₄ *gao*₁ *shi*₂ *gung*₁*fen*₁
tree tall ten centimeter
‘The tree is ten centimeters tall.’
b. *shu*₄ *gao*₁ *le*₅ *shi*₂ *gung*₁*fen*₁
tree tall LE ten centimeter
‘The tree grew ten centimeters.’

Example (2a) asserts a state, i.e., that of the tree being ten centimeters tall. In contrast, example (2b) describes a change of state, i.e., the event of the tree becoming taller by ten centimeters. Since these examples represent a minimal pair differing only in the absence or presence of the particle *le*, it must be the source of the inchoative reading. For more in-depth discussions about the particle *le* and its inchoative function, please refer to (Lin, 2004).

In the presence of a difference value, Mandarin degree achievements exhibit the same aspectual behavior as their English counterparts:

- (3) a. *ta*₁ *zai*₄ *yi*₁ *nian*₂ *nei*₄ *gao*₁ *le*₅ *san*₂ *gung*₁*fen*₁
he at one year in taller LE three centimeter
‘He grew three centimeters in a year.’
b. **ta*₁ *gao*₁ *san*₂ *gung*₁*fen*₁ *gao*₁ *le*₅ *yi*₁ *nian*₂
he taller three centimeter taller LE one year
‘He grew three centimeters for a year.’

In Chinese, a bare temporal adverbial, e.g., *yi*₁ *ge*₅ *zhong*₁*tou*₂ ‘one hour’, is interpreted in a durative manner. Verb reduplication is necessary, however, in many circumstances to render the sentence grammatical. The construction *zai*₄ *X nei*₄, literally ‘at *X* in’, is the Chinese equivalent of the frame adverbial.¹ Just as in English, Mandarin degree achievements with difference values are telic.

Turning our attention to degree achievements without explicit difference values, the theory of Hay, Kennedy, and Levin predicts that degree achievements based on closed-range adjectives will be telic, and those based on open-range adjectives will be atelic. Acceptability with the adverbial *completely* is a well-known diagnostic for the open-/closed-range distinction:

- (4) a. completely straight/empty/dry (closed-range)

¹See (Liu, 1997) for discussions about these diagnostics.

b. ??completely long/wide/short (open-range)

It has long been noted that atelic predicates are entailed by their progressive forms, while telic predicates are not (Vendler, 1957; Dowty, 1979):

- (5) a. John is singing. \Rightarrow John has sung.
b. John is baking a cake. \nRightarrow John has baked a cake.

It appears that the predictions are borne out:

- (6) a. They are straightening the pipe. \nRightarrow They have straightened the pipe.
b. The clothes are drying. \nRightarrow The clothes have dried.
- (7) a. They are lengthening the beam. \Rightarrow They have lengthened the beam.
b. The snow is slowing. \Rightarrow The snow has slowed.

Since the scale associated with adjectives such as *straight* and *dry* have maximal values, Hay, Kennedy, and Levin claim that a bound on the difference value can be identified. The measure of change takes the affected argument to the end of the scale. In contrast, adjectives such as *long* and *slow* lack maximal values, and hence there is no basis for determining the bound on the difference value.

If this analysis is correct, then why are all degree achievements without difference values compatible with both durative and frame adverbials?

- (8) a. The sun dried the clothes in a hour/for an hour.
b. The soup cooled in an hour/for an hour.

Example (8a) is predicted to be telic because the adjective *dry* is a closed-scale adjective, yet it displays atelic behavior. Example (8b) is predicted to be atelic because the adjective *cool* is an open-scale adjective, yet it displays atelic behavior. Hay, Kennedy, and Levin explain the second example by appealing to contextual influences. They attribute the telic reading to a conversational implicature: the soup cooled to room temperature, which represents a bounded difference value. However, such an explanation significantly weakens the predictive force of the theory. If degree achievements without difference values can exhibit dual behaviors, how does one distinguish the effect of the open-/closed-range distinction from the influence of context?

Furthermore, turning to Mandarin, we see an even more complex picture. Degree achievements without difference values sound odd with both durative and frame adverbials:

- (9) a. ??*ta*₁ *zai*₄ *yi*₁ *nian*₂ *nei*₄ *gao*₁ *le*₅
he at one year in taller LE
'He grew in a year.'
- b. **ta*₁ *gao*₁ *le*₅ *yi*₁ *nian*₂
he taller LE one year
'He grew for a year.'

The only way to rescue the above sentences is the following:

- (10) *ta*₁ *yi*₁ *shun*₄*jian*₁ *gao*₁ *le*₅
he one moment taller LE
'He suddenly became taller.'

This behavior is puzzling. Why do the aspectual profiles of degree achievements without difference values differ cross-linguistically? Does this imply that degree achievements do not form a coherent class of verbs across languages? In the following sections, I present a unified account of degree achievements consistent with evidence from both English and Mandarin Chinese. I will argue that degree achievements without difference values are punctual, i.e., they are true achievements. Different aspectual readings arise from coercion effects and cross-linguistic differences can be attributed to the availability of coercion operators in different languages.

2 Accomplishments or Achievements?

Consider the following Mandarin sentences involving change of state predicates:

- (11) a. *Li₃si₄ pang₄ le₅ liang₃ gong₁jing₁*
 Lisi fat LE two kilograms
 ‘Lisi gained two kilograms.’
 b. *bo₁li₂ sui₄ le₅ man₃ di₄*
 glass shatter LE whole floor
 ‘The glass shattered all over the floor.’

In (Lin, 2004), I argue extensively that all Mandarin change of state predicates (and hence all degree achievements) are achievements. In the next section, I will extend this theory to degree achievements in English, but first, I will review the evidence supporting this claim for Chinese.

The “progressive test” has frequently been cited as a diagnostic for distinguishing stative and non-stative verbs in English (Lakoff, 1966); only non-statives can occur in the progressive:

- (12) a. *John is knowing the answer. (state)
 b. John is dancing. (activity)
 c. John is painting a picture. (accomplishment)

Achievements, however, present a more complex story:

- (13) a. John is winning the game. (achievement)
 b. ??John is noticing the sign. (achievement)

Since achievements are punctual, Smith (1991) argues that the progressive refers to the preliminary stages of the event leading up to the change of state rather than the change of state itself (a point that will become important later on). For now, I will simply assume that compatibility of English achievements with the progressive varies by verb.

Another useful test for separating achievements from accomplishments is the acceptability of the verb as the complement of *stop*:

- (14) a. Mary stopped knowing the answer. (state)
 b. Mary stopped dancing. (activity)
 c. Mary stopped painting a picture. (accomplishment)
 d. ??Mary stopped reaching the top. (achievement)

Achievements sound odd as the complement of *stop*, expect perhaps in a habitual interpretation, e.g., “John stopped noticing the noise after a while.” The results of these two tests are summarized below:

	<i>compatible with prog.?</i>	complement of <i>stop</i>
state	no	ok
(15) activity	yes	ok
accomplishment	yes	ok
achievement	maybe	bad

We can now apply these diagnostics to Mandarin sentences. As it turns out, the sentences in (11) are incompatible with the progressive and as the complement of *stop*, as shown in (16) and (17). From these results, we can conclude that the sentences denote achievements.

- (16) a. **Li₃si₄ zheng₄zai₄ pang₄ le₅ liang₃ gong₁jing₁*
 Lisi in.process.of fat LE two kilograms
 intended: ‘Lisi is gaining two kilograms.’
- b. **bo₁li₂ zheng₄zai₄ sui₄ le₅ man₃ di₄*
 glass in.process.of shatter LE whole floor
 intended: ‘The glass is shattering all over the floor.’
- (17) a. **Li₃si₄ ting₂zhi₃ pang₄ le₅ liang₃ gong₁jing₁*
 Lisi stop fat LE two kilograms
 intended: ‘Lisi stopped gaining two kilograms.’
- b. **bo₁li₂ ting₂zhi₃ sui₄ le₅ man₃ di₄*
 glass stop shatter LE whole floor
 intended: ‘The glass stopped shattering all over the floor.’

In Mandarin, accomplishments are typically formed through the process of resultative verb compounding. In such a compound, the first verb denotes an activity and the second verb denotes the result of that activity:

- (18) a. *Zhang₁san₁ kan₃ dao₃ le₅ shu₄*
 Zhangsan chop fall LE tree
 ‘Zhangsan chopped the tree down.’
- b. *Zhang₁san₁ da₃ sui₄ le₅ bo₁li₂*
 Zhangsan hit shatter LE glass
 ‘Zhangsan shattered the glass.’

Such constructions are accomplishments, as demonstrated by their compatibility with the progressive (although the sentences sound much more natural in the *ba* construction):

- (19) a. *Zhang₁san₁ zheng₄zai₄ ba₃ shu₄ kan₃ dao₃*
 Zhangsan in.process.of BA tree chop fall
 ‘Zhangsan is chopping the tree down.’
- b. *Zhang₁san₁ zheng₄zai₄ ba₃ bo₁li₂ da₃ sui₄*
 Zhangsan in.process.of BA glass hit shatter
 ‘Zhangsan is shattering the glass.’

Summarizing so far, Mandarin degree achievements (and in fact, all change of state predicates in general) appear to be punctual, i.e., they denote an instantaneous change of state. In the next section, I will extend this analysis to account for the variable aspectual behavior of English degree achievements.

3 The Semantics of Degree Achievements

Following the standard account of adjectives presented in the literature, I analyze them as expressions that map their arguments onto abstract representations of measurement, i.e., scales that contains *degrees* (Cresswell, 1998; von Stechow, 1984):

$$(20) \llbracket \text{wide}(x)(t) \rrbracket = \text{the degree to which } x \text{ is wide at time } t$$

Beyond this, I essentially employ Hay, Kennedy, and Levin’s underlying “semantic machinery” to analyze degree achievements. The function INCREASE, contributed by the verbalizing affix \emptyset or *-en* in English, takes a gradable adjective meaning ϕ and returns a description of an event of some object undergoing a change in the degree to which it is ϕ :

$$(21) \llbracket \text{INCREASE}(\phi)(x)(d)(e) \rrbracket = 1 \text{ iff } \phi(x)(\text{SPO}(e)) + d = \phi(x)(\text{EPO}(e))$$

The functions SPO and EPO pick out the starting and ending points of an event, respectively. In prose, INCREASE $(\phi)(x)(d)(e)$ is true of an event e if and only if the degree to which x is ϕ at the end of the event equals d plus the degree to which x is ϕ at the beginning of the event, i.e., just in the case that x increases in ϕ -ness by d during the event. This measure of change d is the difference value.

With these definitions, Hay, Kennedy and Levin assign the following logical representations to degree achievements:

- (22) a. The road widened.
 $\exists e, d[\text{INCREASE}(\text{wide}(\text{road}))(d)(e)]$
 b. The road widened 5m.
 $\exists e[\text{INCREASE}(\text{wide}(\text{road}))(5\text{cm})(e)]$

Example (22a) is true just in the case that the road increased in width by an unspecified (i.e., existentially quantified) amount. Since the adjective *wide* lacks a maximal value, there is no basis for determining a bound on d ; hence, the event is atelic. On the other hand, example (22b) is true just in the case that the road increased in width by exactly five meters. Since the difference value is bounded, the event is telic.

My proposal that degree achievements without difference values are punctual can be implemented by replacing the existentially quantified d with a variable called δ , which I define as the margin of comparison (the analysis of degree achievements with difference values remains the same):

- (23) $L_i s_i_4 \quad p_a n g_4 \quad l_e_5$
 Lisi fat LE
 ‘Lisi gained weight.’
 $\exists e[\text{INCREASE}(\text{weight}(\text{Lisi}))(\delta)(e)]$

The variable δ represents the minimum difference in degree such that a comparative judgment can be made—in (23), Lisi can be said to have gained weight only if he weighs more now than he did before. The truth condition in this example can only be determined with the aid of some measuring device such as a scale. The δ is thus dependent on the resolution of the measuring device, i.e., the smallest weight increment that the scale can measure. Under my implementation, a degree achievement without a difference value becomes true the moment there is a measurable change in the underlying property (weight in this case). This change is instantaneous, and hence the event is interpreted as an achievement.

This analysis appears to capture the facts observed in Mandarin. However, the puzzling aspectual behavior of degree achievements without difference values in English remains unexplained. If my claims are correct, what accounts for the grammaticality of the following sentence?

(24) The soup cooled in an hour.

If cooling is punctual (i.e., the statement becomes true as soon as there is a measurable drop in temperature), then why is *cool* compatible with a frame adverbial? I believe that sentences such as (24) parallel the following examples, all involving unambiguous achievements:

- (25) a. John reached the top in an hour.
b. Mary won the chess match in ten minutes.

For example, the transition from not having reached the top to having reached the top is instantaneous, as well as the change of state from not having won to having won a chess match. Yet, these achievements are compatible with frame adverbials. I believe that examples such as (24) and examples such as (25) form a coherent class of phenomenon.

The solution to this mystery involves the addition of a preparatory phase to an instantaneous change, which renders an achievement compatible with a frame adverbial. The duration of an hour in “winning the chess match in a hour” refers to the period of time leading up to the actual attainment of victory. It is clear that the actual achievement (i.e., the transition from not having won to having won) occurs precisely at the end of the interval specified by the frame adverbial. Thus, if the chess match concluded in an hour with Mary as the victor, the following sentence would be pragmatically odd:

(26) #Mary won the chess match in two hours.

To further illustrate the fact that the frame adverbial refers to the time leading up to the achievement as opposed to the achievement itself, consider the felicity of the following utterance, given the context:

- (27) Context: The chess match lasted an hour. Up until the last second, Mary was actually in a losing situation, but in the end, she pulled a gambit that paid off.
Mary won the chess match in an hour.

I believe that degree achievements behave exactly the same way. Because they are punctual, the frame adverbial refers to the “preparatory phase” leading up to the change in degree.

To highlight this, consider the following scenario. A bowl soup sits on the kitchen table; its initial temperature is 120°. At precisely nine minutes, fifty-nine seconds, the temperature drops to 119.9° (assume that our thermometer can only measure temperature to an accuracy of 0.1°). Here are possible statements one can make about the situation:

- (28) a. The soup cooled in five minutes.
 b. The soup cooled in ten minutes.
 c. The soup cooled in fifteen minutes.

The statement in (28a) is obviously false, while the statement in (28b) is true. However, (28c) sounds pragmatically odd, in the same way that (26) is infelicitous. This demonstrates that whenever an achievement appears with a frame adverbial, a preparatory phase is added *before* the actual event, placing the change of state at the end of the denoted interval.

More formally, I believe that this process can be capture by aspectual coercion, e.g., (Moens and Steedman, 1988; de Swart, 1998, 2000). According to de Swart, coercion operators come into play in the semantic composition when and only when a type clash licenses them: “Coercion . . . is governed by implicitly contextual reinterpretation mechanisms triggered by the need to resolve aspectual conflicts” (de Swart, 1998:360). In this case, achievements have the feature [–durative] and frame adverbials have the feature [+durative]. To resolve this type clash, the operator ADD-PREP is introduced, adding a preparatory phase to the event.

The same coercion operator allows many English achievements to appear in the progressive. In these cases, the progressive does not apply to the actual achievement, but rather to the unspecified event leading up to it:

- (29) a. Mary is winning the chess match.
 b. The training is arriving.

A coercion account can be similarly applied to explain the grammaticality of the following sentence:

- (30) The soup cooled for an hour.

Here, the iteration operator ITER is applied to resolve the type clash. In other words, (30) refers to a successive series of small cooling events, each of which results in the temperature of the soup dropping by δ .

Why, then, are degree achievements in Mandarin incompatible with both durative and frame adverbials? Recall these facts, repeated from (9):

- (31) a. *??ta₁ zai₄ yi₁ nian₂ nei₄ gao₁ le₅*
 he at one year in taller LE
 ‘He grew in a year.’
 b. **ta₁ gao₁ le₅ yi₁ nian₂*
 he taller LE one year
 ‘He grew for a year.’

Quite simply, the coercion operators ADD-PREP and ITER are not available in Mandarin. I posit that the availability of these coercion operators is governed by a parameter of Universal Grammar. Thus, the only temporal adverbials allowed with achievements are ones that have the [–durative] property, as in the following, repeated from (10):

- (32) *ta₁ yi₁ shun₄jian₁ gao₁ le₅*
 he one moment taller LE
 ‘He suddenly became taller.’

A prediction of this claim is that achievements cannot appear in the progressive in Mandarin, because the relevant coercion operators are unavailable. This is indeed borne out:

- (33) a. **Zhang₁san₁ zheng₄zai₄ ying₂ na₄ pan₂ qi₂*
 Zhangsan in.process.of win that CL chess.game
 intended: ‘Zhangsan is winning that chess game.’
 b. **huo₃che₁ zheng₄zai₄ dao₄ le₅*
 train in.process.of arrive LE
 intended: ‘The train is arriving.’

To summarize, I have presented a semantic analysis of degree achievements as punctual events (i.e., true achievements), and shown how this account is consistent with the aspectual behavior of these verbs in English and Mandarin Chinese. The differences between the two languages can be explained by the availability of coercion operators that resolve type clashes.

4 The Scalar Structure of the Base Adjective

Although degree achievements are true achievements, the scalar structure of their underlying adjectives nevertheless influences their aspectual behavior. The difference between degree achievements based on closed-range adjectives and those based on open-range adjectives remains unexplained. The following sentences are repeated from (6) and (7):

- (34) a. They are straightening the pipe. \nRightarrow They have straightened the pipe.
 b. The clothes are drying. \nRightarrow The clothes have dried.
 (35) a. They are lengthening the beam. \Rightarrow They have lengthened the beam.
 b. The snow is slowing. \Rightarrow The snow has slowed.

An interesting observation is that for degree achievements based on closed-range adjectives without explicit difference values, the change of state takes the affected argument to the maximal value of the scale.

- (36) a. #They have straightened the pipe, but it’s still crooked.
 b. #The clothes have dried, but they’re still wet.

For example, straightening the pipe implies that the pipe has attained its maximal straightness, and thus denying the maximal value results in a contradiction. Asserting that the clothes have dried cannot be followed up by a claim that the clothes remain wet (i.e., or that the clothes are in any state other than the maximal value of dryness). In contrast, corresponding sentences for degree achievements based on open-range adjectives are perfectly acceptable:

- (37) a. They have widened the road, but it's still very narrow.
 b. The soup has cooled, but it's still really hot.

My explanation is that δ for degree achievements based on closed-range adjectives is always the difference in degree between the state of the entity and the maximal value on the relevant scale (i.e., δ spans the maximum range of the scale). In other words, such expressions are true only if the entity attains the maximum allowed degree value. If this analysis is indeed correct, how can we explain the following behavior?

- (38) a. The sun dried the clothes in an hour.
 b. The sun dried the clothes for an hour.

The interpretation of (38a) is so far consistent with my analysis. The closed-range nature of dryness sets δ to be the difference between the current dryness of the clothes and the maximal value on the dryness scale (i.e., zero water content). The sentence is only true in the case where the maximal dryness is attained at the end of the hour. Upon closer examination, we can see that (38b) *does not* refer many successive smaller drying events, whereby the water content is reduced. Otherwise, the following sentence would be perfectly acceptable:

- (39) #The sun dried the clothes for an hour, but they're still wet.

Instead, the sentence indicates that the clothes remained in the dry state under the sun for an hour. The durative adverbial is modifying the resulting state, not the actual change of state.

5 Conclusion

By considering evidence from Mandarin Chinese, I have presented an analysis that explains the puzzling aspectual behavior of degree achievements cross-linguistically. My analysis differs from previous accounts in that complex aspectual behavior arises from interactions between predicates and other sentential elements, and not from properties inherent to the predicates themselves. However, there remain many interesting unresolved issues. For one, it appears that Mandarin stative verbs are comparative in their unmarked form:

- (40) a. *ta*₁ *gao*₁/*pang*₄/*lao*₃
 he taller/fatter/older
 'He is taller/fatter/older.' (compared to a person determined by context)
 b. *shei*₂ *gao*₁/*pang*₄/*lao*₃? *ta*₁ *gao*₁/*pang*₄/*lao*₃
 who taller/fatter/older he taller/fatter/older
 'Who's taller/fatter/older? He is.'

It is important to note that (40a) *does not* mean “he is tall”. For a non-comparative reading, the positive degree marker *hen*₃ ‘very’ (counterintuitively) is required. In these contexts, *hen* is typically unstressed and does not serve as an intensifier (cf. Sybesma, 1997):

- (41) *ta*₁ *hen*₃ *gao*₁/*pang*₄/*lao*₃
 he very taller/fatter/older
 ‘He is tall/fat/old.’

To further complicate the situation, a stative verb with a measure phrase is ambiguous between a comparative reading and an absolute reading:

- (42) *shu*₄ *gao*₁ *shi*₂ *gung*₁*fen*₁
 tree taller ten centimeter
 i. ‘The tree is ten centimeters tall.’
 ii. ‘The tree is ten centimeters taller.’ (than something determined by context)

And to add even more complexity, a degree achievement (i.e., stative predicate + *le*) in Mandarin can have a comparative reading in addition to the inchoative reading:

- (43) *shu*₄ *gao*₁ *le*₄ *shi*₂ *gung*₁*fen*₁
 tree taller _{LE} ten centimeter
 i. ‘The tree grew ten centimeters.’
 ii. ‘The tree is ten centimeters taller.’ (than something determined by context)

Consider another example:

- (44) *zhe*₄ *fang*₂*jian*₁ *xiao*₅ *le*₅ *yi*₁ *dian*₃
 this room smaller _{LE} one bit
 i. ‘This room is a bit smaller (than expected).’
 ii. ‘The room grew smaller.’

In an “Alice-in-Wonderland” setting where rooms magically grow and shrink in size, the change of state reading would be felicitous. Under normal circumstances, however, only the comparative reading is available.

From these facts in Mandarin, there appears to be a deeper connection between comparatives, degree achievements, and underlying states. I have only begun to scratch the surface in this work, but further study of these issues promises to advance our understanding of lexical semantics.

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