Japanese resultative phrases as verbal degree modifiers

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Wechsler's (2005) analysis of English resultatives, whose central feature is the notion of structural homomorphism, has clarified the meaning of this construction considerably. By identifying the scale structure of the result phrase and the event described by the sentence, this analysis correctly predicts that, at least in the canonical cases, English resultatives only allow result phrases with upper closed scales. Surprisingly, however, Japanese resultatives do not exhibit the same structural homomorphism. That is, although the existence of a result phrases in Japanese has the force of changing the described event from an atelic into a telic one, the scale associated with it does not have to be upper closed. For example, *nagaku* 'long' in (1) does not have an upper closed scale (as can be seen from the unacceptability of #*kanzen-ni nagai* 'completely long'), yet its appearance as a result phrase changes the described event from an atelic into a telic one, as can be seen from the fact that the resultative sentence (1) induces the 'imperfective paradox', as in (2).

(1) John-ga gomu-o nagaku nobasi-ta.
John-NOM rubber-ACC long stretch-PAST
(lit.) 'John stretched the rubber long.'
'John stretched the rubber and made it long.'

(2) John-ga gomu-o nagaku nobasi-tei-ta. $\not\models$ John-ga gomu-o nagaku nobasi-ta.
John-NOM rubber-ACC long stretch-ing-PAST John-NOM rubber-ACC long stretch-PAST
(lit.) 'John was stretching the rubber long.' $\not\models$ 'John stretched the rubber long.'

Previous studies have not paid attention to, let alone provided an adequate analysis of, this apparent lack of homomorphism between the scale structure and the event structure in Japanese resultatives. It turns out, however, that, by employing the scale-based semantics of event structures recently developed by Kennedy and Levin (2008) (K&L) and treating result phrases as verbal degree modifiers, a straightforward analysis is available for this phenomenon.

Verbs appearing in the Japanese resultatives are basically change of state verbs (Kageyama 1996). Thus, we can analyze them as denoting measure of change functions, as in (3), along the lines of K&L. ($\mathbf{m}_\Delta$ is a shorthand for a measure of change function derived from a measure function $\mathbf{m}$ of type $\langle e, d\rangle$. $\mathbf{m}^{\uparrow}_{d}$ is the same as $\mathbf{m}$ except that the lower endpoint is redefined as the degree d. *init* and fin return the initial and the final temporal intervals of an event. For a reason that will become clear, we notate the dimension of measurement in the subscript of a measure function: e.g., by $\mathbf{m}_{d[\delta=length]}$, we know that the dimension of the scale underlying $\mathbf{m}$ is that of length.)

(3) $[\![\text{nobas}]\!] = \mathbf{stretched}_{\Delta[\delta=\text{length}]} = \lambda x \lambda e.\mathbf{stretched}^{\uparrow}_{\mathbf{stretched}(x)(init(e))}(x)(fin(e))$

In its positive form, (3) describes an atelic event, since, following K&L, we assume that the result of combining (3) with the verbal positive morpheme returns true just in case the **stretched**-degree of x as a result of event e is larger than the degree at e's initial point, since the scale underlying **stretched** is an open scale (that is, (3) is atelic since the exact value of the endpoint is not specified).

Given this semantics of the verb, we can analyze Japanese result phrases as verbal degree modifiers. The roots shared by result phrases and positive form adjectives are analyzed as simple measure functions of type $\langle e, d\rangle$ e.g., (4). Also, we posit the 'adverbializing' morpheme **adv** in (5), which returns verbal degree modifiers from measure functions. Combining (4) and (5), we obtain a verbal degree modifier in (6) which returns true just in case the degree that the measure of change function returns reaches the standard **long**-degree. This formulation correctly captures the telicity of the event described by the resultative VP in (7), as will be discussed in detail below.

(4) $[\![\text{naga}]\!] = \mathbf{long}_{[\delta=\text{length}]}$

(5) $\mathbf{adv} = \lambda g_1 \in D_{m[\delta=\mathcal{D}]} \lambda g_2 \in D_{m_\Delta[\delta=\mathcal{D}]} \lambda x \lambda e.g_2(x)(e) \geq \mathbf{stnd}(g_1)$

(6) $\mathbf{adv}([\![\text{naga}]\!]) = \lambda g \in D_{m_\Delta[\delta=\text{length}]} \lambda x \lambda e.g(x)(e) \geq \mathbf{stnd}(\mathbf{long})$

(7) $[\![\text{nagaku nobas}]\!] = \mathbf{adv}([\![\text{naga}]\!])([\![\text{nobas}]\!])$
$= \lambda x \lambda e.\mathbf{stretched}^{\uparrow}_{\mathbf{stretched}(x)(init(e))}(x)(fin(e)) \geq \mathbf{stnd}(\mathbf{long})$

Importantly, a verbal degree modifier can be combined only with particular verbs whose scale is COMPATIBLE with that of the modifier. What we mean by saying that two scales are compatible is that they are placed along the same dimension of measurement, although they may be different in the subpart relation with respect to each other. For example, the scales underlying **stretched**$_\Delta$ and **long** are placed along the same dimension of measurement, that of length. However, these two scales are different in that the scale underlying **long** is a proper subpart of that underlying **stretched**$_\Delta$: the former is placed in a certain higher-degree subpart of the scale of the latter. We ensure this requirement for scale compatibility between a verb and a degree modifier by analyzing **adv** (5) as requiring as arguments a measure of change function and a measure function of the same dimension $\mathcal{D}$, where $\mathcal{D}$ is a variable for an arbitrary dimension.

The one-way entailment pattern in (8), where the sentences are assumed to be asserted to describe the rubber's state as a result of someone's stretching it, supports this kind of compatible but asymmetric scale structures for **stretched**$_\Delta$ and **long**. Only when the scale underlying *naga* 'long' is a proper subpart of that underlying *nobas* 'stretch', does this kind of pattern arise.

(8) Kono gomu-wa nobas-are-teiru. $\not\models \not=\!\!\mid$ Kono gomu-wa nagai. (in the above context)
this rubber-TOP stretch-PASS-PERF this rubber-TOP long
'This rubber has been stretched.' $\not\models \not=\!\!\mid$ 'This rubber is long'

As a result, the meaning of the VP in (7) is correctly predicted to be telic although the verb in its positive form would describe an atelic event. This is because (7) returns true just in case *x*'s **stretched**-degree as a result of participating in *e* reaches a certain point, namely, the standard of **long**-degree. Thus, our analysis correctly accounts for the seemingly mysterious behavior of Japanese resultatives.

Moreover, the current analysis correctly predicts that, if upper closed scale adjectives appear as result phrases, the result state of the patient must have a maximal degree of the property, since the standard degree of an upper closed predicate is its maximal degree (cf., e.g., Kennedy 2007). Thus, the proposed analysis automatically predicts that (9) is contradictory, to the desired effect.

(9) #John-wa tsukue-o kireeni hui-ta-ga sono tsukue-wa kanzenni kireeni-wa
John-TOP desk-ACC clean wipe-PAST-but the desk-TOP completely clean-TOP
nara-nakat-ta.
become-NEG-PAST
'John wiped the table clean, but the table didn't become completely clean.'

The analysis outlined here is fully compatible with the observations made in the previous studies. Washio (1997) notes that result phrases in Japanese must denote a state which the event described by the verb has an intrinsic 'disposition' to change the patient into. This semantic restriction is properly accounted for in the current analysis as the requirement that the verb must have an underlying scale that has as its subpart the scale underlying the result phrase; Nakazawa (2008) argues that Japanese result phrases syntactically behave more like modifiers than verbal arguments. This observation, too, is compatible with the current analysis since we have analyzed result phrases as verbal degree modifiers.

In conclusion, the behavior of Japanese resultatives can be neatly captured by analyzing the result phrases as verbal degree modifiers: the proposed analysis demonstrates the effectiveness of K&L's scale-based semantics of event structures in the analysis of a new empirical problem, while at the same time suggesting a way to further elaborate it by introducing the notion of compatibility relations among scales.

References: Kageyama, T. 1996. *Doosi Imiron* [*Verb Semantics*]. Kuroshio. **Kennedy, C. 2007.** Vagueness and grammar: the semantics of relative and absolute gradable adjectives. *L&P* 30:1–45. **Kennedy, C. & B. Levin. 2008.** Measure of change: The adjectival core of degree achievements. In *Adjectives and Adverbs*, 156–182. OUP. **Nakazawa, T. 2008.** Resultative phrases in Japanese as modifiers. Presented at HPSG 2008. **Washio, R. 1997.** Resultatives, compositionality and language variation. *JEAL* 6:1–49. **Wechsler, S. 2005.** Resultatives under the 'event-argument homomorphism' model of telicity. In *The Syntax of Aspect*, 255–273. OUP.