

ON THE SEMANTICS OF THE *Izyoo*-COMPARATIVE*

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1 Introduction

This paper deals with the semantics of Japanese comparative constructions shown in (1) and (2):

- (1) John-wa Bill-yori kasikoi.
John-TOP Bill-YORI smart
'John is smarter than Bill.'
- (2)a. John-wa Bill-izyoo-ni kasikoi. b. John-wa [Bill-ga kasikoi izyoo-ni] kasikoi.
John-TOP Bill-IZYOO-DAT smart John-TOP Bill-NOM smart IZYOO-DAT smart
'John is smarter than Bill.' lit. 'John is smarter than Bill is smart.'

The sentences in (1) and (2) involve the comparison of two individuals in terms of certain properties. Of the two contrasted individuals, we refer to the one which is referred to by the noun phrase selected by *yori* or *izyoo-ni* as in (1) and (2a) or within the clause selected by *izyoo-ni* as in (2b) as the *standard*. The one contrasted with the standard is referred to as the *associate*.¹ Thus, Bill is a standard and John is an associate in all of the sentences in (1) and (2).

(1) is what we call the (phrasal) *yori*-comparative, where the associate and the standard are compared in terms of the property of the main predicate. (1) thus compares the degree of the associate with the degree of the standard in terms of smartness. This type of comparative has been extensively discussed in the literature in terms of syntax and semantics (see Kikuchi 1987, Ishii 1991, Snyder et al. 1995, Beck et al. 2004, Oda 2008, Hayashishita 2009, Kennedy 2009, Sawada 2009, 2013, Bhatt and Takahashi 2011, Shimoyama 2012, Sudo 2015 a.o.). Though there has been much controversy of how to analyze the *yori*-comparative, for the purpose of this paper, it suffices to assume the standard semantic analysis of comparative constructions for it, that is, “x-wa [y-yori] *adj*” is true iff x’s degree of *adj*-ness is greater than y’s.

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¹I took these terminologies from Bhatt and Takahashi (2011). They use these terminologies to discuss phrasal comparatives like (1). I use these also in clausal comparatives like (2b).

(2a) differs minimally from (1) in that *yori* is replaced with *izyoo-ni*. As (2b) shows, *izyoo-ni* can take a clausal argument as well.² We call these types of comparative the *izyoo*-comparative. Compared with the *yori*-comparative, the *izyoo*-comparative has received less attention (but see Hayashishita 2007, 2017, Kubota 2012, Oda 2015, 2016). Although these two constructions look alike on the surface and can mostly be translated in the same way, there are certain differences between the two comparatives. The main concern of this paper is to develop a proper semantic analysis of the *izyoo*-comparative.

This paper argues, following Hayashishita (2007, 2017), that the *izyoo*-comparative is an instance of a Comparison of Deviation (CoD) (Bierwisch, 1989, Kennedy, 1999), in which extents of deviation from contextual standards are compared. I depart from Hayashishita (2007), however, in its formal semantic analysis. I propose a new analysis of how extents of deviation are calculated in the *izyoo*-comparative. Specifically, I propose that extents of deviation are proportionally calculated based on the comparison class, and show that this proposal gives a unified account for facts that are newly reported in this paper.

This paper is organized as follows. Section 2 summarizes important properties of the *izyoo*-comparative discussed in the previous literature, arguing that it is an instance of the CoD. Section 3 examines Hayashishita's (2007) formal semantic analysis of the *izyoo*-comparative. It is shown, with new observations, that his analysis suffers from empirical problems. Section 4 presents my proposal, showing that it accounts for the facts presented in sections 2 and 3. Section 5 concludes.

2 The *izyoo*-comparative as a CoD

This section reviews some of the properties of the *izyoo*-comparative noted in the previous literature. It is concluded, following Hayashishita (2017), that the *izyoo*-comparative cannot be analyzed as a standard kind of comparative, rather it is a CoD construction.

Before presenting data of the *izyoo*-comparative, I would like to introduce some terminology regarding positive sentences like (3):

- (3) Mary is smart.

The positive sentence in (3) is true iff Mary's smartness exceeds some relevant standard of smartness which is determined in a given context.³ This standard is often referred to as the contextual standard in the literature. Here, to avoid confusion, it is dubbed *threshold* (θ)⁴ and the term *standard* is reserved for phrases that are contrasted with the *associate* in comparative constructions. Let us also say that a construction has a *positive/evaluative reading* when an element within it has a degree above one specified by a positive form of an adjective, i.e. a threshold.

²In contrast to *izyoo-ni*, *yori* cannot take a clausal argument in which there is an overt adjective:

- (i) *John-wa [Bill-ga kasikoi yori] kasikoi.
 John-TOP Bill-NOM smart YORI smart
 lit. 'John is smarter than Bill is smart.'

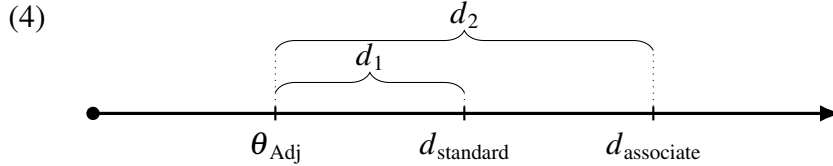
There has been an ongoing debate as to why (i) is unacceptable. See Snyder et al. (1995), Beck et al. (2004) and Sudo (2015) among many others.

³How the value of relevant standards is determined is related to various issues like vagueness, comparison class, and scale types of adjectives. See Kennedy and McNally (2005) and Kennedy (2007).

⁴This term comes from Lassiter (2017).

This positive interpretation is a notable property of the *izyoo*-comparative. That is, when (2a,b) are true, both John and Bill need to be smart.⁵ This interpretation is absent in the *yori*-comparative; for (1) to be true, neither John nor Bill needs to be smart.

Granted this difference between the *yori*- and *izyoo*-comparatives, Kubota (2012) argues that this is the only one. In other words, he argues that the *izyoo*-comparative is the *yori*-comparative with a positive interpretation.⁶ On the other hand, Hayashishita (2007, 2017) claims that the *izyoo*-comparative is a CoD. Since it compares extents of deviation from thresholds, positive interpretations necessarily arise. Their proposals are illustrated in (4):



For Kubota, what is compared in the *izyoo*-comparative is the standard's degree of *adj*-ness (d_{standard}) and the associate's degree of *adj*-ness ($d_{\text{associate}}$), as in the *yori*-comparative. For Hayashishita, what is compared is extents of deviation, that is, the difference between d_{standard} and the threshold (i.e. d_1) and the difference between $d_{\text{associate}}$ and the threshold (i.e. d_2).

These proposals make the same prediction when standards and associates are associated with the same threshold but make different predictions when different thresholds are involved. Hayashishita (2017) provides such examples, showing that they support the CoD analysis. Consider (5), where the first sentence is the *izyoo*-comparative and the second is the *yori*-comparative:

- (5) John-wa [[Bill-ga zibun-no kurasu-no naka-de kasikoi] izyoo-ni] John-no kurasu-no
 J.-TOP B.-NOM self-GEN class-GEN inside-at smart IZYOO-DAT J.-GEN class-GEN
 naka-de kasikoi. To-wa-it-temo, John-yori Bill-no hoo-ga kasikoi.
 inside-at smart COMP-TOP-say-although J.-YORI B.-GEN HOO-NOM smart
 lit. 'John is smarter in John's class than Bill is smart in his (= Bill's) class. But I would say
 Bill is smarter than John.' (Adapted from Hayashishita 2017:180)

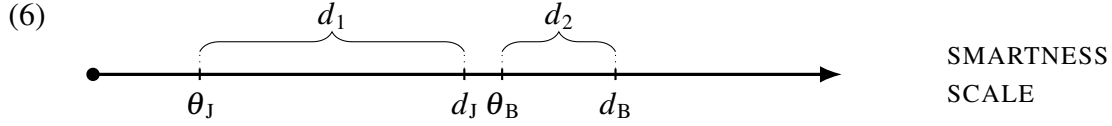
The phrases "in his class" in the first sentence invoke different comparison classes in different clauses. The CoD analysis correctly predicts (5) to be true in the situation illustrated in (6), where John's deviation d_1 from the threshold in John's class is greater than Bill's deviation d_2 from the threshold in Bill's class, but Bill is smarter than John (i.e. $d_B > d_J$). Since the first sentence is an *izyoo*-comparative, it involves the comparison of extents of deviation. The second

⁵See Kubota (2012) and Hayashishita (2017) for the semantic nature of positive/evaluative interpretations in the *izyoo*-comparative. They agree on the point that an evaluative interpretation is a presupposition for the standard, whereas it is an entailment for the associate.

⁶Oda (2015, 2016) proposes a different analysis from the ones reviewed in this section, but her analysis is similar to Kubota's (2012) analysis in that it involves the direct comparison of two degrees on the scale. She argues that "the best paraphrase of the sentence [(i)] is 'Y is long, and X is longer than that' (Oda, 2015:219)."

- (i) X-wa [Y-ga nagai izyoo-ni] nagai.
 X-TOP Y-NOM long IZYOO-DAT long
 'X is longer than Y is long.'

sentence involves *yor*i, and comparison is made between John's and Bill's smartness, hence (5) is predicted to be coherent and true in a situation like (6). On the other hand, if the *izyoo*-comparative were the *yor*i-comparative with the positive interpretation, as Kubota (2012) claims, (5) would be contradictory, since the first sentence requires that John is smarter than Bill, and the second sentence that Bill is smarter than John. The acceptability of (5) thus supports the CoD analysis.



To summarize, the CoD analysis of the *izyoo*-comparative accounts for the positive interpretation and the interpretation of sentences in which standards and associates have different thresholds.⁷ In the next section we turn to some details of Hayashishita's (2007) analysis. Based on new observations, I point out some empirical problems with his analysis.

3 Hayashishita's (2007) analysis and its predictions

The ingredients of Hayashishita's (2007) analysis are as follows. First, he assumes a relational analysis of adjectives, where adjectives express a relation between individuals and degrees and are of type $\langle d, et \rangle$ (Cresswell, 1976, von Stechow, 1984, Heim, 1985):⁸

$$(7) \quad \llbracket Adj \rrbracket = \lambda d \lambda x_e. [\delta_{Adj}(x) = d] \quad (\text{Adapted from Hayashishita 2007:80})$$

Second, a null morpheme *pos* is assumed to account for the evaluative interpretation (Bartsch and Vennemann, 1972, Cresswell, 1976, von Stechow, 1984, Kennedy, 1999, 2007). His version of *pos* is (8):⁹

$$(8) \quad \llbracket pos_H \rrbracket = \lambda d_2 \lambda P_{\langle d, et \rangle} \lambda x_e. \exists d_1 [standard(d_1)(d_2)(P)(C) \wedge P(d_1)(x)]$$

Crucial in the denotation is the part of $standard(d_1)(d_2)(P)(C)$, which holds iff a degree d_1 “exceeds by a degree d_2 the appropriate standard of comparison [the threshold in our term, AA] for an adjective P with respect to a comparison class determined by C (Hayashishita, 2007:96).” The degree d_2 is thus a degree that measures d_1 's deviance from the threshold. Crucially, d_2 is assumed to be greater than or equal to zero. It cannot take a negative value.

Hayashishita (2007) argues that in the *izyoo*-comparative, the position of d_2 is occupied by a degree operator which undergoes movement (Chomsky, 1977) to form a degree predicate via

⁷See Arano (2018) for further evidence for different treatments of the two comparative constructions in question. It is observed there that (i) the morpheme *hoo* can attach to associates in the *yor*i-comparative, but not in the *izyoo*-comparative (see Matsui and Kubota (2012) for properties of *hoo*), and (ii) measure phrases can be standards in the *yor*i-comparative, but not in the *izyoo*-comparative, which are argued to follow from the CoD analysis. Arano (2018) also argues that the *izyoo*-comparative cannot be analyzed as an instance of metalinguistic comparison in the sense of Morzycki (2011).

⁸This is not the standard relational analysis, which relates an individual x to a degree d if x is *at least* d -adjective. Here, each individual stands in the relation to exactly one degree.

⁹(8) is from Hayashishita (2007: 96). (8) and (10a) carry subscript H to indicate that these are Hayashishita's versions. The denotations of these expressions will be revised later.

degree abstraction. This is illustrated in (9), where IP_1 denotes a set of degrees which measure a difference between John's smartness and the threshold:^{10,11}

- (9) $[IP_1 Op_2 [IP_2 John\text{-}ga [AdjP_1 [XP t_2 [X pos]] [AdjP_2 kasikoi]]]$
 $\llbracket AdjP_2 \rrbracket = \llbracket smart \rrbracket = \lambda d \lambda x_e. [\delta_{smart}(x) = d]$
 $\llbracket X \rrbracket = \llbracket pos \rrbracket = \lambda d_2 \lambda P_{\langle d, et \rangle} \lambda x_e. \exists d_1 [standard(d_1)(d_2)(P)(C) \wedge P(d_1)(x)]$
 $\llbracket XP \rrbracket = \lambda P_{\langle d, et \rangle} \lambda x_e. \exists d_1 [standard(d_1)(d_2)(P)(C) \wedge P(d_1)(x)]$
 $\llbracket AdjP_1 \rrbracket = \llbracket XP \rrbracket(\llbracket AdjP_2 \rrbracket) = \lambda x_e. \exists d_1 [standard(d_1)(d_2)(\llbracket smart \rrbracket)(C) \wedge \delta_{smart}(x) = d_1]$
 $\llbracket IP_2 \rrbracket = \llbracket AdjP_1 \rrbracket(\llbracket John \rrbracket) = \exists d_1 [standard(d_1)(d_2)(\llbracket smart \rrbracket)(C) \wedge \delta_{smart}(j) = d_1]$
 $\llbracket IP_1 \rrbracket = \lambda d_2 \exists d_1 [standard(d_1)(d_2)(\llbracket smart \rrbracket)(C) \wedge \delta_{smart}(j) = d_1]$

Hayashishita (2007) argues that *izyoo* takes two degree predicates of this kind, comparing them in terms of their maximal degree. His version of *izyoo* is (10a). It includes Max-operators, whose definition is given in (10b) (von Stechow, 1984, Rullmann, 1995):

- (10) a. $\llbracket izyoo_H \rrbracket = \lambda P_{\langle dt \rangle} \lambda Q_{\langle dt \rangle}. Max(Q) > Max(P)$
 b. $Max(D) = \iota d \in D. \forall d' \in D [d \geq d']$, where D is a totally ordered set of degrees

Clausal *izyoo*-comparatives like (2b) are analyzed as in (11):

- (11) a. LF-representation
 $[IP_1 [YP [IP_3 Op_3 [IP Bill\text{-}ga [AdjP [XP t_3 [X pos]] [AdjP kasikoi]]]]] [Y izyoo\text{-}ni]]$
 $[IP_2 Op_2 [IP John\text{-}wa [AdjP [XP t_2 [X pos]] [AdjP kasikoi]]]]]$
 b. Semantic composition
 $\llbracket IP_3 \rrbracket = \lambda d_3. \exists d_1 [standard(d_1)(d_3)(\llbracket smart \rrbracket)(C) \wedge \delta_{smart}(b) = d_1]$
 $\llbracket IP_2 \rrbracket = \lambda d_2. \exists d_1 [standard(d_1)(d_2)(\llbracket smart \rrbracket)(C) \wedge \delta_{smart}(j) = d_1]$
 $\llbracket Y \rrbracket = \llbracket izyoo \rrbracket = \lambda P_{\langle dt \rangle} \lambda Q_{\langle dt \rangle}. Max(Q) > Max(P)$
 $\llbracket YP \rrbracket = \llbracket Y \rrbracket(\llbracket IP_3 \rrbracket)$
 $= \lambda Q_{\langle dt \rangle}. Max(Q) > Max(\lambda d_3. \exists d_1 [standard(d_1)(d_3)(\llbracket smart \rrbracket)(C) \wedge \delta_{smart}(b) = d_1])$
 $\llbracket IP_1 \rrbracket = \llbracket YP \rrbracket(\llbracket IP_2 \rrbracket) = 1 \text{ iff}$
 $Max(\lambda d_2. \exists d_1 [standard(d_1)(d_2)(\llbracket smart \rrbracket)(C) \wedge \delta_{smart}(j) = d_1]) >$
 $Max(\lambda d_3. \exists d_1 [standard(d_1)(d_3)(\llbracket smart \rrbracket)(C) \wedge \delta_{smart}(b) = d_1])$

¹⁰(9) is based on Hayashishita (2007: 98). He glosses over how binding is established between the trace t_2 , interpreted as a free variable d_2 , and the coindexed operator Op_2 . See Heim and Kratzer (1998) for a standard solution which employs an assignment as a parameter of interpretation.

¹¹Hayashishita (2007) argues that in the positive construction, the position of d_2 is occupied by a free variable which is subject to \exists -closure:

- (i) a. LF-representation
 $[IP John\text{-}ga [AdjP_1 [XP d_2 [X pos]] [AdjP_2 kasikoi]]]$
 b. Semantic composition
 $\llbracket IP \rrbracket = \exists d_1 [standard(d_1)(d_2)(\llbracket smart \rrbracket)(C) \wedge \delta_{smart}(j) = d_1]$
 $\exists\text{-closure} \rightarrow$
 $\llbracket IP \rrbracket = 1 \text{ iff } \exists d_2 \exists d_1 [standard(d_1)(d_2)(\llbracket smart \rrbracket)(C) \wedge \delta_{smart}(j) = d_1]$

This analysis predicts that (ia) is true iff John has a degree d_1 of smartness and there is a degree d_2 which measures d_1 's deviance from the threshold. Since the existence of d_2 means that d_1 is greater than the threshold, (ia) is true iff John's smartness exceeds the threshold.

In (11), IP_3 and IP_2 denote sets of degrees which measure the extents of deviance for Bill's and John's smartness, respectively. *Izyoo* takes them and gives the truth conditions that the sentence is true iff the maximal degree of John's deviance is greater than that of Bill's.¹² As for phrasal comparatives, Hayashishita (2007) argues that they are derived from clausal ones via deletion.

Hayashishita's (2007) analysis seems to make the following predictions. First, since extents of deviation are also degrees defined on a scale, the extents of deviance that are to be compared have to be commensurable. Kennedy (1999: 17) states this condition explicitly: "[A] necessary condition for comparison is that the compared objects are to be ordered along the same dimension." This condition is intuitively reasonable since it is unreasonable to talk about the comparison of, for example, 5kg and 5cm, and it gives us a straightforward account for the fact that when two adjectives are used with different dimensional parameters, the English comparative is illicit (Kennedy, 1999).

- (12) #My copy of *The Brothers of Karamazov* is heavier than my copy of *The Idiot* is old.
(Kennedy, 1999:16)

Given this condition, Hayashishita's (2007) analysis predicts that the clausal *izyoo*-comparative has to use adjectives that share the same dimensional parameter.

Second, in the *yori*-comparative, the associate's degree and the standard's degree are compared, and their difference can be expressed with a measure phrase. For example, (13) means that John is taller than Bob, and the difference between John's height and Bob's is 3cm:

- (13) John-wa Bob-yori 3cm segataikai.
John-TOP Bob-YORI 3cm tall
'John is 3cm taller than Bob.'

Since extents of deviation are also degrees defined on a scale, Hayashishita's analysis leads us to expect that the difference between the two extents of deviation can be measured explicitly. These predictions are not borne out, however.

First, the *izyoo*-comparative allows the use of two adjectives with different dimensional parameters. On the Web, I have found a number of such examples. I present two of them below:¹³

- (14) a. [Context: Reviewing a food product]
Kono siriizu-wa [kakaku-ga yasui izyoo-ni] ryoo-ga sukunai-desu.
this series-TOP price-NOM inexpensive IZYOO-DAT amount-NOM small-COPULA
'As for this series, how small its amount is exceeds how inexpensive its price is.'

¹²One might wonder why *pos*'s are obligatory in IP_2 and IP_3 of (11). If the presence of *pos*'s were optional and IP 's in (11a) could have the following structure, it would be predicted that the *izyoo*-comparative allows an interpretation without evaluativity:

- (i) a. [IP Op₁ [IP Bill-ga [$AdjP$ t₁ kasikoi]]] b. [IP] = $\lambda d_1. [\delta_{\text{smart}}(b) = d_1]$

Hayashishita (2007) excludes this possibility by endorsing Snyder et al.'s (1995) claim. They argue, following Fukui (1986), that Japanese adjectives are impoverished, lacking a syntactic position for a degree variable or constant. If there is no syntactic position for degree arguments within $AdjP$ in Japanese, the derivation in (ia) is impossible. To put it differently, Japanese adjectives need help from other morphemes like *pos* for degree abstraction to take place.

¹³(14a): https://www.amazon.co.jp/gp/customer-reviews/R3BNX9BPIWPQEI/ref=cm_cr_arp_d_rvw_ttl?ie=UTF8&ASIN=B071YP1CZB; (14b): <http://junjun2310.bunj.in/?p=1957>

- b. [Context: Talking about an instant noodle]
 [Sono nedan-ga takai izyoo-ni] oisikatta.
 its price-NOM expensive IZYOO-DAT delicious
 ‘How delicious it was exceeded how expensive its price was.’

Under Hayashishita’s (2007) analysis, what is compared in (14a) is d_1 and d_2 in (15), where d_F is a degree of the food product with respect to relevant properties:



Note that d_1 and d_2 are defined on scales that are incommensurable. The acceptability of (14a) is then mysterious given the commensurability requirement.¹⁴

Second, the *izyoo*-comparative cannot be modified by measure phrases to express the difference between the extents of deviation:

- (16) *John-wa Bill-izyoo-ni 3cm segatakai.
 John-TOP Bill-IZYOO-DAT 3cm tall
 ‘John is 3cm taller than Bill.’

The unacceptability of (16) is not likely to be due to a syntactic reason: the fact that intensifiers like *zutto* ‘much’ cannot co-occur with measure phrases in the *yor*i-comparative, as shown in (17), suggests that they occupy the same syntactic position. However, in contrast to a measure phrase, *zutto* ‘much’ can be used to modify the difference of the extents of deviation, as shown in (18):

¹⁴It should be noted that Hayashishita (2007: 90, fn. 12) argues that adjectives in the *izyoo*-comparative have to be commensurable, based on the unacceptability of (i):

- (i) [Context: Pairs of boys and girls are competing for a contest. John and Mary constitute a team.]
 *[[John-ga baka dearu] izyoo-ni] Mary-ga genkina (node, kono-tiimu-wa heikin-ten-yori
 John-NOM stupid COPULA IZYOO-DAT Mary-NOM lively because this-team-TOP average-score-YORI
 ii-ten-o toru-daroo).
 good-score-ACC get-probably
 ‘Since how lively Mary is exceeds how foolish John is, this team could probably score above the average.’
 (Hayashishita, 2007:90)

I agree with Hayashishita on the unacceptability of (i) *in the given context*. I believe, however, that its unacceptability does not stem from the alleged commensurability requirement imposed on the *izyoo*-comparative. Rather, I argue that (i) is unacceptable for pragmatic reasons. I suggest that in principle, any two degree predicates can be used in the *izyoo*-comparative, but there must be a reason to compare properties specified by degree predicates (see Morzycki (2011) for the same suggestion as to metalinguistic comparatives). That is, (i) is degraded because it is not straightforward to come up with a situation in which both stupidity and liveliness are relevant in a contest. In fact, example (i) improves when it is uttered in a very specific context like (ii) in which both stupidity and liveliness are important.

- (ii) [Context: Pairs of boys and girls are competing for a contest. In the first part of the contest, girls compete in a dance competition. In the second part, boys compete in a quiz bowl. John and Mary constitute a team.]

- (17)*Jon-wa Bob-yori zutto 50cm segataikai. (18)?Jon-wa Bob-izyoo-ni zutto segataikai.
 J.-TOP B.-YORI much 50cm tall J.-TOP B.-IZYOO-DAT much tall
 lit. ‘Jon is much 50cm taller than Bob.’ ‘Jon is much taller than Bob.’

To summarize, we have seen that in the *izyoo*-comparative incommensurable adjectives can be used, and that intensifiers, but not measure phrases, can modify the difference between the extents of deviation. Though these facts cannot be captured by Hayashishita’s analysis, I would like to retain Hayashishita’s thesis that the *izyoo*-comparative is an instance of the CoD, since I believe that there are good reasons to believe that his thesis is correct. Instead of throwing away the CoD thesis, I propose a new analysis of the CoD which accounts for the properties of the *izyoo*-comparative.

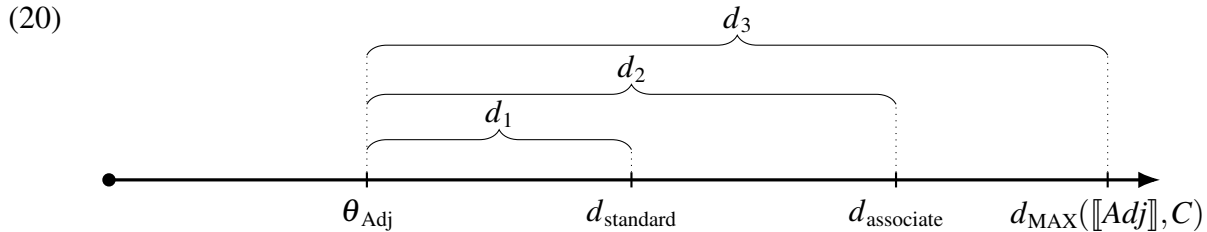
4 Proposal: Comparison of proportional deviation

In this section I propose a new analysis of the CoD which involves proportional calculation of extents of deviation within a comparison class.

Let us first define $d_{\text{MAX}}(P, C)$ as the greatest degree associated with an adjective P that any member of the comparison class C has:¹⁵

$$(19) \quad d_{\text{MAX}}(P, C) := \text{Max}\{d \mid \exists x \in C [P_{\langle d, \text{et} \rangle}(d)(x)]\}$$

I propose that the extent of deviation from the threshold is proportionally calculated based on d_{MAX} and thresholds. (20) illustrates my proposal. The associate’s deviation from the threshold is $\frac{d_{\text{associate}} - \theta_{\text{Adj}}}{d_{\text{MAX}}(\llbracket \text{Adj} \rrbracket, C) - \theta_{\text{Adj}}} (= \frac{d_2}{d_3})$ and the standard’s deviation from the threshold is $\frac{d_{\text{standard}} - \theta_{\text{Adj}}}{d_{\text{MAX}}(\llbracket \text{Adj} \rrbracket, C) - \theta_{\text{Adj}}} (= \frac{d_1}{d_3})$, and the *izyoo*-comparative is true iff the former is greater than the latter.



Underlying this proposal is the intuition that when extents of deviation are compared, the notion of dimensions on scales is neutralized. I concretize this intuition via division. $d_{\text{associate}}$, d_1 , d_2 , and so on are defined on a scale and therefore they are associated with dimensional information provided by adjectives. Fractions like $\frac{d_2}{d_3}$, on the other hand, express proportional information between two

¹⁵Note that $d_{\text{MAX}}(P, C)$ is not the maximal value of the scale, but the highest degree of P instantiated by any member of the comparison class. This is always a particular degree, even for scales that do not have a maximum (like the ones associated with relative adjectives like *tall*). Moreover, note that the threshold is calculated with respect to a comparison class. For a comparison to be felicitous, the comparison class has to contain more than one individual, which means that $d_{\text{MAX}}(P, C)$ has to be larger than the corresponding threshold for any P and C . For these reasons, the proportion is going to be defined in all intuitively felicitous cases.

degrees and dimensional information associated with them is neutralized. Thus, we can say that 2cm is to 4cm what 2kg is to 4kg in terms of proportion.

To get the proposed meaning of the *izyoo*-comparative compositionally, I propose the following denotation of *pos*:

$$(21) \quad \llbracket pos \rrbracket = \lambda d_2 \lambda P_{\langle d, et \rangle} \lambda x_e. \exists d_1 [d_2 = \frac{d_1 - \theta_P}{d_{MAX}(P, C) - \theta_P} \wedge d_2 \geq 0 \wedge P(d_1)(x)]$$

As in Hayashishita's version of *pos*, the degree d_2 refers to the extent of d_1 's deviance. Under my analysis, however, d_2 is not a degree on the scale associated with an adjective, but it refers to proportion.¹⁶ Semantic composition proceeds as in (22):

(22) a. LF-representation

$$\begin{array}{c} \boxed{\text{[IP}_1 \text{ [YP [IP}_3 \text{ Op}_3 \text{ [IP Bill-ga [AdjP [XP t}_3 \text{ [X pos]] [AdjP kasikoi]]]]] [Y izyoo-ni]]}} \\ \boxed{\text{[IP}_2 \text{ Op}_2 \text{ [IP John-ga [AdjP [XP t}_2 \text{ [X pos]] [AdjP kasikoi]]]]]} \end{array}$$

b. Semantic composition¹⁷

$$\begin{aligned} \llbracket \text{IP}_3 \rrbracket &= \lambda d_3. \exists d_1 [d_3 = \frac{d_1 - \theta_{\text{smart}}}{d_{MAX}(\llbracket \text{smart} \rrbracket, C) - \theta_{\text{smart}}} \wedge d_3 \geq 0 \wedge \delta_{\text{smart}}(b) = d_1] \\ \llbracket \text{IP}_2 \rrbracket &= \lambda d_2. \exists d_1 [d_2 = \frac{d_1 - \theta_{\text{smart}}}{d_{MAX}(\llbracket \text{smart} \rrbracket, C) - \theta_{\text{smart}}} \wedge d_2 \geq 0 \wedge \delta_{\text{smart}}(j) = d_1] \\ \llbracket Y \rrbracket &= \llbracket \text{izyoo} \rrbracket = \lambda P_{\langle dt \rangle} \lambda Q_{\langle dt \rangle}. \exists d_4 [Q(d_4) \wedge d_4 > \text{Max}(P)] \\ \llbracket \text{YP} \rrbracket &= \llbracket Y \rrbracket (\llbracket \text{IP}_3 \rrbracket) \\ &= \lambda Q_{\langle dt \rangle}. \exists d_4 [Q(d_4) \wedge d_4 > \text{Max}(\lambda d_3. \exists d_1 [d_3 = \frac{d_1 - \theta_{\text{smart}}}{d_{MAX}(\llbracket \text{smart} \rrbracket, C) - \theta_{\text{smart}}} \wedge d_3 \geq 0 \wedge \delta_{\text{smart}}(b) = d_1])] \\ \llbracket \text{IP}_1 \rrbracket &= \llbracket \text{YP} \rrbracket (\llbracket \text{IP}_2 \rrbracket) = 1 \text{ iff} \\ &\exists d_4 [\exists d_1 [d_4 = \frac{d_1 - \theta_{\text{smart}}}{d_{MAX}(\llbracket \text{smart} \rrbracket, C) - \theta_{\text{smart}}} \wedge d_4 \geq 0 \wedge \delta_{\text{smart}}(j) = d_1] \wedge \\ &\quad d_4 > \text{Max}(\lambda d_3. \exists d_1 [d_3 = \frac{d_1 - \theta_{\text{smart}}}{d_{MAX}(\llbracket \text{smart} \rrbracket, C) - \theta_{\text{smart}}} \wedge d_3 \geq 0 \wedge \delta_{\text{smart}}(b) = d_1])] \end{aligned}$$

This analysis, just like Hayashishita's analysis, compares the extents of deviance from thresholds, not the degrees the standard and the associate have, though in a different way.

¹⁶To see the difference between my analysis and Hayashishita's analysis more clearly, we can rewrite Hayashishita's version of *pos* as in (i):

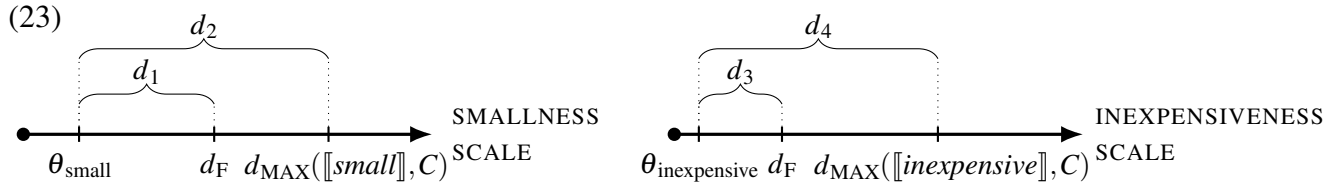
$$(i) \quad \llbracket pos_H \rrbracket = \lambda d_2 \lambda P_{\langle d, et \rangle} \lambda x_e. \exists d_1 [d_2 = d_1 - \theta_P \wedge d_2 \geq 0 \wedge P(d_1)(x)]$$

Under Hayashishita's formulation, extents of deviation are defined via subtraction on a scale. Under my analysis, extents of deviation are defined via division and the notion of dimension is neutralized.

¹⁷Here I adopt the denotation of *izyoo* which is different from Hayashishita's (2007, 2017) (see (10a)). This is to capture the nature of evaluative interpretations briefly noted in fn. 5. Kubota (2012) and Hayashishita (2017) argue that an evaluative interpretation for the standard is presupposed, while one for the associate is not. This asymmetry between the standard and the associate cannot be captured by Hayashishita's (2007) version of *izyoo*. Since his denotation of *izyoo* involves Max-operators in its truth-conditional part, it bears presuppositions not intended by him. Specifically, the Max-operators introduce a presupposition that there is at least one element in both sets combined with *izyoo*. In the *izyoo*-comparative, then, there would be presuppositions that there are degrees that measure the standard's and associate's deviance (note that Hayashishita assumes degrees of deviation to be greater than or equal to zero.). Equivalently, there would be presuppositions that both standards and associates have evaluative interpretations. To avoid this, my version of *izyoo* involves a Max-operator only for the part of the standard.

Therefore, it can account for the facts reviewed in section 2, presented as evidence for the CoD analysis.

This analysis also predicts that extents of deviation are expressed as a proportion with a dimensional parameter neutralized. This leads to a number of consequences. First, it predicts that incommensurable adjectives can be used when comparing the extents of deviance from their thresholds. It thus correctly predicts that (14a), which involves incommensurable adjectives, is true in the situation illustrated in (23), where d_F is a degree of the food product with respect to relevant properties and $\frac{d_1}{d_2}$ is greater than $\frac{d_3}{d_4}$:



Second, measure phrases are sensitive to a dimensional parameter of an adjective. In the *yori*-comparative, differences between degrees can be measured as long as a dimensional parameter of adjectives is compatible with measure phrases:

- (24) John-wa Bill-yori 2cm/2inches/*2kg/*2\$ segataakai.
 John-TOP Bill-YORI 2cm/2inches/*2kg/*2\$ tall
 ‘John is 2cm/2inches/*2kg/*2dollars taller than Bill.’

Since extents of deviation are neutralized with respect to a dimensional parameter as a result of division, the *izyoo*-comparative cannot be modified by measure phrases, as shown in (16). Intensifiers, on the other hand, seem to be insensitive to dimension. They can co-occur with adjectives with different dimensional parameters.

- (25) John-wa Bill-yori zutto segataakai/kasikoi/bakada/yasasii.
 John-TOP Bill-YORI much tall/smart/stupid/kind
 ‘John is much taller/smarter/more stupid/kinder than Bill.’

This is why they also can occur in the *izyoo*-comparative, as in (18).¹⁸

5 Conclusion

This paper has proposed a new semantic analysis of the *izyoo*-comparative. It is a refined version of Hayashishita’s (2007) CoD analysis. Specifically, it has been proposed that in the *izyoo*-comparative, the extent of deviation is proportionally calculated within the comparison class.

¹⁸There is an open question regarding the unacceptability of (i):

- (i) *John-wa Bill-izyoo-ni 2-bai segataakai.
 John-TOP Bill-IZYOO-DAT 2-times tall
 ‘John is 2 times taller than Bill.’

If the *izyoo*-comparative involves comparison of proportion, it is predicted that it is measured by factor phrases. I have to leave for future research why (i) is unacceptable.

It has been shown that this analysis not only retains the virtue of Hayashishita's original analysis, but also accounts in a unified way for the facts that incommensurable adjectives can be compared and that intensifiers, but not measure phrases, can occur within the construction.

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