On the semantics of comparative constructions in Japanese

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March 14, 2018

1 Introduction

This study deals with the semantics of comparative constructions in Japanese, which has at least two types of them, as shown in (1) and (2):

(1) John-wa Bill-yori kasikoi. [*Yori*-comparative]
John-TOP Bill-YORI smart
'John is smarter than Bill.'

(2) a. John-wa Bill-izyoo-ni kasikoi. [*Izyoo*-comparative]
John-TOP Bill-IZYOO-DAT smart
'John is smarter than Bill.'

b. John-wa [Bill-ga kasikoi izyoo-ni] kasikoi.
John-TOP Bill-NOM smart IZYOO-DAT smart
lit. 'John is smarter than Bill is smart.'

The sentences in (1) and (2) all involve the comparison of two individuals in terms of a certain property. Of the two contrasted individuals, we refer to the one which is selected by *yori* or *izyoo-ni* as in (1) and (2a) or which is within the clause selected by *izyoo-ni* as in (2b) as the *standard*. The one in the matrix clause which is 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 involves the comparison of the degree of smartness of the associate and that of the standard, and it is true if and only if the former is greater than the latter. This type of comparative has been extensively discussed in the literature in terms of its 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 2009, 2015, Mohri and Tei 2017 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 that "x-wa [y-yori] *adj*" is true iff the extent of x' *adj*-ness is greater than the extent of b's *adj*-ness.

(2a) is minimally different from (1a) in that *yori* is replaced with *izyoo-ni*. As (2b) shows, *izyoo-ni* can take a clausal argument as well.[2] We will call these types of comparative the *izyoo*-comparative. Compared with the *yori*-comparative, the *izyoo*-comparative has received less attention (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.

[1] I took these terminologies from Bhatt and Takahashi (2011).

[2] As opposed to *izyoo-ni*, *yori* cannot take a clausal argument in which there is an overt adjective:

I argue, following Hayashishita (2007, 2017), that the *izyoo*-comparative is an instance of the comparison of deviation constructions (Bierwisch 1989, Kennedy 1999). I depart from Hayashishita, however, in its formal semantic analysis. I propose a new analysis of how the deviation is 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 given in this paper.

This paper is organized as follows. In section 2, I review two major approaches to the *izyoo*-comparative. In section 3, I compare these approaches and show that the comparison of deviation analysis is empirically superior. In section 4, based on new data, I point out some problems for the previous formal analysis of the comparison of deviation. In section 5, I present a new analysis of the comparison of deviation. In section 6, I conclude.

2 The *izyoo*-comparative: Previous research

In this section I review the previous research into the *izyoo*-comparative by Hayashishita (2007, 2017) and Kubota (2012). There are two main issues that are discussed by these authors: (i) the *izyoo*-comparative induces a semantic implication that the *yori*-comparative does not. What is the nature of this semantic implication? and (ii) semantically, both *yori*- and *izyoo*-comparatives involve comparison. What is compared in these constructions, and what are the differences, if any, between them? Hayashishita (2007, 2017) and Kubota (2012) make different claims on these issues. We review their analyses together with the empirical evidence they present.

2.1 Kubota (2012)

One notable property of the *izyoo*-comparative is its semantic implication. Consider first sentence (3), where we have an unmodified/positive form of an adjective:

(3) John is smart.

We will call this type of sentence the *positive* construction to distinguish it from comparative constructions. The positive sentence in (3) is true when John'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*[4] and the term *standard* is reserved for phrases which are contrasted with the *associate* in comparative constructions. Let us also say that a construction is *evaluative* when an element within it has a degree above one specified by an unmodified/positive form of an adjective, i.e. a threshold.[5]

It is well known that, in contrast to the positive construction, the comparative in English is not evaluative. For example, when *John is smarter than Bill* is true, neither John nor Bill need to be considered smart. The same holds for *yori*-comparatives: the truth of (1) does not require that John or Bill be smart. Crucially, as

(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 (2009, 2015) among many others.

[3]How 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).

[4]The term *threshold* comes from Lassiter (2017).

[5]I borrow the term *evaluative* from Rett (2015).

originally observed by Hayashishita (2007), the *izyoo*-comparative differs from them in this respect. When (2a) and (2b) are true, both John and Bill need to be smart.[6] Consider (4):

(4) a. #Kono-tesuto-kara, John-wa kessite kasikoku-nai-ga, (kare-wa) Mary-izyoo-ni kasikoi
this-test-from John-TOP at.all smart-NEG-but he-TOP Mary-IZYOO-DAT smart
koto-ga wakatta.
fact-NOM understood
'From this test, we came to understand that John is not smart at all, but he is smarter than Mary.'
(Hayashishita 2007:83)

b. #Kono-tesuto-kara, Mary-wa kessite kasikoku-nai-ga, John-wa Mary-izyoo-ni kasikoi
this-test-from Mary-TOP at.all smart-NEG-but John-TOP Mary-IZYOO-DAT smart
koto-ga wakatta.
fact-NOM understood
'From this test, we came to understand that Mary is not smart at all, but John is smarter than Mary.' (Hayashishita 2007:84)

In the first part of (4a) and (4b), it is asserted that John is not smart and that Mary is not smart, respectively. Both of these cannot be followed by the *izyoo*-comparative. This is expected if the *izyoo*-comparative is evaluative with respect to both the standard and the associate. Since the the *izyoo*-comparative in (4) implicates that both John and Mary are smart, it cannot be used after the assertion that John is not smart, or after the assertion that Mary is not smart.[7] Hayashishita (2007) takes (4) as evidence that the evaluativity in question is an entailment, i.e. parts of the assertion. As Kubota (2012) points out, however, this conclusion is too hasty. This is because it is not the only way we can account for the infelicity of (4). Suppose, for example, that a particular semantic implication is a presupposition. This also can capture the infelicity of (4).

Kubota's (2012) main point is that the evaluativity of the *izyoo*-comparative follows from its presupposition regarding the standard. Specifically, he demonstrates that *izyoo* triggers a presupposition that the positive form of the adjective is true of the standard, but nothing is presupposed about the associate. This point is borne out by standard tests for presupposition like embedding under modals and in the antecedents of conditionals. Consider (5), where the *izyoo*-comparative is embedded within conditional antecedents:[8]

(5) a. Watasi-wa John-ga kasikoku-nai koto-o sitteiru. Sono-ue-de, John-ga Mary-izyoo-ni
I-TOP John-NOM smart-NEG that-ACC know that-above-at John-NOM Mary-IZYOO-DAT
kasikok-ereba, karera-ni hitotu-no purozyekuto-o makaseru-to itta-no-da.
smart-if them-DAT one-GEN project-ACC make.do-that said-COMP-COPULA
'I know for a fact that John is not smart. Knowing that, I have said that if John were smarter than Mary, I would let them take care of one project by themselves.'

[6] In English, *John is even smarter than Bill* seems to have the same semantic implication (p.c. Jonathan David Bobaljik). The addition of *even* to translations may thus be helpful to bring out this particular effect in English.

[7] When *izyoo-ni* is replaced with *yori* in (4), sentences are acceptable (Hayashishita 2007:84), showing that *yori* does not cause the implication in question.

[8] I have modified the translations of the conditional antecedents of (5). The original translations are "...if John is smarter than Mary ...". But these conditionals should be counterfactual.

b. #Watasi-wa Mary-ga kasikoku-nai koto-o sitteiru. Sono-ue-de, John-ga Mary-izyoo-ni
I-TOP Mary-NOM smart-NEG that-ACC know that-above-at John-NOM Mary-IZYOO-DAT
kasikok-ereba, karera-ni hitotu-no purozyekuto-o makaseru-to itta-no-da.
smart-if them-DAT one-GEN project-ACC make.do-that said-COMP-COPULA
'I know for a fact that Mary is not smart. Knowing that, I have said that if John were smarter than Mary, I would let them take care of one project by themselves.'
(adapted from Hayashishita 2017:169)

Conditional antecedents are known as presupposition holes, environments in which presuppositions within them are projected outside (Karttunen 1973). The contrast in (5) then follows if the evaluative interpretation regarding the standard, but not the associate, is presuppositional. Since the second sentence of (5b) presupposes that Mary is smart, it cannot be uttered after asserting that I know that Mary is not smart. (5a), on the other hand, is felicitous since the evaluativity regarding the associate is not presupposed.[9]

Kubota (2012) thus argues that evaluativity with respect to the standard and the associate is of different nature. The evaluativity of the the standard is presuppositional, while that of the associate comes from truth-conditions. Sentences in (2), for example, presuppose that Bill is smart. Also, for this sentence to be true, the degree of John's smartness has to exceed the degree of Bill's smartness. Thus the combination of the presupposition and truth-conditions account for why the standard and its associate have evaluative interpretations in the *izyoo*-comparative. Kubota (2012) goes on to argue that this presupposition is the only difference between *yori*- and *izyoo*-comparatives.

Kubota (2012) adopts the measure-function analysis of adjectives, where adjectives are functions from individuals to degrees (i.e. type $\langle e,d\rangle$) (Bartsch and Vennemann 1972, Kennedy 1999).[10]

(6) $[\![Adj]\!] = \lambda x_e.\ \delta_{Adj}(x)$, where δ is a function from objects to degrees

His version of the denotation of *izyoo* for phrasal comparatives is (7), whose presuppositional part dictates that with respect to a degree predicate, the first argument of *izyoo* (i.e. the standard) have a greater degree than the threshold (θ):[11]

(7) $[\![izyoo_{\text{K:phrasal}}]\!] = \lambda x_e \lambda g_{\langle e,d\rangle} \lambda y_e : g(x) \geq \theta_g.\ g(y) > g(x)$

(2a), repeated as (8), has the truth-conditions in (9):

(8) John-wa Bill-izyoo-ni kasikoi.
John-TOP Bill-IZYOO-DAT smart
'John is smarter than Bill.'

(9) $[\![(8)]\!] = 1$ iff $\delta_{smart}(j) > \delta_{smart}(b)$
Presupposition: $\delta_{smart}(b) \geq \theta_{smart}$

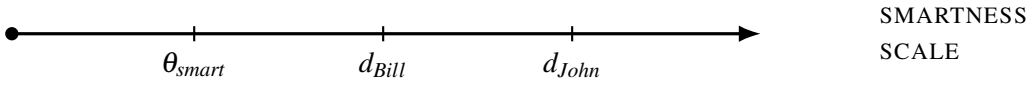
This condition is met in the situation illustrated in (10), where John's smartness is greater than Bill's smartness, which in turn is greater than the threshold:

[9]When the *yori*-comparative is used instead of the *izyoo*-comparative in (5), sentences are acceptable (Hayashishita 2017:170). This indicates that the *yori*-comparative does not involve a presupposition regarding evaluativity.

[10]In addition to standard atomic types e and t, d is used for degrees. Degrees are points on a dimension with a strict ordering. Under the measure-function analysis, the adjective *smart* maps individuals to degrees on the smartness dimension, while the adjective *long* maps individuals to degrees on the dimension of length. Note that different adjectives may have the same dimensional parameter, but have different ordering relations. For example, *long* and *wide* share the same dimensional parameter of length, but individuals mapped have different ordering relationships, since objects have different length and width. See Kennedy (1999) for more detailed discussion.

[11](7) is a simplified version. Kubota's original formulation involves a world variable. Here we abstract away from it since it is not relevant in the following discussion.

(10)



Note that under Kubota's (2012) analysis, the comparison in the *izyoo*-comparative is directly made between the degree of the standard and the degree of the associate on the scale specified by the adjective. In this sense, he analyzes the *izyoo* comparative as the 'standard' comparative construction with a special presupposition.

We have so far restricted our attention to phrasal comparatives, in which *izyoo-ni* takes a phrase, not a clause. Recall that in addition to the phrasal form, the *izyoo*-comparative allows clausal comparatives, as repeated as (11):

(11) John-wa [Bill-ga kasikoi]-izyoo-ni kasikoi.
John-TOP Bill-NOM smart-IZYOO-DAT smart
lit. 'John is smarter than Bill is smart.'

The clausal *izyoo*-comparative also shows evaluativity. Kubota proposes the following denotation for the clausal version of *izyoo*, which takes first an element of type d:

(12) $[\![izyoo_{\text{K:clausal}}]\!] = \lambda d \lambda g_{\langle e,d\rangle} \lambda x_e : d \geq \theta_g.\ g(x) > d$

Recall that Kubota adopts a measure-function analysis of adjectives, where adjectives are of type $\langle e,d\rangle$. Therefore, the first argument of *izyoo* in (11) is "Bill-ga kasikoi" of type d, and (11) has the truth-conditions in (9) as (8).

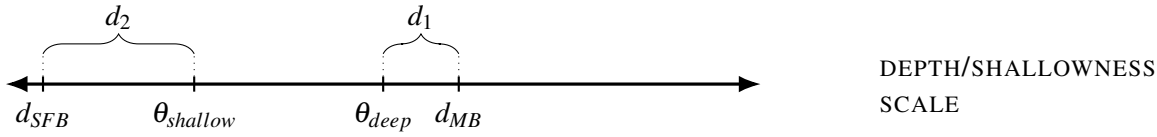
2.2 Hayashishita (2007, 2017)

Hayashishita (2007, 2017) argues that the *izyoo*-comparative is an instance of the comparison of deviation constructions (Bierwisch 1989, Kennedy 1999). (13) is an English example from Kennedy (1999):

(13) San Fransisco Bay is more shallow than Monterey Bay is deep. (Kennedy 1999:208)

Kennedy (1999) notes three characteristics of this construction. First, it requires the analytic form of comparative morphology (*more shallow*) rather than the synthetic morphology (*shallower*). Second, in the comparison of deviation construction two objects are not compared directly in terms of the same scale. Rather, the comparison is made between the extents of their deviance from the threshold associated with adjectives. (13) is thus true when the extent of San Fransisco Bay's deviation from the threshold for *shallow* is greater than the extent of Monterey' deviation from the threshold for *deep*. It is thus true iff d_2 is greater than d_1 in (14).[12] Crucially, it is not the case that d_{SFB} and d_{MB} are directly compared on the scale, as in the 'standard' comparative.

(14)



[12]Following Kennedy (1999), pairs of adjectival antonyms are assumed to be associated with two scales with the same dimension, but with the opposite orderings on their domains. This assumption straightforwardly explains the validity of (i):

(i) San Fransisco Bay is shallower than Monterey Bay iff Monterey Bay is deeper than San Fransisco Bay.

The first statement is true iff on the depth scale, San Fransisco Bay has a greater value than Monterey Bay. For the second statement to be true, Monterey Bay has to have a greater value than San Fransisco Bay on the shallowness scale. If these two scales share the same dimension, but have the opposite orderings, these statements are true in the same situations.

Third, the English comparison of deviation construction, like the *izyoo*-comparative, carries a semantic implication that the 'standard' comparative construction does not. The contrast in (15) shows that the comparison of deviation construction, but not the 'standard' comparative, carries an uncancelable implication that San Fransisco Bay is shallow:

(15) a. San Fransisco Bay is shallower than Monterey Bay, though they are fairly deep.
b. San Fransisco Bay is more shallow than Monterey Bay is deep. #San Fransisco Bay isn't shallow, though. (Kennedy 1999:209)

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):[13]

(16) $[\![Adj]\!] = \lambda d \lambda x_e.\ [\delta_{Adj}(x) = d]$

Second, he relies on the null morpheme *pos* to account for the evaluativity interpretation (Bartsch and Vennemann 1972, Cresswell 1976, von Stechow 1984, Kennedy 1999, 2007). His version of *pos* is (17):

(17) $[\![pos_{\mathrm{H}}]\!] = \lambda d_2 \lambda P_{\langle d,et \rangle} \lambda x_e.\ \exists d_1 [standard(d_1)(d_2)(P)(C) \wedge P(d_1)(x)]$

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] 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 degree abstraction.[14] This is illustrated in (18), where IP_1 denotes a set of degrees which measure the distance between John's smartness and the threshold:[15]

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[13] This 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.

[14] Hayashishita (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
[$_{\mathrm{IP}}$ John-ga [$_{\mathrm{AdjP1}}$ [$_{\mathrm{XP}}$ d_2 [$_{\mathrm{X}}$ pos]] [$_{\mathrm{AdjP2}}$ kasikoi]]]
b. Semantic composition
$[\![\mathrm{X}]\!] = [\![pos]\!] = \lambda d_2 \lambda P \lambda x.\ \exists d_1 [standard(d_1)(d_2)(P)(C) \wedge P(d_1)(x)]$
$[\![\mathrm{XP}]\!] = \lambda P \lambda x.\ \exists d_1 [standard(d_1)(d_2)(P)(C) \wedge P(d_1)(x)]$
$[\![\mathrm{AdjP}_2]\!] = [\![smart]\!] = \lambda d \lambda x.\ \delta_{smart}(x) = d$
$[\![\mathrm{AdjP}_1]\!] = \lambda x.\ \exists d_1 [standard(d_1)(d_2)([\![smart]\!])(C) \wedge \delta_{smart}(x) = d_1]$
$[\![\mathrm{IP}]\!] = \exists d_1 [standard(d_1)(d_2)([\![smart]\!])(C) \wedge \delta_{smart}(j) = d_1]$
$\exists$-closure $\rightarrow$
$[\![\mathrm{IP}]\!] = 1$ iff $\exists d_2 \exists d_1 [standard(d_1)(d_2)([\![smart]\!])(C) \wedge \delta_{smart}(j) = d_1]$

First, *pos* takes a free degree variable to form XP. This XP then is composed with AdjP_2, resulting in AdjP_1. AdjP_1 then takes a subject and we get IP. Finally, $\exists$-closure applies to the free variable d_2. This analysis predicts that (i) 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, (i) is true iff John's smartness exceeds the threshold. The details of how a free variable in the object language gets existentially closed in the metalanguage remain unclear, but this technical point is orthogonal to our concerns here.

[15] (18) is based on Hayashishita (2007: 98). When *pos* is composed with t_1, t_1 is interpreted as d_2, which is eventually bound by a lambda-operator. Though Hayashishita does not show any assignment, to make sure that this binding relationship holds, we need a system of assignments, for example, developed by Heim and Kratzer (1998).

(18) $[_{IP_1}$ Op$_2$ $[_{IP_2}$ John-ga $[_{AdjP1}$ $[_{XP}$ t$_2$ $[_X$ pos]] $[_{AdjP2}$ kasikoi]]]

$[\![\text{AdjP}_2]\!] = [\![smart]\!] = \lambda d \lambda x_e.\ [\delta_{smart}(x) = d]$

$[\![\text{X}]\!] = [\![pos]\!] = \lambda d_2 \lambda P_{\langle d,et\rangle} \lambda x_e.\ \exists d_1 [standard(d_1)(d_2)(P)(C) \wedge P(d_1)(x)]$

$[\![\text{XP}]\!] = [\![\text{X}]\!]([\![\text{t}_2]\!]) = \lambda P_{\langle d,et\rangle} \lambda x_e.\ \exists d_1 [standard(d_1)(d_2)(P)(C) \wedge P(d_1)(x)]$

$[\![\text{AdjP}_1]\!] = [\![\text{XP}]\!]([\![\text{AdjP}_2]\!]) = \lambda x_e.\ \exists d_1 [standard(d_1)(d_2)([\![smart]\!])(C) \wedge \delta_{smart}(x) = d_1]$

$[\![\text{IP}_2]\!] = [\![\text{AdjP}_1]\!]([\![John]\!]) = \exists d_1 [standard(d_1)(d_2)([\![smart]\!])(C) \wedge \delta_{smart}(j) = d_1]$

$[\![\text{IP}_1]\!] = \lambda d_2 \exists d_1 [standard(d_1)(d_2)([\![smart]\!])(C) \wedge \delta_{smart}(j) = d_1]$

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 (19a). It includes Max-operators, whose definition is given in (19b) (von Stechow 1984, Rullmann 1995):

(19) a. $[\![izyoo_{\text{H}}]\!] = \lambda P_{\langle dt\rangle} \lambda Q_{\langle dt\rangle}.\ Max(Q) > Max(P)$

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 (20) are analyzed as in (21):

(20) [Bill-ga kasikoi]-izyoo-ni John-wa kasikoi.
Bill-NOM smart-IZYOO-DAT John-TOP smart
lit. 'John is smarter than Bill is smart.'

(21) a. LF-representation

$[_{IP1}$ $\boxed{[_{YP}\ \boxed{[_{IP3}\ \text{Op}_3\ [_{IP}\ \text{Bill-ga}\ [_{AdjP}\ [_{XP}\ t_3\ [_X\ \text{pos}]]\ [_{Adj}\ \text{kasikoi}]]]]}\ [_Y\ \text{izyoo}]]}$

$\boxed{[_{IP2}\ \text{Op}_2\ [_{IP}\ \text{John-wa}\ [_{AdjP}\ [_{XP}\ t_2\ [_X\ \text{pos}]]\ [_{Adj}\ \text{kasikoi}]]]]}$]

b. Semantic composition

$[\![\text{IP}_3]\!] = \lambda d_3.\ \exists d_1 [standard(d_1)(d_3)([\![smart]\!])(C) \wedge \delta_{smart}(b) = d_1]$

$[\![\text{IP}_2]\!] = \lambda d_2.\ \exists d_1 [standard(d_1)(d_2)([\![smart]\!])(C) \wedge \delta_{smart}(j) = d_1]$

$[\![\text{Y}]\!] = [\![izyoo]\!] = \lambda P_{<dt>} \lambda Q_{<dt>}.\ Max(Q) > Max(P)$

$[\![\text{YP}]\!] = [\![\text{Y}]\!]([\![\text{IP}_3]\!])$

$= \lambda Q_{<dt>}.\ Max(Q) > Max(\lambda d_3.\ \exists d_1 [standard(d_1)(d_3)([\![smart]\!])(C)\ \wedge \delta_{smart}(b) = d_1])$

$[\![\text{IP}_1]\!] = [\![\text{YP}]\!]([\![\text{IP}_2]\!]) = 1$ iff

$Max(\lambda d_2.\ \exists d_1 [standard(d_1)(d_2)([\![smart]\!])(C) \wedge \delta_{smart}(j) = d_1]) >$

$Max(\lambda d_3.\ \exists d_1 [standard(d_1)(d_3)([\![smart]\!])(C) \wedge \delta_{smart}(b) = d_1])$

In (21), IP$_3$ and IP$_2$ denote a set of degrees which measure the extents of deviance for Bill's and John's smartness, respectively. *Izyoo* takes them and gives truth conditions that the sentence is true iff the maximal degree of John's deviance is greater than that of Bill's. In this way, Hayashishita (2007) tries to capture the semantic implications in the *izyoo*-comparative.[16] Hayashishita (2017) revises his analysis, adding a presupposition part in the denotation of *izyoo* in the spirit of Kubota (2012), though retaining his thesis that the *izyoo*-comparative is a comparison of deviation.

[16] One might wonder why *pos*'s are obligatory in IP$_2$ and IP$_3$ of (21). If the presence of *pos*'s were optional and IP's in (21a) could have the following structure, it would be predicted that the *izyoo*-comparative allows the interpretation without evaluativity:

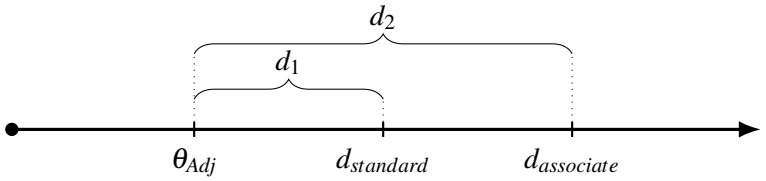
(22) $[\![izyoo_{\mathrm{H}}]\!] = \lambda P_{\langle dt\rangle}\lambda Q_{\langle dt\rangle} : Max(P) \geq 0.\ Max(Q) > Max(P)$

As for phrasal comparatives, he assumes that they are underlyingly clausal, and that their surface form is derived via deletion. That is, phrasal comparatives are reduced clausal comparatives.

(23) John-wa [Bill-~~ga kasikoi~~]-izyoo-ni kasikoi.

To summarize, Kubota (2012) analyzes the *izyoo*-comparative as the standard comparative with a presupposition. On the other hand, Hayashishita (2007, 2017) claims that the *izyoo*-comparative is a comparison of deviation. They thus propose different semantic analyses of the *izyoo*-comparative. For Kubota (2012) what is compared is $d_{standard}$ and $d_{associate}$ in (24); for Hayashishita (2007, 2017) what is compared is d_1 and d_2.

(24)



These analyses make the same prediction when the associate and the standard are associated with the same threshold. In the next section, we will see cases where these two analyses make different predictions, i.e. when the associate and the standard are associated with different thresholds.[17]

Before going to the next section, I would like to modify Hayashishita's (2017) proposal slightly. What Hayashishita (2017) tries to do is to combine the analysis developed by Hayashishita (2007) with the insight about presupposition from Kubota (2012). Recall that Kubota's (2012) point is that in the *izyoo*-comparative, there is a presupposition regarding the standard, but not the associate. Hayashishita (2017) tries to capture this by adding a presuppositional part ($Max(P) \geq 0$) as in (22). However, since his denotation of *izyoo* involves Max-operators in its truth-conditional part, it bears further presuppositions not intended by him. Specifically, the Max-operators introduce a presupposition that there is at least one element in a set selected by *izyoo*. In (21), then, there would be presuppositions that there are degrees that measure John's and Bill's deviance (note that Hayashishita assumes degrees of deviation to be greater than or equal to zero.).

(i) a. [$_{\mathrm{IP}}$ Op$_1$ [$_{\mathrm{IP}}$ Bill-ga [$_{\mathrm{AdjP}}$ t$_1$ kasikoi]]]
b. $[\![\mathrm{IP}]\!] = \lambda d_1.[\delta_{smart}(b) = d_1]$

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 needs a help of other morphemes like *pos* for degree abstraction to take place.

This proposal is related to the interpretation of sentences like (ii), where a measure phrase occurs with a positive form of an adjective:

(ii) John is 180cm tall.

In English, which has a syntactic position for a degree argument within AdjP, this position can be occupied by the measure phrase, and we get the interpretation that John's height is 180cm, without evaluativity. Japanese, on the other hand, does not have this interpretation since it lacks a position for a degree within AdjP. Instead, Japanese sentences have the meaning that John is 180cm taller than some standard which is contextually provided.

[17] Oda (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.'

Equivalently, there would be presuppositions that John and Bill have evaluative interpretations. So, not only is the presuppositonal part in (22) redundant, but also this formulation causes an unwelcome result since there should not be presupposition regarding associates. To capture the asymmetry within the comparison of deviation analysis, I propose the following denotation for *izyoo*:

(25) $[\![izyoo]\!] = \lambda P_{\langle dt\rangle}\lambda Q_{\langle dt\rangle}.\ \exists d[Q(d) \wedge d > Max(P)]$

Under this formulation, a presupposition arises only for the first argument selected by *izyoo*. (26) is semantic composition based on (25):

(26) a. LF-representation

[$_{IP1}$ [$_{YP}$ [$_{IP3}$ Op$_3$ [$_{IP}$ Bill-ga [$_{AdjP}$ [$_{XP}$ t$_3$ [$_X$ pos]] [$_{Adj}$ kasikoi]]]] [$_Y$ izyoo]] [$_{IP2}$ Op$_2$ [$_{IP}$ John-ga [$_{AdjP}$ [$_{XP}$ t$_2$ [$_X$ pos]] [$_{Adj}$ kasikoi]]]]]

b. Semantic composition

$[\![\text{IP}_3]\!] = \lambda d_3.\ \exists d_1[standard(d_1)(d_3)([\![smart]\!])(C) \wedge \delta_{smart}(b) = d_1]$

$[\![\text{IP}_2]\!] = \lambda d_2.\ \exists d_1[standard(d_1)(d_2)([\![smart]\!])(C) \wedge \delta_{smart}(j) = d_1]$

$[\![\text{Y}]\!] = [\![izyoo]\!] = \lambda P_{\langle dt\rangle}\lambda Q_{\langle dt\rangle}.\ \exists d_4[Q(d_4) \wedge d_4 > Max(P)]$

$[\![\text{YP}]\!] = [\![\text{Y}]\!]([\![\text{IP}_3]\!])$

$= \lambda Q_{\langle dt\rangle}.\ \exists d_4[Q(d_4) \wedge d_4 > Max(\lambda d_3.\ \exists d_1[standard(d_1)(d_3)([\![smart]\!])(C) \wedge \delta_{smart}(b) = d_1])]$

$[\![\text{IP}_1]\!] = [\![\text{YP}]\!]([\![\text{IP}_2]\!]) = 1$ iff

$\exists d_4[\exists d_1[standard(d_1)(d_4)([\![smart]\!])(C) \wedge \delta_{smart}(j) = d_1] \wedge$

$d_4 > Max(\lambda d_3.\ \exists d_1[standard(d_1)(d_3)([\![smart]\!])(C) \wedge \delta_{smart}(b) = d_1])]$

3 Comparing and evaluating the two analyses

The analyses reviewed above make different predictions when adjectives associated with the standard and the associate have different thresholds. Hayashishita (2017) provides two such cases. The first case is when two different adjectives are used in two clauses in the clausal *izyoo*-comparative. Consider (27), where adjectival antonyms are used in different clauses:

(27) [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 kasikoi (node, kono-tiimu-wa
John-NOM stupid COPULA IZYOO-DAT Mary-NOM smart because this-team-TOP
heikin-ten-yori ii-ten-o toru-daroo).
average-score-YORI good-score-ACC get-probably

'Since how smart Mary is exceeds how foolish John is, this team could probably score above the average.' (Hayashishita 2017:178)

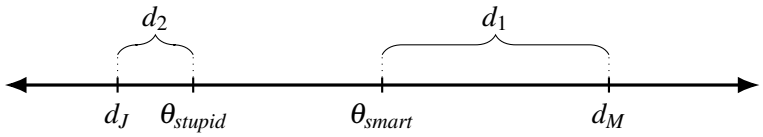
In (27), it is presupposed that John is stupid, and John's stupidness and Mary's smartness are measured and compared. Under Hayashishita's (2017) analysis, what is compared here is that the extent of John's deviance from the threshold on the stupidness scale and the extent of Mary's deviance from the threshold on the smartness scale, which seems to be an intuitively correct interpretation. Since the pair of antonyms share the dimensional parameters (see footnote 12), these extents of deviance are predicted to be comparable, and the

acceptability is expected. Under Kubota's (2012) analysis, however, (27) is difficult to explain. His theory predicts the following truth-conditions:

(28) $[\![(27)]\!] = 1$ iff $\delta_{smart}(m) > \delta_{stupid}(j)$
Presupposition: $\delta_{stupid}(j) \geq \theta_{smart}$

It is not that clear if it is possible to compare a degree on the smartness scale and a degree on the stupidness scale (cf. Kennedy 1999), but even if that is possible, there is a problem in a presuppositional part, which says that John's stupidness exceeds the threshold on the smartness scale. Since the thresholds on the smartness scale and the stupidness scale are different, Kubota's (2012) analysis does not predict a correct presupposition for this case. (29) is a summary with illustration:

(29)



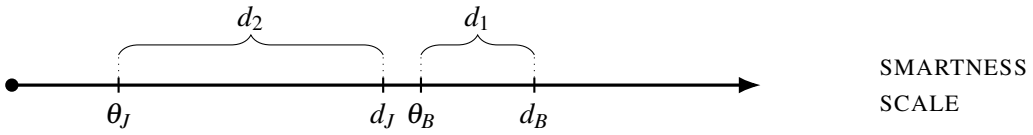
(27) is true iff
Kubota: $d_M > d_J$ (Presupposition: $d_J > \theta_{smart}$)
Hayashishita: $d_1 > d_2$ (Presupposition: $d_2 \geq 0$)

The second case involves different comparison classes in the two clauses. Consider (30), where the first sentence is the *izyoo*-comparative and the second is the *yori*-comparative:

(30) John-wa [[Bill-ga zibun-no kurasu-no naka de kasikoi] izyoo-ni] John-no
John-TOP Bill-NOM self-GEN class-GEN inside at smart IZYOO-DAT John-GEN
kurasu-no naka de kasikoi. To-wa it-temo, zissai-wa John-yori Bill-no
class-GEN inside at smart COMP-TOP say-although reality-TOP John-YORI Bill-GEN
hoo-ga kasikoi.
side-NOM smart
lit. 'John is smarter in his (= John's) class than Bill is smart in his (= Bill's) class. Although I am saying that, in reality Bill is smarter than John.' (Hayashishita 2017:180)

The phrase "in his class" in the first sentence is used to invoke different comparison classes in different clauses. Hayashishita's (2017) analysis correctly predicts (30) to be true in the situation illustrated in (31), where the extent of John's deviation from the threshold in John's class (i.e. d_2) is greater than the extent of Bill's deviation from the threshold in Bill's class (i.e. d_1), but Bill is smarter than John (i.e. $d_B > d_J$). Since the first sentence is the *izyoo*-comparative, it involves the comparison of deviation. The second sentence, on the other hand, involves *yori*, and comparison is made between John's and Bill's smartness, hence (30) is coherent. Kubota's (2012) analysis, on the other hand, predicts (30) to be contradictory. Under his analysis, both *izyoo*- and *yori*-comparatives involve comparison of John's and Bill's smartness. It is then predicted that the first sentence requires that John is smarter than Bill, and the second sentence Bill is smarter than John. The acceptability of (30) thus supports the comparison of deviation analysis.

(31)



(30) is true iff
Kubota: $d_J > d_B$ and $d_B > d_J$
Hayashishita: $d_2 > d_1$ and $d_B > d_J$

To summarize, we have seen the two cases in which the associate and the standard are associated with different thresholds, and shown that only the comparison of deviation analysis makes correct predictions.

I provide two pieces of new evidence for the comparison of deviation analysis from phrasal comparatives. One crucial difference between the two analyses is their relation with the *yori*-comparative. According to Kubota's (2012) analysis, the *izyoo*-comparative is the *yori*-comparative with the presupposition. Hence, in principle, there should be no difference between these constructions other than the presupposition. This expectation is not met. (32) shows that measure phrases like *180cm* can be selected by *yori*, but not by *izyoo*:

(32) a. John-wa 180cm yori segatakai.
John-TOP 180cm YORI tall
'John is taller than 180cm.' (Sudo 2015:46)

b. #John-wa 180cm izyoo-ni segatakai.
John-TOP 180cm IZYOO-DAT tall
'John is taller than 180cm.'

Measure phrases are standardly assumed to be of type d. Since Kubota's (2012) analysis allows the possibility that *izyoo* takes an argument of type d (cf. (12)), a measure phrase in principle should be able to occur in that position. Hayashishita's (2017) analysis, on the other hand, correctly predicts the status of (32b) since *izyoo* takes a degree predicate of type $\langle dt \rangle$ as its first argument. Thus, the contrast in (32) constitutes evidence in favor of Hayashishita's (2017) analysis.

Another difference is with regard to the compatibility with *hoo*. Informally, a morpheme *hoo* can be attached to an expression which is contrasted with another element (see Matsui and Kubota (2012) for its formal analysis). For example, in the situation where the speaker chooses either salad or soup at a restaurant, he can use (33) to express his request:

(33) [Context: the speaker is choosing either salad or soup at a restaurant]

Watashi-wa sarada-no-hoo-o onegaisimasu.
I-TOP salad-GEN-HOO-ACC request
'I will have a salad, please.' (Not the other i.e. soup) (Matsui and Kubota 2012:137)

Importantly, attachment of this morpheme leads to infelicity when an expression it attaches to contrasts with more than one element:

(34) [Context: the speaker is choosing either salad or soup or dessert at a restaurant]

#Watashi-wa sarada-no-hoo-o onegaisimasu.
I-TOP salad-GEN-HOO-ACC request
'I will have a salad, please.'

Following Matsui and Kubota (2012), I assume that *hoo* can attach to an expression whose comparison class' cardinality is 2. This morpheme can be used in the *yori*-comparative, but not with *izyoo*-comparative, to contrast the associate and the standard:

(35) a. John-no-hoo-ga Bill-yori kasikoi.
John-GEN-HOO-NOM Bill-YORI smart
'John is smarter than Bill.'

b. #John-no-hoo-ga Bill-izyoo-ni kasikoi.
John-GEN-HOO-NOM Bill-IZYOO-DAT smart
'John is smarter than Bill.'

The contrast in (35) presents another discrepancy between the two constructions. Under the comparison of deviation analysis, the contrast in question can be explained in the following manner. The *yori*-comparative involves the direct comparison of the associate and the standard on the scale specified by the adjective, hence we only have to take these two into consideration, and *hoo* can occur in the *yori*-comparative. The *izyoo*-comparative, as an instance of the comparison of deviation, involves measuring extents of John's and Bill's deviation from thresholds. Crucially, to calculate extents of deviation requires reference to comparison classes (see (17), where *standard* takes a comparison class *C*), and in general, we need to take more than two people into consideration to see if someone is smart and how much deviation there is. Therefore, (35b) is infelicitous. This line of explanation predicts that if a context is adjusted in a way that a comparison class consists only of an associate and a standard, the *izyoo*-comparative becomes compatible with *hoo*. This prediction seems to be correct. Under the context specified below, (36) sounds much better:

(36) [Context: An anchor is reporting that John made it to the final in the Olympics, which means he will get a silver or a gold medal. Of course, either is great, but to get the gold medal is more wonderful.]

Kin-medaru-no-hoo-ga gin-medaru-izyoo-ni subarasii (node, John-ni-wa
gold-medal-GEN-HOO-NOM siver-medal-IZYOO-DAT wonderful because John-DAT-TOP
ganbatte-hosii-desu.)
do.his.best-want-COPULA
'Since the gold medal is more wonderful than the silver medal, I hope he will do his best.'

These data thus support the comparison of deviation analysis of the phrasal *izyoo*-comparative.

4 New data: Further properties of the *izyoo*-comparative

We have so far restricted our attention to the comparison of the two theories of the *izyoo*-comparative, and have seen that the comparison of deviation analysis by Hayashishita (2007, 2017) is empirically more adequate. In this section we will pursue predictions of his formal analysis. Based on new data, it will be shown that predictions of his analysis are not borne out, showing that his analysis is not without problems.

Hayashishita's 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, i.e., they have to be compared on the scale with the same dimensional parameter. 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 weird 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).

(37) a. #Larry is more tired than Michael is clever.
b. #My copy of *The Brothers of Karamazov* is heavier than my copy of *The Idiot* is old.
(Kennedy 1999:16)

Second, in the *yori*-comparative, the associate's degree and the standard's degree are compared, and their difference can be predicated by measure phrases. For example, (38) means that John is taller than Bill, and the difference between John's and Bill's height is 3cm:

(38) John-wa Bob-yori 3cm segatakai.
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 expects 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. Consider (39):

(39) [Context: John is looking for a smart woman and a beautiful woman. But he cannot hire both.]

[Mary-ga utukusii izyoo-ni] Ann-wa kasikoi (node, watashi-wa Ann-o
Mary-NOM beautiful IZYOO-DAT Ann-TOP smart because I-TOP Ann-ACC
yatoi-tai.)
hire-want
'Since how smart Ann is exceeds how beautiful Mary is, I want to hire Ann.'

Intuitively, (39) involves the comparison between the extent of Ann's deviation from threshold on the smartness scale, and the extent of Mary's deviation from threshold on the beauty scale. According to Hayashishita's analysis, what is compared is d_1 and d_2 in (40). Note that d_1 and d_2 are on the scales with different dimensional parameters. Thus, Hayashishita's analysis incorrectly predicts (39) to be unacceptable.

(40)

Here are more examples that can be found on the Web:

(41) a. [Context: A door is being under construction in early March.][18]

Taihen urusai. Iya, [urusai izyoo-ni] samui.
really noisy well noisy IZYOO-DAT cold
'It is really noisy. Well, how cold it is exceeds than how noisy it is.'

b. [Context: Talking about an instant noodle][19]

[Sono nedan-ga takai izyoo-ni] oisikatta.
its price-NOM expensive IZYOO-DAT delicious
'How delicious it was exceeded how expensive its price was.'

c. [Context: Reviewing a food product][20]

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.'

It should be noted that Hayashishita (2007: 90, fn. 12) argues that adjectives in the *izyoo*-comparative have to be commensurable, based on the contrast between (27) and (42) :

(42) [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
John-NOM stupid COPULA IZYOO-DAT Mary-NOM lively because this-team-TOP
heikin-ten-yori ii-ten-o toru-daroo).
average-score-YORI 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)

In (27), *stupid* and *smart* are used, which are an antonym pair which shares the dimensional parameter, and in (42), *stupid* and *lively* are used, which are incommensurable. I agree with Hayashishita on the unacceptability of (42) *under 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 (42) is unacceptable because of a pragmatic reason. 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. In the context given in (27) and (42), John and Mary are taking part in a contest as a team, and their performance will be scored. In this situation, it is quite reasonable to compare smartness and stupidness since it is easy to imagine a situation in which smartness/stupidness is important in a contest. On the other hand, it is not straightforward to come up with a situation in which both stupidness and liveliness are relevant in a contest. In fact, example (42) improves when it is uttered in a very specific context like (43) in which both stupidness and liveliness are important.

(43) [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.]

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

[18] http://news.livedoor.com/article/detail/11275614/

[19] http://junjun2310.bunj.in/?p=1957

[20] https://www.amazon.co.jp/gp/customer-reviews/R3BNX9BPIWPQEI/ref=cm_cr_arp_d_rvw_ttl?ie=UTF8&ASIN=B071YP1CZB

the extents of deviation:

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

The unacceptability of (44) is not likely to be due to a syntactic reason since intensifiers like *zutto* 'much' can be used to modify the difference of the extents of deviation:

(45) ?John-wa Bill-izyoo-ni zutto segatakai.
John-TOP Bill-IZYOO-DAT much tall
'John is much taller than Bill.'

Intensifiers and measure phrases seem to occupy the same syntactic position since they cannot co-occur:

(46) *John-wa Bill-yori zutto 50cm segatakai.
John-TOP Bill-YORI much 50cm tall
lit. 'John is much 50cm taller than Bill.'

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 comparison of deviation, since I believe that the data reviewed in the last section strongly supports his thesis. Instead of throwing away the comparison of deviation thesis, I propose a new analysis of the comparison of deviation which accounts for the data presented in this and the last sections.

5 Proposal: Comparison of proportional deviation

When judging a positive sentence, we need to take the comparison class into consideration.[21] Suppose that John is 6.2 feet tall, and consider if sentence (47) is true:

(47) John is tall.

If it is uttered when talking about human's height in general, it is likely to be judged to be true. If it is uttered when talking about NBA players, it is likely to be judged to be false. This context-sensitivity of adjectives like *tall* is what every analysis has to account for, and it is typically accounted for by assuming that thresholds associated with adjectives vary depending on the comparison class. Here I make a further use of the comparison class. Let us define $d_{MAX}(P,C)$ as the greatest degree associated with an adjective P that any member of the comparison class C has.

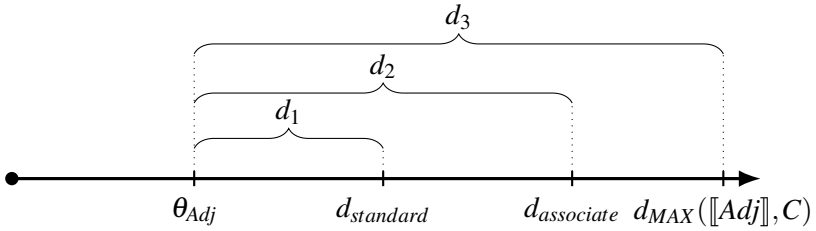
(48) $d_{MAX}(P,C) := Max\{d \mid \exists x \in C\ [P_{\langle d,et\rangle}(d)(x)]\}$

I propose that the extent of deviation from the threshold is proportionally calculated based on d_{MAX} and thresholds. (49) illustrates my proposal. The associate's deviation from the threshold is $\frac{d_{associate}-\theta_{Adj}}{d_{MAX}([\![Adj]\!],C)-\theta_{Adj}}$ ($= \frac{d_2}{d_3}$) and the standard's deviation from the threshold is $\frac{d_{standard}-\theta_{Adj}}{d_{MAX}([\![Adj]\!],C)-\theta_{Adj}}$ ($= \frac{d_1}{d_3}$), and the *izyoo*-

[21] This statement holds true only for relative adjectives in the sense of Kennedy and McNally (2005), whose scale structure has no closed end. As for absolute adjectives, which are associated with at least partly closed end of the scale, their thresholds are determined independently of the context. What is stated below is the proposal for relative adjectives. See Kennedy and McNally (2005) and Kennedy (2007) for claims that *pos* expresses different meanings depending on classes of adjective.

comparative is true iff the former is greater than the latter.[22]

(49)



'associate-wa [standard IZYOO-ni] adj'
'associate-wa [standard-ga adj IZYOO-ni] adj' are true iff

$$\frac{d_{associate}-\theta_{Adj}}{d_{MAX}(\llbracket Adj \rrbracket,C)-\theta_{Adj}} > \frac{d_{standard}-\theta_{Adj}}{d_{MAX}(\llbracket Adj \rrbracket,C)-\theta_{Adj}} \text{ i.e. } \frac{d_2}{d_3} > \frac{d_1}{d_3}$$

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. $d_{associate}$, 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 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*:

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

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.[23]

Semantic composition proceeds as in (51):[24]

[22]Note that $d_{MAX}(P,C)$ 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 θ 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 $d_{MAX}(P,C)$ 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.

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

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

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.

[24]Whether the phrasal *izyoo*-comparative is underlyingly clausal or phrasal is an issue we cannot fully address in this paper. If it turns out that it is underlyingly phrasal, as argued for the *yori*-comparative by Bhatt and Takahashi (2011), I would assume the denotation in (i):

(i) $\llbracket izyoo \rrbracket = \lambda x_e \lambda P_{\langle e,dt \rangle} \lambda y_e.\ \exists d_1 [P(y)(d_1) \wedge d_1 > \iota d_2 [P(x)(d_2)]]$

The first argument is the standard, and the second argument is satisfied by the following IP, which takes an individual argument and returns an a set of degrees which measure its deviation from the threshold:

(51) a. LF-representation

[IP1 [YP [IP3 Op3 [IP Bill-ga [AdjP [XP t3 [X pos]] [Adj kasikoi]]]]] [Y izyoo]]

[IP2 Op2 [IP John-ga [AdjP [XP t2 [X pos]] [Adj kasikoi]]]]]

b. Semantic composition

$[\![\text{IP}_3]\!] = \lambda d_3.\ \exists d_1[\ \frac{d_1-\theta_{smart}}{d_{MAX}([\![smart]\!],C)-\theta_{smart}} = d_3 \wedge\ d_3 \geq 0\ \wedge\ \delta_{smart}(b) = d_1]$

$[\![\text{IP}_2]\!] = \lambda d_2.\ \exists d_1[\ \frac{d_1-\theta_{smart}}{d_{MAX}([\![smart]\!],C)-\theta_{smart}} = d_2 \wedge\ d_2 \geq 0\ \wedge\ \delta_{smart}(j) = d_1]$

$[\![\text{Y}]\!] = [\![izyoo]\!] = \lambda P_{\langle dt\rangle}\lambda Q_{\langle dt\rangle}.\ \exists d_4[Q(d_4) \wedge d_4 > Max(P)]$

$[\![\text{YP}]\!] = [\![\text{Y}]\!]([\![\text{IP}_3]\!])$

$= \lambda Q_{\langle dt\rangle}.\ \exists d_4[Q(d_4) \wedge d_4 > Max(\lambda d_3.\ \exists d_1[\ \frac{d_1-\theta_{smart}}{d_{MAX}([\![smart]\!],C)-\theta_{smart}} = d_3\ \wedge\ d_3 \geq 0\ \wedge\ \delta_{smart}(b) = d_1])]$

$[\![\text{IP}_1]\!] = [\![\text{YP}]\!]([\![\text{IP}_2]\!]) = 1$ iff

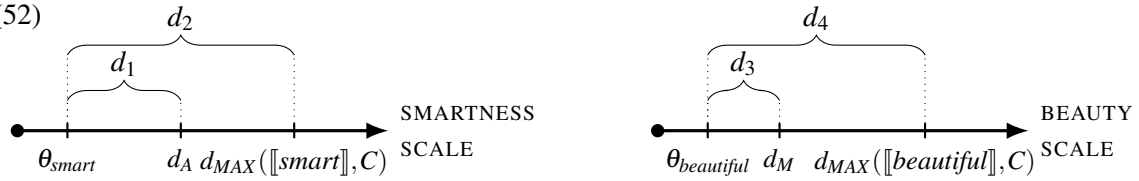
$\exists d_4[\exists d_1[\ \frac{d_1-\theta_{smart}}{d_{MAX}([\![smart]\!],C)-\theta_{smart}} = d_4\ \wedge\ d_4 \geq 0\ \wedge\ \delta_{smart}(j) = d_1] \wedge$

$d_4 > Max(\lambda d_3.\ \exists d_1[\ \frac{d_1-\theta_{smart}}{d_{MAX}([\![smart]\!],C)-\theta_{smart}} = d_3\ \wedge\ d_3 \geq 0\ \wedge\ \delta_{smart}(b) = d_1])]$

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. Therefore, it can account for the facts reviewed in section 3, presented as evidence for the comparison of deviation 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 (39), which involves incommensurable adjectives, is true in the situation illustrated in (52):

(52)



(39) is true iff $\frac{d_1}{d_2} > \frac{d_3}{d_4}$

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

(ii) a. [IP1 λx_1 [IP2 Op2 [IP3 t1 [XP t2 [X pos]] [AdjP2 kasikoi]]]]

b. $[\![]\!]\text{IP}_1 = \lambda x_1\lambda d_2.\ \exists d_3[\ \frac{d_3-\theta_{smart}}{d_{MAX}([\![smart]\!],C)-\theta_{smart}} = d_2\ \wedge\ d_2 \geq 0\ \wedge\ \delta_{smart}(x_1) = d_3]$

Finally, it takes the associate. (iii) is the LF-representation of the phrasal *izyoo*-comparative:

(iii) [IP1 John-wa [IP2 [YP Bob [Y izyoo]] [IP3 λx_1 [IP4 Op2 [IP5 t1 [XP t2 [X pos]] [AdjP2 kasikoi]]]]]]

(53) John-wa Bill-yori 2cm/2inches/*2kg/*2$ segatakai.
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 (44). Intensifiers, on the other hand, seem to be insensitive to dimension. They can co-occur with adjectives with different dimensional parameters.

(54) John-wa Bill-yori zutto segatakai/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 (45). Thus, the proposed analysis accounts for the data presented in sections 3 and 4.[25]

Before concluding, I would like to consider a theoretical possibility that has not been pursued before. It is to analyze the *izyoo*-comparative as metalinguistic comparison, which also differs from ordinary comparatives in a number of significant ways. (McCawley 1998, Giannakidou and Yoon 2011, Morzycki 2011 among many others). (55) is an English example:

(55) George is more dumb than crazy.

Attributing its observation to Sawada (2007), Morzycki (2011) presents the *iu-yori*-comparative as a metalinguistic one in Japanese:

(56) Taroo-wa kasikoi-to iu-yori zurugasikoi.
Taroo-TOP smart-as say-than cunning
'Taroo is more cunning than smart.'

Morzycki (2011) proposes that metalinguistic comparatives involve a comparison of degrees of imprecision. He argues that informally, what (55) means is that it is more precise to say that George is dumb than to say that he is crazy. One might propose to extend this line of analysis to the *izyoo*-comparative. That is, one might claim that (57) means that it is more precise to say that John is smart than to say that Bill is smart.

(57) John-wa Bill-izyoo-ni kasikoi.
John-TOP Bill-IZYOO-DAT smart
'John is smarter than Bill.'

This proposal may appear attractive since the *izyoo*-comparative shares certain properties with the metalinguistic comparative.[26] For example, the metalinguistic comparative allows comparison of incommensurable adjectives (cf. (39) and (41)):

(58) Taroo-wa utukusii-to iu-yori segatakai.
Taroo-TOP beautiful-as say-than tall
'Taroo is more tall than beautiful.'

[25]There is an open question regarding the unacceptability of (i):

(i) *John-wa Bill-izyoo-ni 2-bai segatakai.
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.

[26]Discussion below is mainly based on Section 2 of Morzycki 2011, where properties of metalinguistic comparative in English are listed.

Also, measure phrases cannot be selected by *iu-yori* (cf. (32b)):

(59) *Taroo-wa 6feet-to iu-yori segatakai.
Taroo-TOP 6feet-as say-than tall
'Taroo is more tall than 6feet.'

It is not the case, however, that they are exactly the same. First, the metalinguistic comparative carries an implicature regarding the evaluativity:

(60) Kyou-wa samui-to iu-yori atatakai.
today-TOP cold-as say-than warm
'It is more warm than cold today.' implicates (but does not entail) that it is warm.

Since this is only an implicature, it is cancelable. Compare it with the assertion:

(61) a. #Kyou-wa atatakai. Demo, atatakaku-wa-nai.
today-TOP warm though warm-TOP-NEG
'It is warm today, though it is not (that) warm.'
b. Kyou-wa samui-to iu-yori atatakai. Demo, atatakaku-wa-nai.
today-TOP cold-as say-than warm though warm-TOP-NEG
'It is more warm than cold today, though it is not (that) warm.'

The evaluativity in the *izyoo*-comparative, on the other hand, is not cancelable.

(62) #Kyou-wa kinoo-izyoo-ni atatakai. Demo, atatakaku-wa-nai.
today-TOP yesterday-IZYOO-DAT warm though warm-TOP-NEG
'It is warmer today than yesterday, though it is not (that) warm.'

Second, the metalinguistic comparison is compatible with total adjectives (Rotstein and Winter 2004; see also Kennedy and McNally 2005) like *closed*. As Hayashishita (2007: 89) points out, this is not the case for the *izyoo*-comparative.

(63) a. Kono-mado-wa aiteiru-to iu-yori(-wa) simatteiru.
this-window-TOP open-as say-than-(TOP) closed
'This window is more closed than open.'
b.??Kono-mado-wa ano-mado-izyoo-ni simatteiru.
this-window-TOP that-window-IZYOO-DAT closed
'This window is more closed than that window.' (Hayashishita 2007:89)

The infelicity of (63b) follows from the evaluative property of *izyoo*-comparative and the scale property of *closed*. Thresholds of adjectives like *closed* is necessarily the maximum degree of the scale under consideration. An individual is considered closed when it has the maximum degree of the scale of closedness, which means that when something is closed, it cannot be more closed. Since (63b) requires that both the associate and the standard are closed, and the former is more closed than the latter, it is infelicitous. This kind of restriction is not observed in the metalinguistic comparative.

There are thus a number of differences between the metalinguistic and the *izyoo*-comparatives, and these considerations suggest that the *izyoo*-comparative should be separated from metalinguistic comparatives.

6 Conclusion

This paper has proposed a new semantic analysis of the *izyoo*-comparative. It is a refined version of the comparison of deviation analysis. Specifically, it has been proposed that in the *izyoo*-comparative, the extent

of deviation is proportionally calculated within the comparison class. 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 it.

There are a few issues that I will leave to future research. The first is to explore further predictions of the proportional analysis. For instance, if *izyoo-ni* can be stacked or embedded under 'as much as,' a simple comparison of deviation (where intuitively possible) and the proportional comparison can give different predictions. Second, it needs to be investigated whether the proposed analysis for the *izyoo*-comparative can be extended to comparison of deviation constructions in general. For languages like English, this requires careful examination since its standard comparative, comparison of deviation construction, and metalinguistic comparative all involve the same morpheme *more*. Finally, there is an alternative idea to achieve commensurability with amounts of deviation directly which maps degrees of different adjectives on a third, contextually relevant scale. For example, for beauty/smartness in the context of hiring (see (39)), this could be a scale of how desirable an individual is as an employee, with one individual's degree of beauty and another's degree of intelligence being mapped onto degrees of desirability as employees. The details of such a map would have to be worked out in enough detail. We would, moreover, expect that in some cases measure phrases might reappear (for instance if desirability as an employee is measured in a point system).

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