

Two Strategies for Being ‘at least’: Japanese *sukunakutomo* and English *at least*

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1 Introduction

The Japanese *sukunakutomo* is often assumed to be a counterpart of the English superlative modifier *at least*, because they share the same two readings, the epistemic (EPI) and concessive (CON) readings (Nakanishi and Rullmann 2009):

- (1) a. At least three people came.
b. The speaker is uncertain about exactly how many people came. (EPI)
c. Three people came and three people’s coming is not the best result and not the worst result either. (CON)
d. Sukunakutomo 3-nin kita.
sukunakutomo three-CL came
‘At least three people came.’ (EPI/CON)

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However, they differ in their availability of the EPI-reading. The EPI-reading of *sukunakutomo* is difficult to obtain if it is used with a scale with mutually exclusive alternatives, where the prejacent and its alternatives cannot be true at the same time (Rullmann (2007)):

- (2) Q: How did Taro's race go in yesterday's final?
- a. Taro at least won a silver medal.
 - b. The speaker is uncertain about what medal Taro won. (EPI)
 - c. Taro won a silver medal and winning a silver medal is not the best result and not the worst result either. (CON)
 - d. Taro-wa *sukunakutomo ginmedaru-o totta*. (??EPI/CON)
Taro-TOP *sukunakutomo* silver.medal-ACC won

Unlike (1d), the prejacent (i.e. *Taro won a silver medal*) and its alternatives (i.e. *Taro won a bronze medal* and *Taro won a gold medal*) cannot be true simultaneously, and the EPI-reading is unavailable in this case.

This paper addresses two questions about *sukunakutomo*: (i) how are the two readings derived? and (ii) why does the availability of the EPI-reading depend on a scale with which it is associated? Extending our previous work (Ihara and Mizutani (2021)), this paper claims that *sukunakutomo p* is a concessive conditional like *even-if-conditionals*, which consists of *sukunai* 'little/few', *to* (the conditional morpheme) and the focus particle *mo* 'even', and that the two readings correspond to the two interpretations of *even if*, *standing-if* and *introduced-if* (Bennett (1982) and Guerzoni and Lim (2007)), and derives the unavailability of the EPI-reading through the incompatibility of the additive presupposition of *mo* with a mutually exclusive scale.

The structure of this paper is as follows. Section 2 reviews a previous analyses of *at least* and our previous work and points out that they cannot answer the above two questions. Section 3 demonstrates that the proposed concessive conditional analysis of *sukunakutomo* can derive the two readings and capture the restriction on the EPI-reading. Section 4 concludes this paper.

2 Previous Analyses

2.1 Chen (2018)

Chen (2018) proposes that *at least* can be decomposed into the preposition *at*, the comparative *less* and the superlative morpheme *-est* and has the semantics in (3a), which derives the truth conditions of (2a) as in (3c):¹

¹Chen (2018) assumes two different LFs for the two readings of *at least* but we set aside this difference due to space limitations. In addition, this paper does not discuss other previous analyses of *at least* (e.g. Geurts and Nouwen (2007)). See Ihara and Mizutani (2021) for the discussion

- (3) a. $\llbracket \textit{at least} \rrbracket^{w,c} = \lambda\alpha_{(s,t)}. \exists\gamma[\gamma \in C \wedge \gamma_w \wedge \forall\beta[\beta \in C \wedge \beta \neq \alpha \rightarrow \mu_C(\alpha) < \mu_C(\beta)]]$, where μ_C is a covert measure function and C is a set of alternatives associated with focus. (Chen 2018:69)
- b. Simplified LF of (2a): [*at least* [Taro won a [silver]_F medal]]
- c. $\llbracket (2a) \rrbracket^{w,c} = \exists\gamma[\gamma \in C \wedge \gamma_w \wedge \forall\beta[\beta \in C \wedge \beta \neq \textit{'Taro won a silver medal'} \rightarrow \mu_C(\textit{'Taro won a silver medal'}) < \mu_C(\beta)]]$
- d. $C = \{ \textit{Taro won a bronze medal}, \textit{Taro won a silver medal}, \textit{Taro won a gold medal} \}$

The superlative meaning (the underlined parts in (3c)) demands that the prejacent is the lowest among its alternatives, and the lower ranked alternative (i.e. a bronze medal) is excluded from C , as in (3d).

The EPI-reading is obtained when the informativity is at issue. The above truth conditions state that there is one element in C that is true. In other words, (2a) is true iff Taro won a silver or gold medal. Because the speaker does not provide the most informative unique answer, the ignorance effect arises.

The CON-reading is obtained when the evaluativity is at issue and the relevant higher alternative in C (i.e. a gold medal) is contextually known to be false. In this context, the prejacent is the only true proposition in C , and it is entailed. Given the presence of the higher and lower ranked alternatives (i.e. gold and bronze medals), the prejacent is not the best and not the worst either, which gives rise to the concessive flavor.

It seems that Chen's (2018) analysis of *at least* can be directly applied to *sukunakutomo*, because these two expressions share the same two readings. However, there are two difficulties. The first is the difference in the morphological makeups. Chen's (2018) analysis involves the superlative meaning (the underlined part in (3c)), and this is the reflection of the superlative morpheme in *at least*. In the case of *sukunakutomo*, there is no superlative morpheme involved, and it is unclear why *sukunakutomo* has such a superlative meaning. The question is, therefore, why *sukunakutomo* has the same two readings as *at least* despite the fact that the former does not contain the superlative morpheme. The second is the difference in the availability of EPI-readings. As noted above, unlike *at least*, the EPI-reading of *sukunakutomo* is difficult to obtain when it is associated with a scale with mutually exclusive scale. If these expressions have the same semantics, this is unexpected. Hence, an alternative analysis of *sukunakutomo* is called for.

2.2 Ihara and Mizutani (2021)

In our earlier work (Ihara and Mizutani (2021)), we claim that *sukunakutomo* can be decomposed into *sukunai* 'few/little', *to* (conditional), and *mo* 'even',

on the difficulties in applying these analyses to *sukunakutomo*.

and forms a concessive conditional like *even if* and that the superlative meaning is derived from the scalar presupposition of *mo*. The adjective *sukunai* is interpreted as *few* or *little* and the exact interpretation (i.e. exactly a ‘small’ amount) is obtained through the MAX-operator (cf. Kennedy (2015)).

$$(4) \quad \llbracket \textit{sukunai} \rrbracket^{w,c} = \lambda D_{\langle d, t \rangle}. \text{MAX}(D) = d_{\Delta}, \text{ where } D \text{ is a set of degrees and } d_{\Delta} \text{ is a small value relative to the context } c.$$

Following Kratzer (1986), the conditional morpheme *to* is assumed to introduce a covert necessity operator to derive its conditional meaning.

$$(5) \quad \text{a. } \textit{to}_{\textit{conditional}}(p)(q) \rightsquigarrow \text{NEC}_w[p] [q], \text{ where NEC is a covert necessity operator.}$$

$$\text{b. } \llbracket \text{NEC}_{\textit{to}} \rrbracket^{w,c} = \lambda p. \lambda q. \forall w' \in \bigcap f_c^*(w): q(w'), \text{ where } f_c^*(w) = f_c(w) \cup \{ \llbracket p \rrbracket \} \text{ and } f_c \text{ is a conversational background in } c.$$

The focus particle *mo*, like *even*, presupposes that the prejacent is ranked the lowest with regard to a contextually salient graded property ($<_c$) (cf. Nakanishi 2006). The graded property is associated with not only likelihood but also unexpectedness, noteworthiness and so on (Rullmann 2007):

$$(6) \quad \llbracket \textit{mo} \rrbracket^{w,c} = \lambda p. p_w \wedge \partial (\forall q [q \in \llbracket p \rrbracket^{\text{ALT}} \wedge q \neq p \rightarrow p <_c q]),$$

where ∂ is a presupposition operator (see Beaver (2001)).

Under this analysis, the simplified LF of (1d) is (7a), where *mo* takes a sentential scope (see Aoyagi (1998) a.o.), and the adjective *sukunai* in *sukunakutomo* takes a contextually determined covert scalar anaphor α_{amount} of type $\langle d, t \rangle$ (cf. Kayne (2005) and Sawada (2016)) and it is resolved as in (7b). Given these ingredients, (2d) is interpreted as in (7d).

$$(7) \quad \text{a. } \llbracket \boxed{3} \textit{mo}_{\textit{even}} \boxed{2} \textit{to}_{\textit{conditional}} \boxed{1} [\textit{sukunai}]_F \alpha \rrbracket [\text{three people came}]]]]$$

$$\text{b. } \llbracket \boxed{1} \rrbracket^{w,c} = \llbracket \textit{sukunai} \rrbracket^{w,c} (\llbracket \alpha \rrbracket^{w,c})$$

$$= \llbracket \lambda I_{\langle d, t \rangle}. \text{MAX}(I) = d_{\Delta} \rrbracket (\lambda d. d\text{-many people came}_w)$$

$$= \text{MAX}(\lambda d. d\text{-many people came in } w) = d_{\Delta}, \text{ where } \llbracket \alpha \rrbracket^{w,c} = \lambda d. d\text{-many people came}_w$$

$$\text{c. } \llbracket \boxed{2} \rrbracket^{w,c} = \llbracket \textit{to}_{\textit{conditional}} \rrbracket^{w,c} (\llbracket \boxed{1} \rrbracket^{w,c}) (\llbracket \textit{three people came} \rrbracket^{w,c})$$

$$= \text{NEC}_w [\text{MAX}(\lambda d. d\text{-many people came in } w) = d_{\Delta}]$$

$$[\exists d [\text{people}(x) \wedge \text{came}_w(x) \wedge \mu(x) = 3]]$$

$$\text{d. } \llbracket \boxed{3} \rrbracket^{w,c} = \llbracket \textit{mo}_C \rrbracket^{w,c} (\llbracket \boxed{2} \rrbracket^{w,c})$$

$$= \text{NEC}_w [\text{MAX}(\lambda d. d\text{-many people came in } w) = d_{\Delta}]$$

- $$\begin{aligned}
& [\exists d[\text{people}(x) \wedge \text{came}_w(x) \wedge \mu(x) = 3]] \\
& \wedge \partial(\forall q [q \in \llbracket 2 \rrbracket^{\text{ALT}} \wedge q \neq \llbracket 2 \rrbracket^{w,c} \rightarrow \llbracket 2 \rrbracket^{w,c} <_c q]), \text{ where} \\
& <_c \text{ is resolved as the } \textit{less-than} \text{ relation.} \\
\text{e. } & \llbracket 2 \rrbracket^{\text{ALT}} \\
& =\{\text{if the number of people who came was } d, \text{ three people came: } d\}
\end{aligned}$$

The assertion states that if the number of people who came was d_Δ , which is a small value relative to the context c , three people came. The scalar presupposition demands that among the alternative propositions of the form ‘if the number of people who came was d , three people came’, the prejacent is the least in terms of $<_{\textit{less-than}}$. To meet this requirement, d_Δ should be the least value. The resulting meaning is that if the number of people who came was the least, three people came. In this way, the existence of *mo* ensures the superlative meaning without using the superlative morpheme.

The ignorance effect of the EPI-reading is derived pragmatically through a typical rule of conversation (Grice (1989)): The speaker asserted that in the case where the number of people who came was the least, three people came, but did not mention other cases (e.g. cases where the number of people who came was large, the largest and so on). From this, we can infer that the speaker does not know how many people came when the number of people who came was larger than the least. Hence, the ignorance inference arises.

The above analysis correctly derives the superlative meaning without the superlative morpheme and captures the ignorance inference of the EPI-readings. However, there remains several problems: It is unclear how the CON-reading is derived based on the meaning of the concessive conditional and why the EPI-reading is difficult to obtain when *sukunakutomo* is associated with a scale with mutually exclusive alternatives.

3 Proposal

As in (8), *even if* has two different readings: one in which the consequent is entailed (= *introduced-if*) and the other in which it is not (= *standing-if*):

- (8) a. Even if the bridge were standing, I wouldn’t cross.
 \rightsquigarrow I wouldn’t cross. (Introduced-if)
- b. Even if John drank [one ounce of whiskey]_F, she would fire him.
 $\not\rightsquigarrow$ she would fire him (Standing-if)
 (Guerzoni and Lim 2007:276)

Recall that according to Chen (2018), the prejacent of the CON-reading of *at least* is entailed, while that of the EPI-reading is not. Based on this similarity, this paper claims that the two readings of *sukunakutomo* correspond to the

two readings of *even if*: The former corresponds to *introduced-if*, where the consequent is entailed, and the latter corresponds to *standing-if*, where the consequent is not entailed.

3.1 Guerzoni and Lim (2007)

Guerzoni and Lim (2007) assume that *even* in *even if* has the standard semantics, which involves additive (existential) and scalar presuppositions.

- (9) $\llbracket \text{even} \rrbracket(C)(p)(w)$ is defined iff (Guerzoni and Lim 2007:278)
 $\exists q \in C [q \neq p \ \& \ q(w) = 1]$ & Additivity
 $\forall q \in C [q \neq p \rightarrow p <_{\text{likely/expected}} q]$ Scalarity
 If defined, then $\llbracket \text{even} \rrbracket(C)(p)(w) = p(w)$ Assertion

According to Guerzoni and Lim (2007), the entailment of the consequent is obtained if *even* is associated with the covert AFF(irmative) operator in the *if*-clause. Given this, the truth conditions are derived as follows:²

- (10) a. $\llbracket \text{AFF} \rrbracket^o = \lambda t. t$, $\llbracket \text{AFF} \rrbracket^f = \{ \lambda t. t, \lambda t. t = 0 \}$
 b. Even [if [AFF]_F the bridge were standing, I would not cross]
 c. C={that if the bridge were standing I wouldn't cross, that if the bridge were not standing I wouldn't cross}
 d. Assertion: If the bridge were standing I would not cross.
 e. Existential Presupposition
 $\exists q [q \in \{ \text{that if the bridge were standing I wouldn't cross, that if the bridge were not standing I wouldn't cross} \} \ \& \ q \neq \text{that if the bridge were standing I wouldn't cross} \ \& \ q(w) = 1]$
 \Leftrightarrow that if the bridge were not standing I would not cross is true in evaluation world.
 f. Scalar Presupposition
 That I would not cross is less likely if the bridge were standing than if the bridge were not standing.(Guerzoni and Lim 2007:282)

Alternative propositions that *even* operates on consist of *if p, q* and *if $\neg p, q$* . As a result, the combination of the existential presupposition and the assertion leads to the statement *if p, q and if $\neg p, q$* , which exhaustifies the logical possibilities. This amounts to saying that under any circumstance, the consequent *q* is true. Hence, the consequent is entailed.

The second reading of *even if* is derived if *even* is associated with an element other than the covert AFF operator in the *if*-clause (e.g. a degree expression). The truth conditions of the second reading are derived as follows:

² $\llbracket X \rrbracket^o$ and $\llbracket X \rrbracket^f$ denote the ordinary and focus semantic values of *X*, respectively.

- (11) a. Even [if John drank_[F] one ounce] of whiskey she would fire him]
- b. $C = \{ p : \exists d \ \& \ p = \text{that if John drank } d\text{-much whiskey he would be fired } \}$
- c. Assertion: If he drank one ounce of whiskey she would fire him.
- d. Existential Presupposition
 $\exists q [q \in (11b) \ \& \ q \neq (11c) \ \& \ q(w) = 1]$
 $\Leftrightarrow \exists d \neq 1 \text{ oz s.t. if John drank } d\text{-much whiskey she would fire him is true in the evaluation world.}$
- e. Scalar Presupposition
 It is less likely that she would fire John if he drank one ounce of whiskey than if he drank any other amount of whiskey.
 (Guerzoni and Lim 2007:283)

The scalar presupposition requires that the prejacent is the least likely (i.e. it entails all the other alternatives). In other words, one ounce is required to be the least amount of whiskey such that if John drank that amount of whiskey she would fire him. Note that degree expressions are downward-monotonic but the antecedent of the conditional is the environment where the entailment relationship is reversed (see von Stechow (1999)). As a result, for any $d > 1$ oz., if he drank d -much whiskey she would fire him. However, this does not exhaustify all the relevant possibilities (e.g. a possibility that John drank no whiskey). Thus, the consequent is not entailed.

3.2 Deriving the Two Interpretations of *sukunakutomo*

In what follows, we derive the two readings of *sukunakutomo* based on Guerzoni and Lim's (2007) analysis of *even if*. Let us start with the CON-reading of (2d). Its LF is (12a), where the focus particle *mo* is associated with the covert AFF operator like *introduced-if* and the scalar anaphor α is resolved as in (12b) because the evaluativity is at issue:³

- (12) a. $[\text{mo}_{\text{even}} [\text{to}_{\text{conditional}} [{}_p \text{AFF}_F \text{ sukunai } \alpha] [{}_q \text{Taro won a silver medal }]]]]$
- b. $\alpha = \lambda d. \text{ Taro was } d\text{-successful}$
- c. $C = \{ \text{if Taro was } d_{\Delta}\text{-successful in the race, he won a silver medal, if Taro was not } d_{\Delta}\text{-successful in the race, he won a silver medal} \}$
- d. Scalar Presupposition: 'Taro won a silver medal is less likely if he was d_{Δ} -successful than if he was not d_{Δ} -successful.'
- e. Existential Presupposition

³ Following Chen (2018), this paper assumes that the CON-reading and the EPI-reading are concerned with the evaluativity and the informativity, respectively.

If Taro was not d_{Δ} -successful, Taro won a silver medal.

- f. Assertion: If Taro was d_{Δ} -successful, Taro won a silver medal.

The point here is that the combination of the existential presupposition and the assertion: If Taro was d_{Δ} -successful or was not d_{Δ} -successful, Taro won a silver medal. This exhaustifies the logical possibilities, and the consequent is entailed. In addition, a silver medal is not the worst result and not the best result either. Hence, the CON-reading is obtained.

Next, let us consider the EPI-reading of (1d). The LF is (13a), where *mo* is associated with the degree expression *sukunai* like *standing-if* and α is resolved as in (13b) because the informativity is at issue:

- (13) a. [mo_{even} [$\text{to}_{\text{conditional}}$ [p *sukunai*_F α] [q three people came]]]
 b. $\alpha = \lambda d. d$ -many people came.
 c. $C = \{\text{if the number of people who came was } d, \text{ three people came: } d\}$
 d. Scalar Presupposition: ‘If the number of people who came was d_{Δ} , three people came’ $<_{\text{likely}}$ ‘If the number of people who came was any other degree, three people came’
 e. Existential Presupposition: If the number of people who came was $d \neq d_{\Delta}$, three people came.
 f. Assertion: If the number of people who came was the least, three people came.

The scalar presupposition requires that the prejacent is the least likely among its alternatives (i.e. the prejacent is required to entail all the other alternatives). To satisfy this requirement, d_{Δ} should be the least. The result is that if the number of people who came was the least, three people came. Given the entailment reversal of the antecedent of the conditional, for any $d > d_{\Delta}$, if the number of people who came was d , three people came. However, this does not consider all the relevant cases (e.g. a case in which no people came). The consequent is, therefore, not entailed.

Next, let us consider why the EPI-reading of (2d) is difficult to obtain:

- (14) a. # [mo_{even} [$\text{to}_{\text{conditional}}$ [p *sukunai*_F α] [q Taro won a silver medal]]]
 b. $\alpha = \lambda d. d$. Taro won d -many medals in the race
 c. $C = \{\text{if Taro won } d\text{-many medals in the race he won a silver medal: } d\}$
 d. Scalar Presupposition: ‘If the number of medals that Taro won

was d_{Δ} , he won a silver medal' $<_{\text{likely}}$ 'If the number of medals that Taro won was d , he won a silver medal'

- e. Existential Presupposition: If Taro won $d \neq d_{\Delta}$ -many medals, he won a silver medal.
- f. Assertion: If the number of medals that Taro won was d_{Δ} , he won a silver medal.

The problem arises from the existential presupposition. Given that one individual can receive only one medal in one race, d_{Δ} should be one. Hence, the existential presupposition results in 'if the number of medal Taro won was $d > d_{\Delta}$ he won a silver medal' but this requires that Taro won more than one medal in one race. However, this is impossible given the nature of a scale with mutually exclusive alternatives. Hence, the EPI-reading is blocked.

The difference in the availability of EPI-readings between *at least* and *sukunakutomo* is summarized as follows: The EPI-reading of *at least* states that there should be one member in C that is true, which is equivalent to a disjunctive sentence. We can form disjuncts from mutually exclusive propositions (e.g. Taro won a silver medal or a gold medal). Hence, the EPI-reading of *at least* is possible when it is associated with a mutually exclusive scale. The EPI-reading of *sukunakutomo*, on the other hand, requires that, due to the additive presupposition of *mo*, there should be more than one members in C that are true, but this requirement cannot be compatible with mutually exclusive scales. Hence, the EPI-reading of *sukunakutomo* is difficult to obtain if it is associated with these scales.

4 Conclusion

This paper claims that the two readings of *sukunakutomo* correspond to the two readings of *even if* and that the incompatibility of the EPI-reading with a mutually exclusive scale arises from the additive presupposition of *mo*. However, the availability of the EPI-reading seems to differ according to speakers.⁴ In fact, even when such a scale is involved, the EPI-reading is possible if the contrastive *wa* is added or if the non-past form of the verb or modals such as *darou* 'would' is used:

⁴ The additive presupposition of *mo* plays a crucial role for the current analysis. However, it is well known that the additive presupposition of scalar particles is absent in some cases.

(i) a. #We invited [Bill]_F, although we didn't invite anyone else.

b. John is even a [full]_F professor. (Guerzoni and Lim 2007:288)

The additive presupposition explains the infelicity of the first example, but the second example indicates that this presupposition is optional, because the associate of *even* in this example constitutes a scale with mutually exclusive alternatives. Our speculation is that the optionality of this presupposition leads to the speaker variation of the availability of the EPI-reading.

- (15) Q: How did Taro's race go in yesterday's final?
- a. Taro-wa sukunakutomo ginmedaru-wa totta.
 Taro-TOP sukunakutomo silver.medal-CT won
- b. Taro-wa sukunakutomo ginmedaru-o toru/toru-darou.
 Taro-TOP sukunakutomo silver.medal-ACC win/win-would
- (EPI/CON)

At present, we have nothing to say about these facts, and leave the analysis for our future research.

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