Predicates of Personal Taste with Epistemic Modals/Evidentials in Japanese*

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1 Introduction

This paper analyzes a semantic difference between epistemic modals and indirect evidentials in Japanese in terms of their interaction with Predicates of Personal Taste (PPTs) such as *tasty* in English. Specifically, the Japanese epistemic modal *nitigainai* 'must' can co-occur with a PPT whose experiencer is overtly specified as the speaker, but the indirect evidential *yooda* 'seem' cannot. I propose that this difference is reduced to the fact that epistemic modals allow their inference bases to be modified by a co-occurring conditional, while evidentials do not.

The remainder of this paper is organized as follows. Section 2 reviews observations in the literature and provides new data. Section 3 illustrates

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how to represent PPTs' semantics. Section 4 provides a denotations of epistemic modals and evidentials, introduces an indirectness requirement associated with these items (von Fintel and Gillies 2010), and crucially presents a hitherto-unaddressed contrast between epistemic modals and evidentials. Section 5 demonstrates how the new data presented in Section 2 are captured by proposing a rescue rule that applies when the presupposition of PPTs cannot be met. Section 6 discusses the implications of this study.

2 Facts from Previous Work and New Observations

This paper deals with the Japanese epistemic modal *nitigainai* and indirect evidential *yooda*:

(1) Ame-ga hutteiru nitigainai/yooda.
rain-NOM falling EPIS/EVID
'It [must / seems to] be raining.'

As Lasersohn (2005) mentions, which lexical items count as PPTs is a difficult to determine. Therefore, throughout this paper, I only address the PPT *oisii* 'tasty', which is treated as the most prototypical PPT in previous studies:

(2) Sono-karee-wa oisii.
that-curry-TOP tasty
'That curry is tasty.'

Let us see the basic facts and observations from the literature on PPTs, epistemic modals, and evidentials. First, in both English and Japanese, PPTs can be accompanied by an overt experiencer:[1]

(3) a. This curry is tasty for me.
b. Sono-karee-wa watasi-nitotte-wa oisii.
that-curry-TOP 1ST-for-TOP tasty.
'That curry is tasty for me.'

As shown below, PPTs with an overt experiencer can co-occur with epistemic modals and evidentials in both English and Japanese.

(4) a. The puerh must be delicious to Mo.
(Anand and Korotkova 2018: (45))

[1] Bylinina (2017) reports that *ni* 'to' can play the same role as *nitotte*:

(i) John-ni-wa kono-keeki-wa oisii nitigainai.
John-to-TOP this-cake-TOP tasty EPIS
'This cake must be tasty to John' (Bilynina 2017:301)

However, I personally find this sentence less acceptable than (3b). Hence, throughout this paper, I use *nitotte* as the postposition that introduces experiencer arguments.

b. Sono-karee-wa John-nitotte-wa oisii [nitigainai / yooda].
that-curry-TOP John-for-TOP tasty [EPIS / EVID]
'That curry [must be / seems] tasty for John.'

However, it has been reported that, in English, PPTs are incompatible with epistemic modals or evidentials if the overt experiencer is the speaker:

(5) a. #Shortbread must be tasty to me! (Pearson 2013: 123)
b. #The puerh apparently was delicious to me...
(Anand and Korotkova 2018: (12))

Unlike the English *must*, the Japanese epistemic modal *nitigainai* can co-occur with PPTs whose experiencer is overtly specified as the speaker, whereas the indirect evidential *yooda* cannot:[2]

(6) (John is complaining about the curry that his wife often makes. He says that the curry is disgusting because it contains a lot of cilantro. You love cilantro, so you think you will like the curry. John also says to you 'You like cilantro, so I think you will like my wife's curry. What do you think?' You reply:)
a. Sono-karee-wa watasi-nitotte-wa oisii nitigainai.
that-curry-TOP 1st-for-TOP tasty EPIS
'That curry must be tasty to me.'
b. #Sono-karee-wa watasi-nitotte-wa oisii yooda.
that-curry-TOP 1st-for-TOP tasty EVID
'That curry must be tasty to me.'

This contrast has never been addressed in the literature. I provide an account of it and propose several cross-linguistic implications.

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[2] Akitaka Yamada (p.c.) points out that the sentence like (6b) improves in contexts such as the following:

(ii) (You and your colleagues are at a party. Everyone but you tried the curry that is served there, and all of them say that it is disgusting. You give it a try, and, to your surprise, find it tasty. You say to yourself:)

?Kono-karee-wa watasi-nitotte-wa oisii yooda.
this-curry-TOP 1ST-for-TOP tasty EVID
'This curry seems tasty to me.'

In this case, the speaker actually tasted the curry, which means that *yooda* in 2 does not signal indirect evidentiality; instead, it is used as a mirative marker (a marker that expresses the speaker's surprise). I acknowledge that there is a deep connection between indirect evidentiality and mirativity (Rett and Murray 2013, among others), but I maintain that PPTs with the speaker as the overt experiencer is incompatible with *yooda* as the marker of indirect evidentiality.

3 PPTs with an Overt Experiencer

This section presents the lexical entries of PPTs with and without an overt experiencer. As has been pointed out in the literature (Ninan 2014, 2020; Anand and Korotkova 2018, among others), PPTs presuppose that the experiencer has a certain type of *direct experience* of the subject:[3]

(7) That curry is tasty. $\rightsquigarrow$ The speaker has actually tasted the curry.

To formalize this requirement, I adopt the same assumption as Anand and Korotkova (2018): the computation of PPTs' semantics involves the following three parameters:

(8) a. w: the possible world (the evaluation world)
b. j: the judge (Lasersohn 2005, Stepehenson 2007)
c. $K_{j,\,w}$ the set of propositions that the judge j knows in w through direct experience.

The following is the denotation of *oisii* 'tasty' without an overt experiencer:

(9) $[\![\, oisii \,]\!]^{w,\,j,\,K_{j,\,w}} = \lambda x.\ x$ is tasty to j in w, defined only if $tasty(x)(j) \in K_{j,\,w} \vee \neg tasty(x)(j) \in K_{j,\,w}$.[4]

[*x-wa-oisii*] '*x* is tasty' is defined only if the contextually salient judge j (typically the speaker) directly knows in w whether x is tasty or not, and becomes true iff x is tasty to j in w.

For the cases where the experiencer is overtly specified (e.g., *y-nitotte-oisii* 'tasty for *y*'), I assume, following Anand and Korotkova (2018), that the judge is lexically fixed regardless of the contextual parameters:

(10) $[\![\, y\text{-}nitotte\text{-}oisii \,]\!]^{w,\,j,\,K_{j,\,w}} = \lambda x.\ x$ is tasty to y in w, defined only if $tasty(x)(y) \in K_{y,\,w} \vee \neg tasty(x)(y) \in K_{y,\,w}$.

In this formula, the experiencer is specified as y, not as j. Appendix B presents the compositional process used to derive the results.

4 Epistemic Modals/Evidentials

4.1 Epistemic Modals/Evidentials with PPTs

For expository purposes, I assume the following possible-world semantics for both the epistemic modal *nitigainai* and the indirect evidential *yooda* (hence-

[3] What type of experience counts as direct experience is a difficult question. See Anand and Korotkova (2018) for a detailed discussion.

[4] The clauses $tasty(x)(j)$ and $\neg tasty(x)(j)$ are to be understood as [$\lambda w.\ x$ is tasty to j in w] and [$\lambda w.\ x$ is not tasty to j in w], respectively.

forth, the contextual parameters j and $K_{j,w}$ are omitted because they are not relevant to the following discussion).[5]

(11) $[\![\text{EPIS/EVID}]\!]^w = \lambda p.\ \forall w'[w' \in \bigcap f(w) \rightarrow [\![p]\!]^{w'}]$, where $f(w)$ is the set of propositions known to be true in w (the ordering source is omitted for the sake of simplicity).

Following Anand and Korotkova (2018), I assume that the presupposition of PPTs with an overt experiencer projects out of the scope of EPIS/EVID:[6]

(12) $[\![\textit{x-wa-y-nitotte oisii} \text{ EPIS/EVID}]\!]^w$
$= [\![\text{EPIS/EVID}]\!]^w([\![\textit{x-wa-y-nitotte-oisii}]\!]^w)$
$= \forall w'[w' \in \bigcap f(w) \rightarrow x$ is tasty to in $w']$, defined only if $\textit{tasty}(x)(y) \in K_{y,w} \vee \neg \textit{tasty}(x)(y) \in K_{y,w}$.

4.2 Indirectness Requirement

As observed in von Fintel and Gillies (2010) and Matthewson (2020), among others, when one uses epistemic modals such as *must*, one must not know directly whether the prejacent is true:

(13) (Seeing the pouring rain)
a. It's raining.
b. ??It must be raining. (von Fintel and Gillies 2010: 353)

I assume that the same requirement is imposed on *nitigainai* and *yooda* given the infelicity of the following example:

(14) (After you saw falling raindrops from the window, you tell this to someone else:)
#Ame-ga futtei-ta nitigainai/yooda.
rain-NOM falling-PAST EPIS/EVID
'It must have been raining. / It seems that it was raining.'

This requirement can be represented as below:

(15) The indirectness requirement[7]
The utterance of [p-EPIS/EVID] by the speaker j in the world w requires $\lceil p \notin K_{j,w} \wedge \neg p \notin K_{j,w} \rceil$.

[5] The modal semantics of *yooda* is assumed only for the sake of exposition. The insights of this paper can be implemented with non-modal analyses of *yooda*, such as Davis and Hara (2014).

[6] See Appendix B for the compositional derivation.

[7] In von Fintel and Gillies (2010), this requirement is incorporated into the presuppositional content of *must*. In this paper, I do not commit myself to whether (15) should be analyzed as a presupposition, an implicature, or a semantic/pragmatic norm that comes from elsewhere.

4.3 The (Im)possibility of Modifying the Inference Base

The following contrast, which has never been addressed in the literature, is crucial to the current purpose:

(16) (John is one of the murder suspects. A police officer detects a fingerprint at the crime scene. Before identifying whether it is John's, she says to herself:)

Kore-ga John-no simon nara yatu-ga han'nin
this-NOM John-GEN fingerprint if he-NOM criminal
nitigainai/#no-yooda.
EPIS/COP-EVID
'If this is John's fingerprint, he [must /#seems to] be the murderer.'

In this context, the speaker's conclusion of her inference (i.e., that John is the murderer) is derived by adding the supposition that the fingerprint she detected is John's, to the best of her knowledge that John is a suspect. Based on the general and traditional assumption that the conditional of form *if p* adds the proposition p to the modal base $f(w)$ of the co-occurring modal (von Fintel and Heim 2011), the truth-conditions in (16) are represented as follows:

(17) $[\![(16)]\!]^w = \forall w'[w' \in \bigcap(f(w) + \textit{this fingerprint is John's}) \rightarrow$ John is the criminal in $w']$.

In this formula, the inference base —that is, the body of information from which the prejacent of the modal is derived (the modal base, in this case) —is modified by the co-occurring conditional. The fact that *yooda* cannot be used in (16) allows us to posit the following generalization.

(18) The inference base of EVID cannot be modified by a co-occurring conditional.[8]

As pointed out by Yusuke Kubota (p.c.), it remains to be explained why evidentials demonstrate this effect while epistemic modals do not. This is an important issue that should be addressed in the future research.

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[8] This does not mean that evidentials can never co-occur with conditionals. When an evidential co-occurs with a conditional, the conditional is not interpreted as modifying the inference base of the evidentials, but as part of the prejacent. That is, the LF of the *yooda*version of the sentence in (16) cannot be as in (a) but as in (b).

(iii) a. [Kore-ga John-no simon nara] [John-ga han'nin no] yooda.
b. [Kore-ga John-no simon nara John-ga han'nin no] yooda.

What the speaker infers in (b) is not that *John is the murderer*, but that *if this is John's fingerprint, John is the murderer*. This interpretation is incompatible with the context of (16).

5 Capturing the Contrast

The sentences in (6), repeated here as (19a), are interpreted as in (19b), where *sp* = the speaker and **c** = *sono-karee* 'that curry':

(19) a. Sono-karee-wa watasi-nitotte-wa oisii nitigainai/#yooda.
that-curry-TOP 1st-for-TOP tasty EPIS/EVID
'That curry [must be/#seems] tasty to me.'

b. $[\![\text{EPIS/EVID}]\!]^w([\![\textit{sono-karee-wa watasi-nitotte oisii}]\!]^w)$
$= \forall w'[w' \in \bigcap f(w) \rightarrow \mathbf{c}$ is tasty to *sp* in $w']$, defined only if $\textit{tasty}(\mathbf{c})(sp) \in K_{sp,\,w} \vee \neg \textit{tasty}(\mathbf{c})(sp) \in K_{sp,\,w}$.

These propositions are defined only if the speaker knows directly whether the curry is tasty or not in the actual world *w*, and they become true if the curry is tasty to the speaker in all the accessible worlds w'.

However, the use of EPIS/EVID by the speaker induces the indirectness requirement in (15): $[\![\textit{Sono-karee-wa watasi-nitotte oisii}]\!] \notin K_{sp,\,w} \wedge [\![\textit{Sono-karee-wa watasi-nitotte oisii}\text{-NEG}]\!] \notin K_{sp,\,w}$, i.e., [**c** is tasty to *sp*] $\notin K_{sp,\,w} \wedge$ [**c** is not tasty to *sp*] $\notin K_{sp,\,w}$. In other words, the speaker must be ignorant of whether the curry is tasty. This contradicts the presupposition of (19b), indicating that it cannot be satisfied in the actual world *w*.

I claim that at least in Japanese, the following rule applies in order to rescue sentences such as (19a):

(20) Let *CG* be the Common Ground (the set of propositions shared by discourse participants).
If a sentence carries the presupposition *q* offered by a PPT in the scope of EPIS/EVID but $\neg q \in CG$, the sentence is interpreted by inserting a counterfactual in order to satisfy the presupposition.

The PPT's presupposition in (19a) (that the speaker directly knows whether the curry is tasty) is satisfied if she has tasted it. Therefore, after (20) is applied, (19a) is interpreted as follows:

(21) [*If I tasted it, sono-karee-wa watasi-nitotte oisii* EPIS/EVID]

I adopt the naïve assumption that the counterfactual *if q* excludes $\neg q$ from the modal base of the co-occurring modal and adds *q* to it. Then, (21) yields the following truth-conditions and presupposition, where q = *I tasted* ***c***:

(22) $\forall w'[w' \in \bigcap(f(w) - \neg q + q) \rightarrow \mathbf{c}$ is tasty to *sp* in $w']$, defined only if $\textit{tasty}(\mathbf{c})(sp) \in K_{sp,\,w'} \vee \neg \textit{tasty}(\mathbf{c})(sp) \in K_{sp,\,w'}$.[9]

[9] As Yusuke Yagi (p.c.) pointed out, it remains unclear how we can formalize the rule (20) in order to arrive at the interpretation here. I leave this issue to future research.

Note that the presupposition is relativized not to $K_{sp,\,w}$ but to $K_{sp,\,w'}$, which represents what the speaker knows in the counterfactual worlds w' where the counterfactual condition *I tasted the curry* holds. This means that the speaker is required to have direct experience with the curry in the counterfactual worlds, but not in the actual world. This does not contradict the indirectness requirement of EPIS/EVID, which requires the speaker's lack of direct experience in the actual world. Hence, by resorting to the rescue rule (20), both the presupposition of the PPT and the indirectness requirement of EPIS/EVID are satisfied.

Why, then, is the indirect evidential *yooda* infelicitous in (19a)? In (22), the modal base of EPIS/EVID is modified by the co-occurring counterfactual conditional, as in $\bigcap(f(w) - \neg q + q)$. Here, (18) comes into play. Unlike EPIS, the inference base (the modal base, in this paper) of EVID must not be modified by a co-occurring conditional. Thus, *yooda* cannot tolerate the configuration in (22). The contrast between EPIS and EVID in (19a) is attributed to the (im)possibility of their inference bases being modified.

In (19a), *yooda* is infelicitous because the inserted counterfactual cannot modify the modal base of *yooda*. Therefore, it is predicted that (19a) will improve if another modal in the same clause provides a modal base that the counterfactual modifies:

(23) Sono-karee-wa watasi-nitotte-wa zettaini/matigainaku oisii yooda.
that-curry-TOP 1ST-for-TOP definitely/certainly tasty EVID
'It seems that that curry is definitely/certainly tasty to me.'

In this case, the inserted counterfactual *If I tasted it* modifies the modal base of the epistemic adverbs *zettaini/matigainaku* 'definitely/certainly', but not of *yooda*, which does not violate (18).

6 Implications

The first issue to be addressed is the generality of rule (20). In Section 5, I propose (20) as a rule solely for PPTs' presupposition, which may sound ad hoc because it is inconceivable that a language possesses a rescuing rule with such a narrow range of applicability. However, the same rule as (20) seems applicable to other presupposition triggers.

To see this, let us turn to the historical facts of Nobunaga Oda, who was a Japanese warlord during the Sengoku Period (from the mid-14th century to the early 16th century). He could not reign Japan because he was betrayed and killed by one of his subordinates. Given this, consider the following contrast:

(24) Nobunaga-no tenka-wa suguni owatta nitigainai/#yooda.
Nobunaga-GEN reign-TOP immediately ended EPIS/EVID
'Nobunaga's reign [must/#seems to] have ended immediately.'

The aspectual verb *owatta* 'ended' in this sentence presupposes that Nobunaga Oda had ruled Japan in the actual world. If the same rule as (20) applies to (24) (i.e., if a counterfactual that satisfies *owatta*'s presupposition is inserted), it is interpreted as follows:

(25) [*If Nobunaga ruled Japan, Nobunaga-no tenka-wa suguni owatta* EPIS/EVID]

We can then derive the unavailability of *yooda* in (24) in the same manner as in Section 5. This means that the insertion of a counterfactual satisfying the presupposition is not particularized for PPTs, but is applicable to other presupposition triggers.

However, the conditions enabling the application of this rule should be explored in the future research. Normally, epistemic modals such as *must* are said to be presupposition hole: presupposition projects over the scope of modals:

(26) John must have stopped smoking. $\rightsquigarrow$ He actually had been smoking.

The same goes for Japanese. (27) sounds unnatural if it is not established that John actually had been smoking before. This is unexpected if the rescue rule is applied whenever the presupposition does not hold in the actual world.[10]

(27) John-wa tabako-o yameta nitigainai.
John-TOP tobacco-ACC quit EPIS
'John must have stopped smoking.'

What distinguishes (24) from (27)? Note that (20) applies if the *negation* of the presupposition is contained in the Common Ground (rather than *if the truth of the presupposition is not contained in CG*). (24) is uttered given a widely-known historical fact that Nobunaga Oda actually could not reigned Japan, so the negation of the presupposition is taken for granted by participants. This may be the factor that makes the rescue rule ready for application in (24). For (27), if there is rich contextual support and it is firmly established that the presupposition is false, the sentence improves:[11]

[10] I thank Yusuke Yagi (p.c.) for bringing up this point.

[11] (28) sounds even better if the subject *John* is marked with a conditional marker *nara*. I leave this topic for future research.

(28) (John and Tom are brothers who passed away a long ago. John was health-conscious and never smoked for his entire life while Tom was a heavy smoker. Tom did not stop smoking, even with the doctors' advice, and passed away when he was young. The speaker, who is familiar with both, is talking about John:)

John-wa Tom-to-tigatte isya-ga-tometa-toki,
John-TOP Tom-with-different doctor-NOM-stopped-when
tabako-o yameta nitigainai.
tobacco-ACC quit EPIS
'Unlike Tom, John must have stopped smoking when the doctors stopped him.'

Thus, the conclusion at the moment is that the application of the rescue rule requires a firm contextual establishment that the presupposition is false in the actual world.

The second implication concerns differences between Japanese and English. As seen in Section 1, the English epistemic modal *must* is reported to be incompatible with PPTs with the overt experiencer as the speaker:

(29) #Shortbread must be tasty to me! (Pearson 2013: 123)

However, the same configuration is felicitous in Japanese as in (6). This can be explained if we assume that rescue rule (20) is unavailable in English. If this is on the right track, it raises the possibility that there is a cross-linguistic variation as to whether rescue rules such as (20) are operative.[12]

Finally, there has been much debate regarding the categorical relationship between epistemic modals and evidentials. Some authors (de Haan 1999, Aikhenvald 2004, among others) argue that the two categories are completely distinct, while others (Matthewson et al. 2007, von Fintel and Gillies, among others) claim that there is an inclusion relation between them. Given the observations in this paper (e.g., (16)), we can say that the two categories differ from each other, at least in their interactions with conditionals.

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[12] A morpho-syntactic difference between Japanese and English may have something to do with this variation. It is generally assumed that, unlike English, Japanese lacks verbal morphology specialized for the subjunctive mood. The epistemic modals in Japanese can co-occur with conditionals, regardless of whether they are counterfactual or not, which is possibly why insertion of a counterfactual works well for Japanese epistemic modals.

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Appendix A On the Causal Analysis

Davis and Hara (2014) argue that *yooda* lexically encodes a causal relation between its prejacent and the proposition serving as the evidence, as represented in (30).[13] Their analysis is based on the contrast in (31).

(30) When [*p-yooda*] is uttered based on the evidence q, p must be the cause of q.[14]

(31) a. (Looking at a wet street)
Ame-ga futta yooda.
rain-NOM fell EVID
'It seems that it rained.'

b. (Looking at falling raindrops)
#Miti-ga nureteiru yooda.
streets-NOM wet EVID
'It seems that the streets are wet.' (Davis and Hara 2014: 187)

In (31a), the prejacent event (i.e., raining) causes the street to be wet, while the one in (31b) (i.e., the streets being wet) cannot be the cause of raining.

One might argue that Davis and Hara's (2014) causal analysis explains the contrast addressed in this paper, so my analysis can be abandoned altogether. In (6), the speaker utters [*That curry is tasty for me* + EVID], based on the evidence that John said that the curry contains a lot of cilantro and that the speaker will like the curry. It is intuitively strange that the prejacent event (i.e., the curry being tasty for me) causes John to say that it contains a lot of cilantro and that the speaker will like the curry. Therefore, *yooda* in (6) may well violate Davis and Hara's causal requirement.

I claim that even if Davis and Hara's causal analysis is correct, it does not immediately follow that my analysis should be jettisoned. The most prominent reason is that their analysis cannot differentiate cases where the experiencer is the speaker from those where the experiencer is someone else. Consider the following:

[13] Takubo (2009) and Krawczyk (2012) propose the same line of analysis for *yooda* and other indirect evidentials although they use the term *explanation* instead of causation.

[14] Empirical problems of this claim are discussed in Hirayama (2020) and Hirayama and Matthewson (2022).

(32) (You tasted a curry and found it disgusting. Later, John said that he liked it. You say to yourself:)

Ano-karee-wa John-nitotte-wa oisii yooda.
that-curry-TOP John-for-TOP tasty EVID
'That curry seems tasty to John.'

In this case, the speaker's utterance [*That curry is tasty to John* + EVID] is based on the evidence that John said he likes the curry. The situation is almost the same as (6), except whose taste is addressed in John's statement (i.e., in (6), John said *the speaker* will like the curry, while in (32), he said *he* likes the curry). It is unclear how Davis and Hara distinguish these cases.[15]

On the other hand, my analysis clearly differentiate the first person and others. The indirectness requirement of EPIS/EVID in (15) contradicts the utterance of [*x is tasty for y* + EPIS/EVID] when *y* is the speaker, but it does not when *y* is someone else. Thus, the insertion of the counterfactual occurs only when *y* is the speaker. Note that the current analysis is not incompatible with Davis and Hara (2014); it is ideal if my analysis is integrated into theirs and all the data including (31) are explained in a unified manner. I leave this issue for future research.

Appendix B The Detailed Composition

In Section 3, I assumed that PPTs such as *oisii* 'tasty' is relativized to the three parameters: w, j, and $K_{j,w}$, as in (33a). The lexical entry of *nitotte*, the postposition that introduces the experiencer argument, is represented in (33b), where *nitotte* takes a PPT P and the experiencer y, relativizes P's truth to y by overwriting the parameter j with y, nullifies P's presupposition by overwriting the parameter $K_{j,w}$ with the set of all propositions $\wp$, and introduces a new presupposition that equals P's presupposition except the second and third parameters are rendered y and $K_{y,w}$, respectively. (33c) presents the result of *nitotte* takes a PPT *oisii* and the overt experiencer *watasi* '1ST'.

(33) a. $[\![\textit{oisii}]\!]^{w,j,K_{j,w}} = \lambda x.\, x$ is tasty to j in w, defined only if $\textit{tasty}(x)(j) \in K_{j,w} \vee \neg\textit{tasty}(x)(j) \in K_{j,w}$.

b. $[\![\textit{nitotte}]\!]^{w,j,K_{j,w}} = \lambda P_{\langle e,t\rangle}.\lambda y.\lambda x.\, [\![P]\!]^{w,y,\wp}(x)$, defined only if $[\![P]\!]^{w,y,K_{y,w}}(x)$ is defined.

c. $[\![\textit{watasi-nitotte oisii}]\!]^{w,j,K_{j,w}} = [\![\textit{nitotte}]\!]^{w,j,K_{j,w}}([\![\textit{oisii}]\!]^{w,j,K_{j,w}})(sp)$ $= \lambda x.\, [\![\textit{oisii}]\!]^{w,sp,\wp}(x)$, defined only if $[\![P]\!]^{w,sp,K_{sp,w}}(x)$ is defined.

[15] Note that the speaker's evidence in (6) and (32) is reportative: the speaker's inference that p is true is based on someone else's statement that p is true. How the causal analysis deals with this case is not discussed in Davis and Hara (2014). Intuitively, the truth of some proposition does not necessarily cause someone else to state that it is true.

$= \lambda x\ x$ is tasty to sp in w, defined only if $tasty(x)(sp) \in \wp \vee \neg tasty(x)(sp) \in \wp$, and defined only if $tasty(x)(sp) \in K_{sp,\,w} \vee \neg tasty(x)(sp) \in K_{sp,\,w}$.
$= \lambda x\ x$ is tasty to sp in w, defined only if $tasty(x)(sp) \in K_{sp,\,w} \vee \neg tasty(x)(sp) \in K_{sp,\,w}$.

In (33c), the underlined part (i.e., what $[\![\ oisii\ ]\!]^{w,\,sp,\,\wp}(x)$ presupposes) is nullified because it holds trivially. Therefore, (33c) is defined only if the speaker knows whether x is tasty or not, and becomes true if x is tasty to the speaker, which is the desired result.

Let us turn to the treatment of EPIS/EVID. As is observed by Pearson (2013), Ninan (2014, 2020), and Anand and Korotkova (2018), PPT's requirement of direct experience disappears when PPTs are in the scope of modals/evidentials (so-called *the obviation effect*). When uttering (34), the speaker need not have the direct experience of the curry.

(34) Sono-karee-wa oisii [nitigainai/yooda].
that-curry-TOP tasty [EPIS/EVID]
'That curry [must be/seems] tasty.'

To achieve this, I assume, following Anand and Korotkova (2018) and Ninan (2020), that EPIS/EVID operate on the parameters of their prejacent:

(35) a. $[\![\ \text{EPIS}\ ]\!]^{w,\,j,\,K_{j,\,w}} = \lambda p.\ \forall w'[w' \in \bigcap f(w) \rightarrow [\![\ p\ ]\!]^{w',\,j,\,\wp}]$.
b. $[\![\ \text{EVID}\ ]\!]^{w,\,j,\,K_{j,\,w}} = \forall w'[w' \in \bigcap f(w) \rightarrow [\![\ p\ ]\!]^{w',\,i,\,K_{i,\,w}}]$, where i is a contextually salient individual that can be different from j.

EPIS overwrites the prejacent's third parameter $K_{j,\,w}$ with the set of all propositions $\wp$. EVID overwrites the second parameter i and the third parameter $K_{j,\,w}$ with i and $K_{i,\,w}$, respectively. When combined with the prejacent *x-wa oisii* 'x is tasty', they provide the following results:

(36) a. $[\![\ x\text{-}wa\ oisii\ nitigainai\ ]\!]^{w,\,j,\,K_{j,\,w}} = [\![\ \text{EPIS}\ ]\!]^{w,\,j,\,K_{j,\,w}}([\![\ x\text{-}wa\ oisii\ ]\!]^{w,\,j,\,K_{j,\,w}})$
$= \forall w'[w' \in \bigcap f(w) \rightarrow [\![\ x\text{-}wa\ oisii\ ]\!]^{w',\,j,\,\wp}]$.
$= \forall w'[w' \in \bigcap f(w) \rightarrow x$ is tasty to j in $w']$, defined only if $tasty(x)(j) \in \wp \vee \neg tasty(x)(j) \in \wp$.
$= \forall w'[w' \in \bigcap f(w) \rightarrow x$ is tasty to j in $w']$.
b. $[\![\ x\text{-}wa\ oisii\ yooda\ ]\!]^{w,\,j,\,K_{j,\,w}} = [\![\ \text{EVID}\ ]\!]^{w,\,j,\,K_{j,\,w}}([\![\ x\text{-}wa\ oisii\ ]\!]^{w,\,j,\,K_{j,\,w}})$
$= \forall w'[w' \in \bigcap f(w) \rightarrow [\![\ x\text{-}wa\ oisii\ ]\!]^{w',\,i,\,K_{i,\,w}}]$.
$= \forall w'[w' \in \bigcap f(w) \rightarrow x$ is tasty to i in $w']$, defined only if $tasty(x)(i) \in K_{i,\,w} \vee \neg tasty(x)(i) \in K_{i,\,w}$.

The presupposition of the PPT *oisii* in (36a) is nullified because its triviality,

in the same manner as in (33c). In (36b), the presupposition is associated with what *i*, rather than *j*, knows through her direct experience. In either case, the PPT's direct requirement is not attributed to the speaker.

The directness requirement of a PPT simply disappears when it is combined with EPIS, while EVID associates this requirement with another judge *i*, which means that EVID+PPTs requires that there be some individual that has direct experience. Then, it is predicted that the combination cannot be used to describe objects of which no one has direct experience. This is borne out:

(37) (You are watching a famous sushi chef making a Chinese food for the first time. You say:)

Kono-hito-no chuuka-ryoori-wa oisii [nitigainai/#yooda]
this-person-GEN Chinese-cuisine-TOP tasty EPIS/EVID
'This person's Chinese food [must be/#seems] tasty.'

In this case, no one has tasted the Chinese food that the chef is making. The semantics proposed in (35) captures the contrast between EPIS and EVID here.

Finally, let us see the composition of the sentence *x-wa watasi-nitotte-oisii nitigainai/yooda* '*x* is tasty to me + EPIS/EVID', where the experiencer is overtly specified as the speaker:

(38) $[\![\textit{x-wa watasi-nitotte-oisii nitigainai}]\!]^{w,\,j,\,K_{j,\,w}}$
$= [\![\text{EPIS}]\!]^{w,\,j,\,K_{j,\,w}}([\![\textit{x-wa watasi-nitotte-oisii}]\!]^{w,\,j,\,K_{j,\,w}})$.
$= \forall w'[w' \in \bigcap f(w) \rightarrow [\![\textit{x-wa watasi-nitotte-oisii}]\!]^{w',\,j,\,\wp}]$.
$= \forall w'[w' \in \bigcap f(w) \rightarrow [\![\textit{nitotte}]\!]^{w',\,j,\,\wp}([\![\textit{oisii}]\!]^{w',\,j,\,\wp})(sp)]$.
$= \forall w'[w' \in \bigcap f(w) \rightarrow [\![\textit{oisii}]\!]^{w',\,sp,\,\wp}(x)]$, defined only if $[\![\textit{oisii}]\!]^{w',\,sp,\,K_{sp,\,w}}$ is defined.
$= \forall w'[w' \in \bigcap f(w) \rightarrow x$ is tasty to *sp* in $w']$, defined only if $\textit{tasty}(x)(sp) \in \wp \vee \neg\textit{tasty}(x)(sp) \in \wp$ and defined only if $\textit{tasty}(x)(sp) \in K_{sp,\,w} \vee \neg\textit{tasty}(x)(sp) \in K_{sp,\,w}$.
$= \forall w'[w' \in \bigcap f(w) \rightarrow x$ is tasty to *sp* in $w']$, defined only if $\textit{tasty}(x)(sp) \in K_{sp,\,w} \vee \neg\textit{tasty}(x)(sp) \in K_{sp,\,w}$.

(38) is defined only if the speaker directly knows in w (the actual world) whether x is tasty or not, and becomes true if x is tasty to her in all the accessible worlds w', which is what we assumed in Section 4. EPIS overwrites $K_{j,\,w}$ with $\wp$, but it does not affect the final result; *nitotte* in (38) lexically imposes $K_{sp,\,w}$ on the PPT's presupposition regardless of the contextual parameter settings. This means that the same result obtains even if EPIS is replaced with EVID, because the difference between the two items lies in how they affect the contextual parameters of the prejacent.