D-3 The Role of Case-Marking Particles in Interpreting the Japanese Auxiliary Verb *(Ra)reru*: Evidence from Eye-Tracking

Chika Okada and Yusuke Sugaya

Our experimental study examines the interplay between several distinct uses of *rareru* (politeness, potentiality, and direct and indirect passives) and its syntactic environments—in particular, we deal with different appearances of case-making particles in a sentence (e.g., A-*ga* B-*wo rareru*). In order to acquire natural and unconscious data, our eye-tracking survey produced images depicting each usage, and we observed 17 participants' gazes (eye movements) that were cast on visual stimuli. Results revealed a variety of interactions of each sentential type with meanings of *rareru*. The A-*ni* B-*wo* construction, for instance, exclusively prompted *rareru* to be interpreted as indirect passive, although the meaning of indirect passive broadly emerged independently of sentence patterns. Moreover, if an agent of a sentence is the object of respect, the interpretation of politeness was basically preferred regardless of construction. We conclusively demonstrated that there were less discrete, absolute—or weak—relations between several uses of *rareru* and case markings in a sentence.

1   Introduction

The Japanese auxiliary verb *(ra)reru* (hereinafter, simply *rareru*) involves several separate functions that are normally assigned to different expressions in other languages. Because of this, a number of Japanese language learners may encounter difficulty in acquiring and thoughtfully using the auxiliary verb. Generally, it contains the following senses:

(i) sensei-*ga*   mado-*wo*   ake-*rare*-ta.
teacher-NOM window-ACC open-AUX-PST   "A teacher (as a target of respect) opened the door."

(ii) kodomo-*wa*   yasai-*ga*   tabe-*rare*-nai.
children-NOM vegetable-ACC eat-can-NEG   "Children cannot eat vegetables."

(iii) otoko-*ga*   same-*ni*   tabe-*rare*-ta.
man-NOM shark-OBL eat-PASS-PST   "A man was eaten by a shark."

(iv) otoko-*ni*   kuruma-*wo*   mi-*rare*-ta.
man-OBL car-ACC   look-PASS-PST   "My car was looked at by a man."

(v) ano ziken-ga   omoidasa-reru.
that incident-TOP remember-AUX   "I (spontaneously) remember that incident."

First, *rareru* may exhibit its speaker's politeness for an agent of an action or have an **honorific** use (abbreviated as H here), as illustrated in (i). Second, it also can express an agent's **potentiality** of an action (indicated by C), as the sentence (ii) refers to (in)capabilities of children to eat vegetables. Third, the auxiliary may show **direct and indirect passives** (DP and IP) as well, in which a referent of a nominative subject is considered a patient of an action (see (iii) and (iv) for examples). Lastly, the sentence (v) means that an action (remembering an incident) appears in the speaker's mind unintentionally. However, this spontaneous sense of *rareru* will be excluded from the object of research here because the condition of the meaning is fairly limited—specifically, there are only a few verbs used for this usage.

Correspondence concerning this article should be sent to: Chika Okada, Graduate School of Humanities, Osaka University, 1-8 Machikaneyama-cho, Toyonaka, Osaka 560-0043 Japan (E-mail: chikaokadaling@gmail.com).

Owing to such complex senses, some learners of Japanese may have this fundamental question: **what determines the meaning of _rareru_ from such multiple uses?** It goes without saying that both grammar and context around the word must be concerned with the selection of usage. In particular, it is quite true that case particles of a sentence are responsible for the determination of meaning of _rareru_; however, it can be more complicated than that. It is thus necessary to conduct empirical investigations on how actual syntactic and pragmatic factors are relevant to the semantics of _rareru_.

2 Theoretical studies

A number of Japanese linguistic studies have researched the theories not only of several different uses of _(ra)reru_ and interrelations among them (e.g., Machida 2009, Kawamura 2011) but also on their relationships to case-marking particles such as _-ga_, _-wo_, and _-ni_ (e.g., Sakuma 1967, Teramura 1982). Although it might be obvious that there are some relationships between usages and constructions (Goldberg 1995), the detailed relationship remains unclear: For example, which sentence patterns may lead to a choice of the ID function to interpret a sentence including _rareru_? The current section will mainly exhibit the study of Teramura (1982: Ch.3), which has focused the most on this respect.

Grammatically, one of the most significant and controversial uses of _rareru_ appears to be the passive voice. Originally, Otsuki (1891) introduced the concept of voice into Japanese grammar and claimed that it should be analyzed as a use of auxiliary verbs. Moreover, Teramura (1982: 205–254) referred to the indirect and direct passives in the passive voice—the former is sometimes called "decent passive" and the latter "nuisance passive" (Mikami 1953). More importantly here, he discussed the relationship between the passive use and sentence patterns of _rareru_. He concluded that the interpretation of _rareru_ as DP is brought about by the following syntactic feature: **X-_ga_ Y-_ni_ V-_rareru_** (X: patient (affected), Y: agent, and V: verb). Obviously, this sentence pattern is not directly connected to the DP use. He thus added that some pragmatic conditions for DP, as classified by Jespersen (1924), must be relevant—e.g., the subject of the active sentence is known, but the interest in the subject of the passive sentence is greater (i.e., the patient of the action is more focused than is the agent of that action).

Additionally, he put forth syntactic and pragmatic conditions for the indirect passive. He pointed out that, first of all, the occurrence of intransitive verbs with _rareru_ does not always trigger the meaning of IP—there are many cases of IP using a transitive verb. Moreover, the function of IP is related to the following construction: **X-_ga_ Y-_ni_ Z-_wo_ V-_rareru_**. However, he noted that the pattern does not force the use of IP in every case. Furthermore, the indirect passive needs a third party (Z) that is affected by an irrelevant event to itself, which is known as the nuisance passive.

Next, he offered an explanation on the relationship between the meaning of potentiality and constructions (ibid, 255–270). Note that, although he classified the potentiality expressions into active and passive potentiality expressions, let us introduce only the former, which contains an agent of action as the subject of a sentence. He finally suggested the construction **X-_ni/ga_ Y-_ga/wo_ V-_rareru_** giving rise to the potentiality use of _rareru_ and showing that, if the auxiliary expresses someone having the ability, the subject (argument of agent) can take either _-ni_ or _-ga_ (e.g., kare-_ni/ga_ hito-_wo_ shinzi-_rareru_ "he can trust people"). Lastly, with respect to the honorific use of _rareru_, we have not found research concerning the syntactic conditions under which the use is exclusively chosen to interpret _rareru_.

Despite the above background of rich research, there has not been a commensurate number of experiments to identify and validate these results, as linguistics has little emphasized experimental and empirical methods to test theories and hypotheses in that sphere. Therefore, our eye-tracking experiment examined the interaction of

grammatical case markers, such as *-ga*, *-wo*, and *-ni*, in a sentence with different usages of the Japanese auxiliary verb *rareru*: DP, IP, C, and H.

3 Experiments

To explore how native speakers of Japanese determine the meaning of *rareru* among several candidates, we designed and executed eye-tracking experiments based on the visual world paradigm (cf., Tanenhaus et al. 1995). As is shown in the previous section, case particles or argument structures seem to be the key for this issue. The literature has, however, collected little actual data concerning this from informants, although such data might be more complicated than the clear-cut descriptions made by such theories. This experiment aimed not only to test theoretical statements from prior studies but also to discover novel facts in an exploratory manner.

3.1 Methods

Participants

Seventeen (8 female and 9 male) native Japanese speakers, aged 18–53 (M = 24.88, SD = 10.61), took part in the experiment and earned 500 yen for participation, all of whom had completed their education at a tertiary institution.

The visual world paradigm

This experiment adopted the visual world paradigm, where we assume that the items drawing perceptual attention must be concerned with some linguistic processing related to those areas. These methods have been developed in a variety of ways after the advent of the methodology. While some studies have presented visual stimuli depicting a subjective, actual scene from the viewpoints of subjects (e.g., Tanenhaus et al. 1995, Kamide et al. 2003, Snedeker and Trueswell 2003), we adopted the method in which several pictures are equally arranged with the same region (e.g., Griffin and Bock 2000, Sedivy et al. 1999). Moreover, our experiment, unlike those prior studies, provided the sentences in a visual rather than an auditory manner.

Sentences and visual images

See Table 1 for the sentences presented in the experiment, which include six verbs and eight sentence types. The six verbs are: *tabe-ru* (eat), *nage-ru* (throw), *nade-ru* (pat), *ake-ru* (open), *ire-ru* (put), and *ate-ru* (hit). Each of them is embedded in the following eight kinds of sentence patterns—five are types where both agent and patient are given, and three are ones where one of them is missing: A-*ga* B-*wo rareru*, A-*wa* B-*wo rareru*, A-*wa* B-*ga*
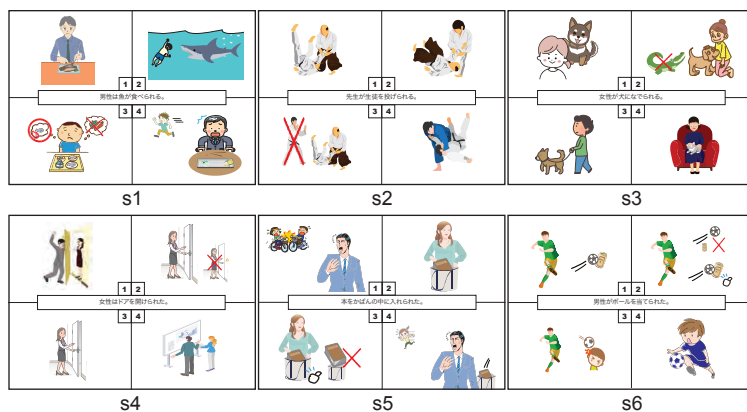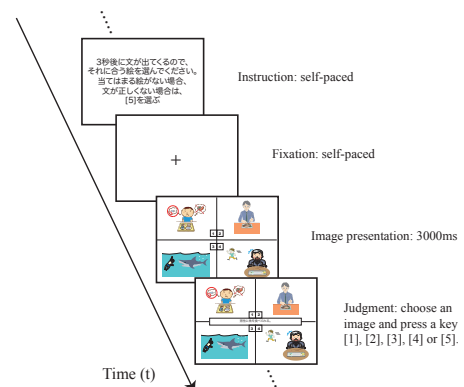

Figure 1: Examples of visual stimuli.

Figure 2: Procedure.

Table 1 (left half):

		H fixation M	SD	H response rate	C fixation M	SD	C response rate	DP fixation M	SD	DP response rate	IP fixation M	SD	IP response rate	Filler fixation M	SD	Filler response rate
s1 A = dansei (man) B = sakana (fish) V = tabe-ru (eat)	1	0.69	0.56	0.44	0.65	0.56	0.25	0.42	0.61	0.00	0.56	0.32	0.31	n/a	n/a	n/a
	2	0.47	0.29	0.35	1.25	0.94	0.41	0.18	0.05	0.00	0.68	0.49	0.24	n/a	n/a	n/a
	3	0.73	0.80	0.47	0.94	0.92	0.47	0.26	0.23	0.06	0.41	0.13	0.00	n/a	n/a	n/a
	4	0.27	0.23	0.00	0.44	0.55	0.12	0.47	0.33	0.88	0.35	0.35	0.00	n/a	n/a	n/a
	5	0.43	0.34	0.07	0.32	0.22	0.00	0.29	0.23	0.00	0.98	0.58	0.59	n/a	n/a	n/a
	6	0.87	0.37	0.59	0.73	1.16	0.18	0.13	0.07	0.00	0.58	0.44	0.24	n/a	n/a	n/a
	7	0.62	0.34	0.53	0.99	0.87	0.33	0.25	0.24	0.00	0.90	0.69	0.13	n/a	n/a	n/a
	8	0.18	0.01	0.00	0.27	0.20	0.00	0.58	0.33	1.00	0.56	0.97	0.00	n/a	n/a	n/a
s2 A = sensei (instructor) B = seito (pupil) V = nage-ru (throw)	1	0.83	0.62	0.47	1.02	0.86	0.24	0.54	0.41	0.06	n/a	n/a	n/a	0.70	0.57	0.06
	2	0.83	0.36	0.65	0.77	0.47	0.24	0.39	0.24	0.06	n/a	n/a	n/a	0.50	0.21	0.00
	3	0.79	0.54	0.53	0.67	0.51	0.12	0.82	1.11	0.00	n/a	n/a	n/a	0.71	0.49	0.00
	4	0.69	0.58	0.06	0.40	0.18	0.00	0.39	0.45	0.94	n/a	n/a	n/a	0.89	0.42	0.00
	5	0.93	0.62	0.24	0.76	0.66	0.29	1.00	1.12	0.00	n/a	n/a	n/a	0.54	0.65	0.06
	6	1.04	0.47	0.88	0.53	0.41	0.00	0.71	0.38	0.06	n/a	n/a	n/a	0.60	0.31	0.00
	7	0.88	0.45	0.47	0.80	0.64	0.00	0.62	0.40	0.06	n/a	n/a	n/a	0.61	0.34	0.18
	8	0.47	0.30	0.06	0.47	0.41	0.00	0.40	0.27	0.94	n/a	n/a	n/a	0.91	0.35	0.00
s3 A = josei (woman) B = inu (dog) V = nade-ru (touch)	1	0.55	0.46	0.12	0.76	0.44	0.59	0.40	0.28	0.06	n/a	n/a	n/a	0.29	0.17	0.00
	2	0.44	0.34	0.00	0.91	0.57	0.71	0.51	0.42	0.06	n/a	n/a	n/a	0.45	0.26	0.00
	3	0.47	0.41	0.12	0.90	0.94	0.53	0.93	0.97	0.00	n/a	n/a	n/a	0.28	0.12	0.00
	4	0.36	0.51	0.00	0.51	0.33	0.00	0.82	0.61	0.94	n/a	n/a	n/a	0.23	0.08	0.00
	5	0.72	0.41	0.24	1.06	0.71	0.29	0.75	1.01	0.00	n/a	n/a	n/a	0.33	0.18	0.00
	6	0.58	0.38	0.35	0.85	0.48	0.65	0.47	0.35	0.00	n/a	n/a	n/a	0.31	0.19	0.00
	7	0.48	0.39	0.12	1.10	1.07	0.59	0.60	0.96	0.00	n/a	n/a	n/a	0.75	0.55	0.00
	8	0.30	0.31	0.00	0.63	0.83	0.00	0.75	0.37	1.00	n/a	n/a	n/a	0.17	0.09	0.00

Table 1 (right half):

		H fixation M	SD	H response rate	C fixation M	SD	C response rate	DP fixation M	SD	DP response rate	IP fixation M	SD	IP response rate	Filler fixation M	SD	Filler response rate
s4 A = josei (woman) B = doa (door) V = ake-ru (open)	1	0.79	0.42	0.29	1.09	0.99	0.24	n/a	n/a	n/a	0.54	0.30	0.18	0.30	0.21	0.00
	2	0.79	0.42	0.24	1.09	0.99	0.35	n/a	n/a	n/a	0.54	0.30	0.00	0.30	0.21	0.00
	3	0.62	0.50	0.35	0.92	0.73	0.35	n/a	n/a	n/a	0.69	0.48	0.00	0.47	0.50	0.00
	4	0.39	0.23	0.00	0.54	0.32	0.06	n/a	n/a	n/a	0.39	0.38	0.00	0.39	0.24	0.00
	5	0.52	0.66	0.06	0.56	0.49	0.00	n/a	n/a	n/a	0.88	0.55	0.94	0.29	0.13	0.00
	6	0.64	0.42	0.47	0.66	0.47	0.18	n/a	n/a	n/a	1.02	0.62	0.29	0.30	0.21	0.00
	7	0.62	0.23	0.24	0.85	0.82	0.06	n/a	n/a	n/a	0.82	0.53	0.65	0.34	0.21	0.00
	8	0.35	0.20	0.00	0.74	0.63	0.00	n/a	n/a	n/a	0.38	0.26	0.06	0.33	0.15	0.00
s5 A = josei (woman) B = hon (book) V = kaban no nakani ire-ru (put into a bag)	1	0.57	0.29	0.29	1.11	0.60	0.24	n/a	n/a	n/a	0.28	0.20	0.00	0.32	0.13	0.06
	2	0.68	0.46	0.35	0.56	0.56	0.18	n/a	n/a	n/a	0.62	0.68	0.00	0.79	0.93	0.00
	3	1.22	0.62	0.29	0.56	0.25	0.12	n/a	n/a	n/a	0.44	0.28	0.00	0.47	0.51	0.06
	4	0.43	0.19	0.06	0.48	0.36	0.06	n/a	n/a	n/a	0.51	0.57	0.00	1.20	1.16	0.00
	5	0.47	0.35	0.24	0.53	0.36	0.06	n/a	n/a	n/a	1.09	0.78	0.47	0.30	0.15	0.00
	6	0.63	0.28	0.65	1.25	0.98	0.24	n/a	n/a	n/a	0.42	0.44	0.12	0.18	0.11	0.00
	7	0.41	0.22	0.18	0.81	0.65	0.18	n/a	n/a	n/a	0.88	0.60	0.47	0.65	0.51	0.00
	8	0.23	0.16	0.06	0.85	1.20	0.00	n/a	n/a	n/a	0.64	0.76	0.06	0.49	0.49	0.00
s6 A = dansei (man) B = bouru (ball) V = ate-ru (hit)	1	0.59	0.33	0.06	0.53	0.36	0.00	n/a	n/a	n/a	0.81	0.56	0.94	0.35	0.26	0.00
	2	0.71	0.57	0.06	0.87	0.85	0.12	n/a	n/a	n/a	0.95	1.10	0.76	0.36	0.33	0.06
	3	0.72	0.36	0.20	1.25	1.03	0.33	n/a	n/a	n/a	0.67	0.53	0.13	0.37	0.24	0.00
	4	0.42	0.33	0.00	0.71	0.48	0.06	n/a	n/a	n/a	0.72	0.54	0.47	0.45	0.23	0.00
	5	0.27	0.14	0.06	0.30	0.23	0.00	n/a	n/a	n/a	0.81	0.44	0.94	0.40	0.58	0.00
	6	0.78	0.51	0.06	1.29	0.89	0.53	n/a	n/a	n/a	0.48	0.35	0.24	0.38	0.18	0.00
	7	0.46	0.28	0.00	0.78	0.79	0.06	n/a	n/a	n/a	0.85	0.36	0.94	0.39	0.26	0.00
	8	0.58	0.61	0.12	0.50	0.26	0.06	n/a	n/a	n/a	0.81	0.50	0.35	0.49	0.51	0.06

1. A-*ga* B-*wo* V-*rareru* 2. A-*wa* B-*wo* V-rareru 3. A-*wa* B-*ga* V-*rareru* 4. A-*ga* B-*ni* V-*rareru* 5. A-*ni* B-*wo* V-*rareru* 6. B-*ga* V-*rareru* 7. B-*wo* V-*rareru* 8. B-*ni* V-*rareru*

Table 1: A summary of fixation durations and responses.

rareru, A-*ga* B-*ni rareru*, A-*ni* B-*wo rareru*, B-*ga rareru*, B-*wo rareru*, and B-*ni rareru*. Note that, in addition, we prepared 22 more sentences as fillers so that participants would not guess the purpose of the experiment.

Moreover, we arranged four different visual images, as shown in Figure 1, for each of 60 sentences. They corresponded to H, C, DP, or IP, although one of the candidates could be irrelevant (i.e., fillers). For example, the top-left of s1 showed H, the top-right DP, the bottom-left C, and the bottom-right IP. The bottom-left image of s3 indicated a filler.

Procedure and apparatus

Figure 2 illustrates the way such sentences and pictures were presented. After the instruction and a gazing point were shown, four-cornered images were displayed for three seconds followed by the appearance of a targeted sentence in the center. Participants were asked to select a picture that corresponded the most to the sentence; their gazes were recorded during all trials by a screen-based eye-tracker with a sampling rate of 60 Hz.

3.2 Results

The experiment recorded participants' responses of offline tasks (i.e., the selection of an image among four options) and gazes at each picture for explanatory variables. Table 1 offers both total fixation durations of each usage of *rareru* (and a filler) and the rate of responses. Note that responses with more than 10 seconds in each trial were all excluded as outliers. Moreover, Figure 3 displays the transition of fixation on pictures over time. These kinds of data were aggregated to elucidate the tendency of relationship between *rareru*'s meanings and constructions. What follows will indicate the results of each construction individually.

First, the A-*ga* B-*wo rareru* structure was generally found to favor the interpretation of C and H. The data of fixation duration denoted that the fixation on both C ($F_{(4, 275)} = 9.316$, $d = -0.450$, $p < .001$) and H ($d = 0.277$, $p < .01$) increased significantly compared to fillers, different from DP ($d = -0.054$, $p = 0.982$) and IP ($d = 0.200$, $p = 0.160$), as a result of an one-way ANOVA and post-hoc Tukey's test. In most cases, C was the most favored, with H as the second most favored (see number 1 rows of s1 to s6 in Table 1), with no significant differences ($d = -0.172$, $p = 0.152$). It is curious that, moreover, even IP and DP were also observed, in which case the DP seemed to be less preferred than the IP—Actually, only DP had a 1 % level of significant difference from C (DP: $d = -0.250$, $p < .05$, IP: $d = -0.395$, $p < .001$). Interestingly, the results corresponding to the s6 stimulus sentence were apt to prefer the
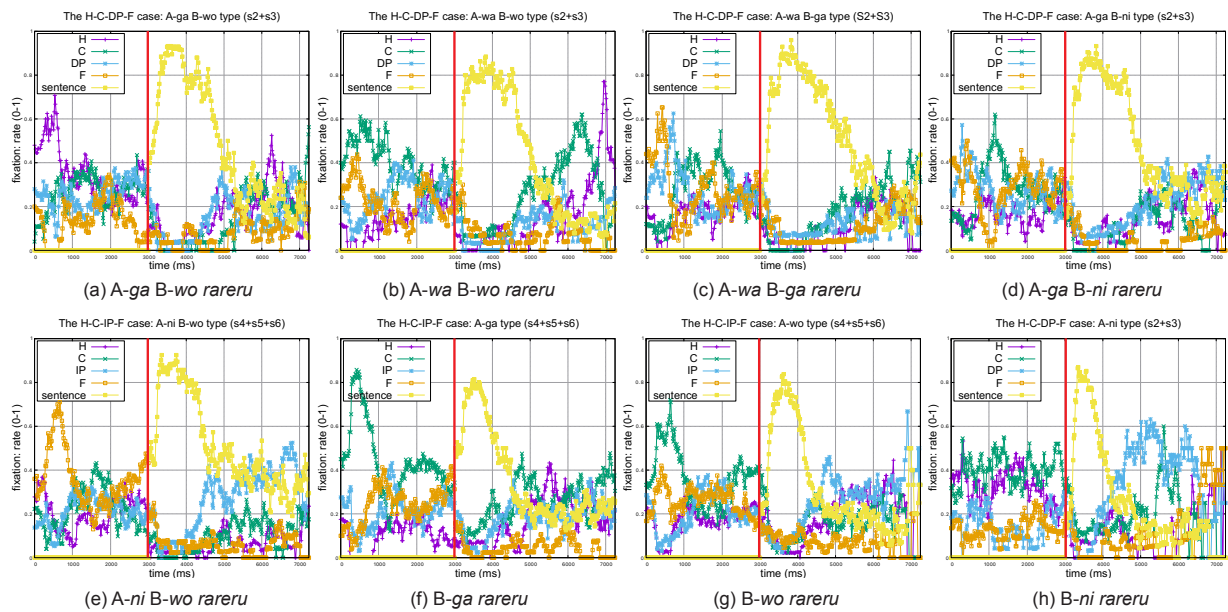
Figure 3: Transition of fixation on each item over time: The red line indicates the onset of a sentence presented in the center of the screen (i.e., 3000ms), and the right end of each figure denotes the average offset or RT of offline tasks (i.e., 7252.6ms).

reading of IP more than the H and C. Additionally, looking at the graph of Figure 3 (a), the fixation on the images of DP completely decreased soon after the sentence was presented, which shows that the reading of DP was easily excluded to interpret this type of sentence. Also, while H and C are competing, IP also shows a value that deserves to be taken into account.

Second, the results for the construction of A-*wa* B-*wo rareru* reveal no substantial difference from the ones for A-*ga* B-*wo rareru* from a broad perspective. To be more precise, participants paid significantly greater attention only to C and H (C: $F_{(4, 270)} = 9.668$, d = -0.472, $p < .001$, H: d = -0.368, $p < .01$) in comparison with fillers, relatively ignoring DP (d = 0.140, $p = 0.818$) and IP (d = 0.237, $p = 0.180$). Table 1, as well as the statistics, clearly indicates that the choice of C tended to be the most favored, and the one of H the second most favored, with significant differences between them (d = -0.368, $p < .001$). Similarly, comparing the preference for interpretations of DP and IP, the latter tended to be preferred over the former (d = 0.377, $p < .05$). In addition, Figure 3 (b) shows that the fixation rates of DP and filler tended to fall, while the ones of C and H increased competitively.

Third, the construction A-*wa* B-*ga rareru* prefers only the construal of C, slightly excluding the reading of H. The results of the multiple comparison showed that only relations of C–F ($F_{(4, 238)} = 4.446$, d = -0.398, $p < .01$) and C–IP (d = -0.313, $p < .05$) had a five percent level of significant differences, among all relations of usages. This was the most predominantly detected as is presented in Figure 3 (c). As an exception, for stimulus s2, a strong preference for H was observed, simply supported by the result of responses of offline tasks.

Unlike the above results, the experiment provided straightforward results for the following two constructions: A-*ga* B-*ni rareru* and A-*ni* B-*wo rareru*. As for the former, DP was most significantly observed with the result presented both in responses of offline tasks (see number 4 rows of Table 1) and the graph of Figure 3 (d). Participants exclusively singled out the pictures of DP and provided longer fixation at them after the sentence shown on a screen. Considering the latter (i.e., A-*ni* B-*wo*), the construction showed the most prominent interpretation of IP, as the analysis of variance revealed that the amount of gaze at IP was significantly dominant over C ($F_{(4, 220)} = 6.703$, d = 0.300, $p < .05$), H (d = 0.367, $p < .05$), and fillers (d = 0.548, $p < .0001$). This was also supported by the result for the responses of offline tasks and the graph of Figure 3 (e).

The last three patterns of sentence are the cases of an agent argument (i.e., A) missing: B-*ga rareru*, B-*wo rareru*, and B-*ni rareru* constructions. First, B-*ga rareru* consistently showed a similar tendency to the first two structures, or a preference for the C and H interpretations. The durations of C (F (4, 286) = 9.345, d = -0.531, p < .0001) and H (d = 0.378, p < .001) were significantly long in comparison with fillers, unlike DP (d = -0.131, p = 0.815) and IP (d = 0.263, p = 0.084). This trend can be obviously seen in the graph of Figure 3 (f) as well. Second, B-*wo rareru* yielded results that displayed the difficulty in identifying a unity or trend from the results of the responses. The results of fixation duration exhibited that participants focused significantly on C (F (4, 272) = 6.927, d = -0.335, p < .01) and IP (d = 0.300, p < .05), when compared to fillers, unlike H (d = 0.028, p = 0.998) and DP (d = 0.074, p = 0.972). Inconsistently, however, Figure 3 (g) showed competing interpretations of H, C, and IP, which demonstrated the difficulty to ascertain a single semantic interpretation of the construction solely on the basis of the argument of *wo*-case. Finally, the B-*ni rareru* construction conspicuously favored the interpretation of DP, as is obvious from both responses of offline tasks and Figure 3 (h).

3.3 General discussion

The results mainly show that, as an overall trend, the relationship between syntax and usage does exist, but it is not clearly definable, as is evident from the results presented in the above sections. For instance, we found that, if the agent of action is the subject of honorifics (or the situation is formal), the interpretation of *rareru* is more likely to be H, regardless of the constructions. This phenomenon might be related to the concept of topic-prominency (Kishimoto 2009).

We can posit this conclusion from the characteristics of IP as well. As seen above, A-*ni* B-*wo rareru* is a construction that strongly evokes the interpretation of IP. Conversely, the use of IP was shown to be less restrictive than the one of DP, as the reading of IP can appear in other sentence patterns—it is more often confirmed without the use of -*ni* than DP. This means that, while IP has more variations in the corresponding sentence types, DP requires -*ni* to induce its interpretation: IP are inferior to DP in constructional restrictiveness. This could be an indication that *ni*-case itself has an impact on the constraining properties of the construction. Taken from these two instances, it could be considered that the strong association—i.e., constructions determine usages—was virtually rejected, whereas the weak relationship—i.e., usages can be predicted from constructions—was upheld considerably.

Lastly, it is of necessity to state the relation of the results of the experiment with the prior theoretical studies introduced in Section 2. As was detailed earlier, Teramura (1982) discussed the relationship between the use of DP, IP, or C and sentence patterns of *rareru*. First, the results confirmed the statement that the structure of X-*ga* Y-*ni* V-*rareru* is a syntactic condition for choosing the meaning of DP. However, there were other sentence patterns evoking the construal of DP. As stated above, moreover, the *ni*-case particle itself, rather than the construction, seems to function well for *rareru* to be interpreted as DP.

Moreover, the experiment validated his theoretical statement that the function of IP is facilitated by the construction of X-*ga* Y-*ni* Z-*wo* V-*rareru*. Nevertheless, as he also mentioned by himself, the use of IP can appear in a broad range of constructions, which was also supported by the experiment. Finally, although he suggested the construction X-*ni/ga* Y-*ga/wo* V-*rareru* relevant to the potentiality of the auxiliary, we did not target the A-*ni* B-*ga/wo* pattern because the sentence like 'otoko-*ni* sakana-*ga* tabe-*rareru*' (the man can eat a fish) was judged not to be well-formed, at least, in the modern Japanese language. Even so, our research could point out limitations of his theory, as more constructions can be concerned with the use of C, such as the sentence types of A-*wa* B-*wo* and B-*ga rareru*.

4 Conclusion

As we mentioned before, the present study aimed not merely to test a limited number of hypotheses in the literature but also to discover unknown facts in an exploratory fashion. Because there were few quantitative studies on the topic, we attempted to broaden the scope, dealing with four senses of *rareru* (H, C, DP, and IP) and eight constructions in an experiment. As a result, our survey demonstrated previous studies'—mainly, Teramura (1982)'s— theories which were yet to be tested, elaborating on the details with a much larger volume of data. Finally, it asserted that there is a less discrete, rigid relation between the usage of *rareru* and case-marking particles, unlike the putative idea that the interpretation is severely driven by syntax.

As a final remark, let us note the methodology adopted here. Our experimental study can be said to provide novel insights into the current theme, since it acquired data from a number of native speakers unrelated to linguistics, thus eliminating the biased perspective of the researcher. Actually, the results of the experiment were never straightforward to interpret; however, we obtained realistic, natural data of responses to analyze. This means that less explicit relationship was present in the experiment yet it is usual that empirical language studies treating actual data of speakers are difficult or even impossible to define a clear-cut relationship between the syntax and the usage (semantics). Additionally, any experimental research also must have limitations. We recognize that the present experiment has several points to be improved: for one thing, it is highly possible that the picture presented might not always correspond to the usage that we wanted to intend. In particular, there was a limitation in expressing the use of H in the picture. Future studies should modify the method to clear this kind of issues. Even so, however, the proposed experimental results have sufficient validity, as they were quite consistent with the outcomes of previous studies.

References

Goldberg, Adele E. 1995. *Constructions: A Construction Grammar Approach to Argument Structure*. Chicago: University of Chicago Press.

Griffin, Zenzi M. and Kathryn Bock. 2000. What the eyes say about speaking. *Psychol Sci* 11(4):274–279.

Jespersen, Otto. 1924. *The Philosophy of Grammar*. London: George Allen & Unwin.

Kamide, Yuki, Gerry T.M. Altmann, and Sarah L. Haywood. 2003. The time-course of prediction in incremental sentence processing: Evidence from anticipatory eye movements. *Journal of Memory and Language* 49:133–156.

Kawamura, Futoshi. 2011. *A Study on Raru-Form Sentences [Raru-kei Jutugobun no Kenkyu]*. Tokyo: Kuroshio Shuppan.

Kishimoto, Hideki. 2009. Topic prominency in Japanese. *The Linguistic Review* 26(4):465–513.

Machida, Akira. 2009. Subjectivity in linguistic expressions: With special reference to rare-constructions in Japanese [gengohyougen-ni mirareru shutaisei: Rareru koubun-wo rei-ni]. *Journal of Nagano Prefectural College* (64):103–114.

Mikami, Akira. 1953. *Modern Japanese Usage: A Synatactic Attempt [Gendai Gohou Josetsu: Sintakusu no Kokoromi]*. Tokyo: Tokoshoin.

Otsuki, Humihiko. 1891. *Japanese Dictionary Genkai [Nihon Zisho Genkai]*. Tokyo: Otsuki Bunko.

Sakuma, Kanae. 1967. *Language Science on Japanese Expressions [Nihonteki Hyougen no Gengo Kagaku]*. Tokyo: Kouseisha Kouseikaku.

Sedivy, Julie C., Michael K. Tanenhaus, Craig G. Chambers, and Gregory N. Carlsonb. 1999. Achieving incremental semantic interpretation through contextual representation. *Cognition* 71(2):109–147.

Snedeker, Jesse and John Trueswell. 2003. Using prosody to avoid ambiguity: Effects of speaker awareness and referential context. *Journal of Memory and Language* 48:103–130.

Tanenhaus, Michael K., Michael J. Spivey-Knowlton, Kathleen M. Eberhard, and Julie C. Sedivy. 1995. Integration of visual and linguistic information in spoken language comprehension. *Science* 268(5217):1632–1634.

Teramura, Hideo. 1982. *Syntax and Semantics of Japanese [Nihongo no Shintakusu to Imi]*, vol. 1. Tokyo: Kuroshio Shuppan.