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1. Introduction

This paper examines two properties of Japanese temporal adverbial clauses which appear to be independent of each other. However, under the theoretical claims concerning these two properties which will be laid out in the following section, these properties are, in fact, closely related. If these theoretical proposals are correct, it is not unnatural to find some correlation between the acquisition of one of the properties and that of the other. We will show that there is, indeed, such a correlation, which in turn supports these claims, and conclude that Universal Grammar (UG) is operative in second language acquisition (SLA).

Another issue that we will deal with in this paper is transfer. Issues regarding transfer have been extensively discussed in the field of SLA. Our results show that early in the course of language development, transfer takes place. Therefore, this paper also supports the hypothesis that transfer occurs in SLA.

For the purpose outlined above, this paper is organized as follows: Section 2 illustrates the theoretical claims regarding the two properties of Japanese temporal adverbial clauses. Then, Section 3 contains discussion on our experiments. We discuss the consequences of our results in Section 4. Finally, Section 5 contains our concluding remarks.

2. Two Properties of Japanese Temporal Adverbial Clauses

2.1. Tense within a Japanese Temporal Adverbial Clause

Abe (1991), Enc (1985, 1987), Stowell (1993), and Zagona (1988, 1990, 1993) argue that tense is a two-place predicate taking two temporal arguments. For instance, Zagona proposes that tense takes ARG, which is located in CP SPEC, and VP as its arguments. ARG refers to the reference time, and the VP indicates the event time. T is realized based on the temporal ordering between the reference time and the event time. What is crucial here is that depending on the value of ARG, the value of T varies. If the reference time precedes the event time, T is realized as non-past. If the event time precedes the reference time, T is realized as past.

Assuming that this predicative analysis of tense is correct, let us turn to Japanese temporal adverbial clauses. Consider (1a, b):

(1)a. John-ga kuru -mae-ni Mary-ga kuru/kita.
-nom come-before -nom come/came
'(lit.) Mary will come/came before John comes.'

b. John-ga kita -ato-ni Mary-ga kuru/kita.
-nom came-after -nom come/came
'(lit.) Mary will come/came after John came.'

It has been observed in the literature (e.g. Kuno, 1973) that temporal adverbial clauses head by *mae-ni* 'before' must contain a predicate with its "non-past" form, while ones headed by *ato-ni* 'after' must have a predicate with its "past" form. Miyamoto (1994) argues that this fact naturally follows from the hypothesis that Japanese temporal adverbial clauses are adjoined to VP with the predicative analysis of tense. If a temporal adverbial clause is adjoined to VP, its ARG is bound by the matrix T which denotes the matrix event time as a result of V-raising, as illustrated in (2):

- (2) [CPARG [TP[VP[ADVARG ...][VP ...]] T+V]]
└──────────────────┘ ↑

In (2), the event time of the temporal adverbial clause is compared with the matrix event time. In addition, the lexical property of *mae-ni* 'before'/*ato-ni* 'after' requires the matrix event to precede/follow the adverbial event. Then, with respect to the matrix event time, the event time of a temporal adverbial clause headed by *mae-ni* 'before' is always a future event whereas that of a temporal adverbial clause headed by *ato-ni* "after" is a past event.

Let us now turn to their English counterparts. English temporal adverbial clauses have different predicate forms, depending on the matrix tense, as shown in (3a-d):

- (3) a. John swam before Mary *swims/swam.
 b. John will swim before Mary swims/*swam.
 c. John swam after Mary *swims/swam.
 d. John will swim after Mary swims/*swam.

These contrast show that the form of a predicate within a temporal adverbial clause is dependent on the matrix tense. For instance, when the tense of a matrix predicate is past, the tense of a predicate within the temporal adverbial clause headed by *before* cannot be present, as shown in (3a). By the same token, if the tense of a matrix predicate is future, the tense of a predicate within the temporal adverbial clause headed by *after* cannot be past, as shown in (3d). Under Zagona's analysis, the ARG of a temporal adverbial clause takes the utterance time as its antecedent. This, in turn, indicates that temporal adverbial clauses in English are not adjoined to VP. Rather, these clauses are, probably, adjoined to TP.

Assuming Miyamoto (1994) is correct, the tense realization within temporal adverbial clauses headed by *mae-ni/ato-ni* 'before/after' indicates that temporal adverbial clauses are adjoined to VP. In contrast, their English counterparts are adjoined to TP.

2.2. Extraction of a WH-phrase from a Japanese Temporal Adverbial Clause

It is widely known that a WH-phrase inside a temporal adverbial clause can be questioned, unlike its English counterpart. Thus, we observe the contrast given in (4):

- (4) a. *How₁ did Mary get angry [before John fixed the car t₁]?
 b. Mary-ga [John-ga doo kuruma-o naosu]-mae-ni okotta -no.
 -nom -nom how car -acc fix -before got angry-Q
 '(lit.) Q: Mary got angry [before John fixed the car how].'

This fact can be naturally accommodated under the hypothesis that temporal adverbial

clauses are adjoined to VP in Japanese. Murasugi and Saito (1992) argue that temporal phrases are arguments of an event predicate or INFL. Then, it is not unnatural that temporal adverbial clauses are arguments of an event predicate or INFL. Since these adverbial clauses are arguments, and thus do not block extraction of a WH-phrase from these clauses.¹

On the other hand, the fact that a WH-phrase cannot be extracted from a temporal adverbial clause in English indicates that temporal adverbial clauses in English do not receive an argument status. If these clauses were adjoined to VP, they would receive an argument status. This, in turn, shows that these adverbial clauses are not within VP, and thus, they cannot be arguments of an event predicate or INFL. It is, then, natural that extraction of a WH-phrase from these clauses is prohibited by the Empty Category Principle.

Again, the contrast between English and Japanese with respect to extraction suggests that Japanese temporal adverbial clauses are adjoined to VP while English ones are not in VP, but, probably, in TP.

3. Experiments

3.1. Hypothesis

Given that the above-mentioned two phenomena are the result of temporal adverbial clauses adjoining to VP, it was hypothesized that there would be a strong correlation between the acquisition of the Japanese tense system and that of an argument status of Japanese temporal adverbial clauses. Those who have mastered the Japanese tense system can also provide an answer to a WH-phrase within a temporal adverbial clause. On the other hand, those who have not mastered the Japanese tense system cannot answer correctly to a WH-phrase within a temporal adverbial clause.

To test the hypothesis, two grammaticality judgment tasks, written and oral, were conducted individually with learners of Japanese as a foreign language, whose L1 is English.

3.2. Experiment 1: Written Task

3.2.1. Methodology

Subjects: The subjects were 12 university students in advanced level Japanese courses, who had studied Japanese for at least two years. They were enrolled in the third and fourth year Japanese courses at Ohio University.

Task: The written task consisted of multiple choice questions with four choices.

¹ To be precise, the structure of a temporal adverbial clause is as (i):

(i) [PP[NP[TP ...]-*mae*]-*ni*]

Japanese temporal adverbial clauses contain a complex NP. Ura (1991) argues that the LF pied-piping mechanism allows any kind of phrasal or clausal elements to be pied-piped. Then, we can pied-pipe the complex NP in (i). One may suggest that this pied-piping allows a WH-phrase to be extracted out of the temporal adverbial clause. The crucial point is, however, whether or not the pied-piped NP can move out of PP. If the temporal adverbial clause appears in TP, this PP cannot receive an argument status, and thus, extraction of the pied-piped NP should be disallowed, assuming that Subadjacency is operative in LF as well as overt syntax (Nishigauchi, 1990). This shows that whether or not a temporal adverbial clause is within VP plays a role in extracting a WH-phrase from the temporal adverbial clause. See also Ura (1993) for much relevant discussion.

Sample test items are given in Examples (5) and (6).

- (5) Yamada-san-wa tennis-o ()-mae-ni tegami-o kaita.
 Mr. Yamada-top tennis-acc -before letter -acc wrote
 'Mr. Yamada wrote a letter before he () tennis.'
 a. suru 'play' b. shita 'played'
 c. either a or b d. none of the above

For the questions on tense, as shown in (5), subjects were asked to fill in the blank with the correct form of the verb to complete the temporal clause. Choice (a) is a non-past form verb, (b) is a past tense form verb, (c) is "either a or b," and (d), "none of the above." In (5), subjects were expected to choose (a) because *-mae-ni* takes a non-past form verb.

- (6) Sato-san-ga peepaa-o dooyatte kaita -ato-ni sushi-o tabeta-no?
 Mr. Sato-nom paper -acc how wrote-after -acc ate -Q
 '(lit.) Q: Mr. Sato ate sushi [after he wrote a paper how].'
 a. computer b. hashi 'chopsticks'
 c. either a or b d. none of the above

This is a sample test item on a WH-question. Subjects were asked to read a question and choose the correct response from four choices: (a) a response to the element in a temporal clause, (b) a response to the element in a main clause, (c) "either a or b," and (d) "none of the above." In Item (6), subjects were expected to choose (a).

This type of test items were created in the way that we could see how subjects interpreted the WH-questions. If a subject chooses choice (a), that means that s/he thinks the WH-phrase inside the temporal clause asks about the element inside the temporal clause. For example, in Item (6), the question "How to write a paper" and the response "chopsticks" do not make sense at all. On the other hand, the response "computer" does not match to the question "How to eat sushi." Therefore, if the subject chooses choice (b), that tells us that s/he thinks the WH-phrase inside the temporal clause is asking about the element outside the temporal clause, that is, the element in the main clause.

In addition to these types of questions, some questions were inserted as fillers to avoid test effect. Two different sets of task sheets, which contain the test sentences in different orders, were also prepared to make sure that the order of questions would not have any influence on the results.

3.2.2. Results

The subjects were divided into two groups according to the percentage they achieved in the questions on tense. The subjects who achieved higher than 80% belong to Group 1, and Group 2 consists of the subjects who achieved below 80%. With one between-groups factor (Group 1 and Group 2) and one within-group factor (types of questions: tense and WH-questions), a split-plot design ANOVA was computed. The Pearson Correlation Test was also used to analyze the correlation between the two types of questions.

Table 1 shows the percentage of the correct answers each subject made in each type of questions. The means and the standard deviations are presented in Table 2.

Table 1

Subjects	G1					G2						
	DD	SK	MC	SH	MT	GK	SB	BM	KR	NF	CP	KH
Tense	100	100	87.5	87.5	87.5	75	68.75	56.25	56.25	56.25	37.5	20
WH-Q	100	93.75	83.33	83.33	0	16.67	81.25	25	18.75	0	18.75	0

Table 2

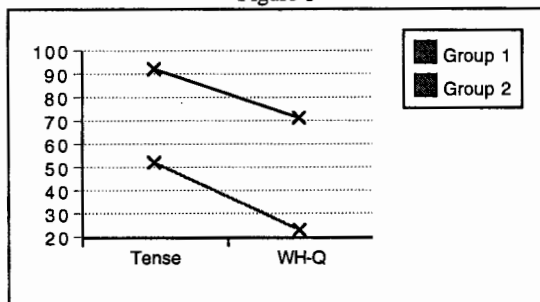
	n	Tense		WH-Questions	
		Mean	SD	Mean	SD
Group 1	5	92.50	6.85	72.08	40.92
Group 2	7	52.86	18.68	22.92	27.48

As we would expect from our theoretical assumptions, a strong positive correlation between tense and WH-questions is observed. The better the subjects did on tense, the better they did on WH-questions [$r = .6986, p < .05$].

There are two cases, however, that appear to be problematic. Subject MT scored high on tense, but scored 0% on WH-questions. The possible reason is that he achieved this high score on tense simply because he remembered the rules for the verb forms in temporal clauses. The other case is Subject SB. Although he scored high on WH-questions, he achieved slightly lower than 80% on tense. This may have been a matter of chance that he made errors on tense. It is possible to say that he might belong to Group 1.

The crucial point is that the acquisition of tense and the acquisition of WH-questions are strongly related. It is statistically supported in this study. When the between-groups factor was analyzed, significant difference between the groups was found [$F(1,10) = 12.93, p = .005$]. The analysis of the within-group factor, two types of questions, also shows that there was a significant main effect of the question type [$F(1,10) = 8.02, p = .018$]. These results indicate that the questions on tense were easier for both of the groups, and Group 1 was better than Group 2 on both types of the questions (Figure 1).

Figure 1



These results demonstrate that in the early stage of acquisition, learners observe the English tense system and cannot answer WH-questions to the element inside the temporal clause. However, the learners in the late acquisition stage observe the Japanese tense system and can answer WH-questions. Moreover, the strong correlation between the two

types of questions indicates that if the subjects do better on tense, they do better on WH-questions, and vice versa.

3.3. Experiment 2: Oral Task

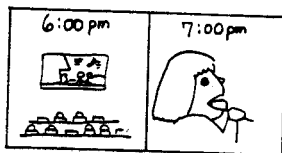
3.3.1. Methodology

Subjects: The subjects used in this experiment were 15 university students who took the third and fourth year Japanese courses at Ohio University. Twelve of them were the same subjects who participated in Experiment 1.

Task: A series of sentences accompanied with the pictures were used in the oral task. The types of questions included were tense, WH-questions, and fillers. Two different orders of the test sentences were prepared to avoid test effect. All the sentences were recorded on the tape beforehand.

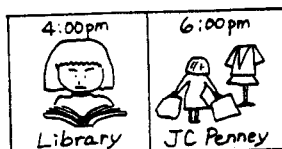
In this task, a subject was asked to listen to the sentence on the tape which described the picture shown and to judge if it was correct or not. If the subject said it was incorrect, s/he was asked to give the reason and correct the error. By so doing, we could avoid the possibility that the subject would give the right answer for the wrong reasons. For items on WH-questions, a question and a response exchanged between two people were recorded on the tape. A subject was asked to determine if the response to the question was correct or not. Examples (7) and (8) below are sample test items for tense and WH-questions respectively. Questions on WH-questions, like (8), were created in such a way that we could see how subjects interpreted the WH-questions by looking at when they accept or reject these responses.

- (7) Tanaka-san -ga eiga -o miru -ato-ni gohan-o taberu.
Miss Tanaka-nom movie-acc watch-after meal -acc eat
'Miss Tanaka eats a meal after she watches a movie.'



In this question, subjects were expected to say it was incorrect. When the subject said it was incorrect, s/he was asked to give the reason and correct the error.

- (8) A: Tanaka-san -ga kaimono -o dokode suru-mae-ni benkyoosuru-no?
Miss Tanaka-nom shopping-acc where do -before study -Q
B: Toshokan.
library
A: '(lit.) Q: Miss Tanaka studies [before she does shopping where].'
B: 'Library.'



Subjects were expected to say "Library" was an incorrect response, because the answer is supposed to be "JC Penney." If the subject said it was incorrect, s/he was asked to give the correct response.

3.3.2. Results

The same statistical procedures used in the previous written task, the Pearson Correlation Test and a split-plot design ANOVA, were used in the oral task.

Table 3 shows the percentage of the correct answers each subject made in each type of question in the oral task. The means and the standard deviations are presented in Table 4.

Table 3

Subjects	G1					G2									
	DD	MC	JK	MB	SB	MT	BM	KH	NF	CH	SH	GK	CP	KR	SK
Tense	100	100	93.75	75	75	75	68.75	62.5	62.5	62.5	56.25	56.25	50	50	50
WH-Q	100	0	0	50	33.33	0	8.33	50	0	0	50	0	58.33	41.67	8.33

Table 4

	n	Tense		WH-Questions	
		Mean	SD	Mean	SD
Group 1	3	97.92	3.61	33.33	57.74
Group 2	12	61.98	9.78	24.99	24.10

In the oral task, we obtained different results from the written task, as shown in Table 3. No significant correlation was found between tense and WH-questions in the oral task [$r = .0687$]. Although the effect of the type of questions was significant [$F(1,13) = 22.12, p = .000$], there was no significant difference between the groups [$F(1,13) = 4.46, p = .055$]. The possible explanation is that subjects chose the most reasonable answers for the pictures without paying much attention to the structure of the sentences.

One point to be noted here is that different tasks yield different results. Although different results from the previous task were obtained, considering the nature of oral tasks in general, we take the results from the written task as a piece of crucial evidence that the acquisition of tense and the acquisition of WH-questions are related.

4. Discussion

The results given in the previous section indicate that in the early stage of acquisition of Japanese as a foreign language (JFL), temporal adverbial clauses are adjoined to TP. This suggests that in the early stage, transfer takes place with respect to the position of temporal adverbial clauses. However, due to positive evidence regarding the position of Japanese temporal adverbial clauses, JFL learners acquire the knowledge that temporal adverbial clauses can adjoin to VP in Japanese. Accordingly, their tense system becomes Japanese.

To be more specific, the ARG within a temporal adverbial clause comes to take the matrix event time as its antecedent. In addition, either an event predicate or INFL comes to take a temporal adverbial clause as its argument, and thus, the JFL learners can answer to a WH-phrase inside the temporal adverbial clause. Hoji (1985) argues that temporal phrases are base-generated between the subject and the object. Further, based on evidence regarding whether or not they can be within the scope of negation, Koizumi (1991) argues that temporal adverbial clauses are adjoined to VP in Japanese. We, thus, take our results as a piece of empirical evidence for Hoji (1985), Koizumi (1991) and Miyamoto (1994) who propose that temporal adverbial clauses are adjoined to VP in Japanese, and also for Murasugi and Saito (1992) who argue that temporal phrases are arguments of an event predicate or INFL.

An important observation is that there was a strong correlation between acquisition of the Japanese tense system and acquisition of the argument status of temporal adverbial clauses. Those who have not acquired the Japanese tense system cannot answer to a WH-phrase inside a temporal adverbial clause, while those who have mastered the Japanese tense system can do so. If the tense system and the questionability of WH-phrases inside temporal adverbial clauses were two independent phenomena, the correlation observed in this study would be mysterious. We suggest that this correlation can be best accounted for if we assume that UG is operative in SLA (among others, White 1989; Toratani, 1995; Yamane, 1995). As mentioned above, under UG, these two different properties of English and Japanese temporal adverbial clauses are due to only one syntactic difference between these two languages; namely, the positions which temporal adverbial clauses of these languages occupy. The only evidence that JFL learners need is that the position of Japanese temporal adverbial clauses is in VP. After JFL learners obtain this necessary evidence, the two properties are expected to be acquired simultaneously. Thus, given UG, the correlation is correctly predicted.

5. Concluding Remarks

This paper examined acquisition of two properties of English and Japanese temporal adverbial clauses; namely, the tense system and the questionability of a WH-phrase within a temporal adverbial clause of these two languages. We found that there is a strong correlation between acquisition of the tense system and that of an argument status of temporal phrases in Japanese. We took this result as a piece of empirical evidence that Japanese temporal adverbial clauses are adjoined to VP (Hoji (1985), Koizumi (1991), and Miyamoto (1994)). Also, our finding supports Murasugi and Saito (1992) who argue for an argument status of temporal phrases in Japanese.

Furthermore, we found a piece of evidence for transfer with respect to the position of temporal adverbial clauses from their L1, namely English. In addition, we interpreted the correlation that we found as an indication that UG is operative in SLA, which, in turn, supports White (1989), Toratani (1995), Yamane (1995), among others.

9. Dokode Yamada-san-wa oyoida-ato-ni odotta-no?
 where -top swam -after danced-Q
 '(lit.)Q: Mr. Yamada danced [after he swam] where.'
 a. Aquatic Center b. Another Fool's Cafe
 c. either a or b d. none of the above
10. Ito-san-wa Columbus-ni ()-toki-ni hanbaagaa-o taberu.
 -top -to -when hamburger-acc eat
 'Miss Ito eats a hamburger when she () to Columbus.'
 a. iku 'go' b. itta 'went'
 c. either a or b d. none of the above
11. Dooyatte Tanaka-san-ga nihon-ni kaeru-mae-ni koronbasu-no hikoojoo-made
 how -nom Japan-to return-before Columbus-gen airport -to
 iku-no?
 go-Q
 '(lit.)Q: Miss Tanaka goes to the Columbus airport [before she returns to Japan]
 how.' or
 '(lit.)Q: Miss Tanaka goes to the Columbus airport [before she returns to Japan
 how].'
 a. hikooki 'airplane' b. bus
 c. either a or b d. none of the above
12. Yamada-san-wa akai hana -o ()-toki-ni tomodachi-ni atta.
 -top red flower-acc -when friend -dat met
 'Mr. Yamada met his friend when he () red flowers.'
 a. motteiru 'have' b. motteita 'had'
 c. either a or b d. none of the above
13. Johnson-san-ga sushi-o dooyatte taberu-mae-ni e -o kaku-no?
 -nom -acc how eat -before picture-acc draw-Q
 '(lit.)Q: Mr. Johnson draws a picture [before he eats sushi how].'
 a. hashi 'chopsticks' b. pen
 c. either a or b d. none of the above
14. Tanaka-san-wa class-ga ()-ato-ni koohee-o nomu.
 -top -nom -after coffee-acc drink
 'Miss Tanaka drinks coffee after the class ().'
 a. owaru 'finish' b. owatta 'finished'
 c. either a or b d. none of the above
15. Tanaka-san-ga osake-o dokode nomu-mae-ni oyogu-no?
 -nom sake -acc where drink -before swim -Q
 '(lit.)Q: Miss Tanaka swims [before she drinks sake where].'
 a. Casa Cantina b. Aquatic Center
 c. either a or b d. none of the above

Appendix B: Oral Task

The first 15 items in the oral task set (A)

O = correct items, X = incorrect items

- O 1. Booifurendo-no -koto -o omotteiru-toki-ni Jonson-san-ga kita.
Boyfriend -gen -matter-acc think -when Johnson -nom came
'Mr. Johnson came when I was thinking about my boyfriend.'
- O 2. Tanaka-san-wa terebi-o mita -ato-ni ongaku-o kiita.
-top TV -acc watched-after music -acc listened
'Miss Tanaka listened to music after she watched TV.'
- X 3. Tanaka-san-wa suupaa -ni itta -mae-ni tegami-o kaita.
-top supermarket-to went-before letter -acc wrote
'Miss Tanaka wrote a letter before she went to the supermarket.'
- O 4. A: Tanaka-san-ga kaimono-o suru-mae-ni dokode eiga -o miru -no?
-nom shopping-acc do -before where movie-acc watch-Q
B: Asenzu shinema.
A: '(lit.)Q: Miss Tanaka watches a movie [before she does shopping] where.'
B: 'Athens Cinema'
- X 5. Tanaka-san-wa ie -ni kaetta -toki-ni itsumo Suzuki-san-ni au.
-top home-to returned-when always -dat meet
'(lit.) Miss Tanaka always meets Suzuki-san when she returned home.'
- O 6. Tanaka-san-wa tenisu -o suru-mae-ni denwa -o shita.
-top tennis-acc play-before telephone-acc did
'Miss Tanaka made a telephone call before she played tennis.'
- X 7. Tanaka-san-wa apaato -o deru -toki-ni Suzuki-san-ni atta.
-top apartment-acc leave-when -dat met
'(lit.) Miss Tanaka met Miss Suzuki when she leaves her apartment.'
- O 8. A: Tanaka-san-wa koronbasu -made dooyatte itta -ato-ni nihon-ni kaetta -no?
-top Columbus-to how went-after Japan-to returned-Q
B: Kuruma-de.
car -by
A: '(lit.)Q: Miss Tanaka returned to Japan [after she went to Columbus how].'
B: 'By car.'
- O 9. Konpyuutaa-o motteita-toki-ni Tanaka-san-wa mada kookoosee datta.
Computer -acc owned -when -top still high school student was
'Miss Tanaka was still a high school student when she owned a computer.'

- O10. A: Tanaka-san-ga dooyatte peepaa-o kaku-mae-ni keeki-o taberu-no?
 -nom how paper -acc write-before cake -acc eat -Q
 B: Konpyuutaa-de.
 Computer -with
 A: '(lit.)Q: Miss Tanaka eats a cake [before she writes a paper] how.' or
 '(lit.)Q: Miss Tanaka eats a cake [before she writes a paper how].'
 B: 'With a computer.'
- X11. Tanaka-san-wa eiga -o miru -ato-ni gohan-o taberu.
 -top movie-acc watch-after meal -acc eat
 'Miss Tanaka eats a meal after she watches a movie.'
- O12. Tanaka-san-wa depaato -ni itta -toki-ni Suzuki-san-ni atta.
 -top department store-to went-when -dat met
 '(lit.) Miss Tanaka met Miss Suzuki when she went to the department store.'
- O13. A: Tanaka-san-ga dokode koohii-o nomu-mae-ni tenisu-o suru-no?
 -nom where coffee -acc drink-before tennis -acc play-Q
 B: Urufu sutoriito.
 A: '(lit.)Q: Miss Tanaka plays tennis [before she drinks coffee] where.' or
 '(lit.)Q: Miss Tanaka plays tennis [before she drinks coffee where].'
 B: 'Wolfe Street.'
- X14. Tanaka-san-wa apaato -o deru -toki-ni kagi-o otosu.
 -top apartment-acc leave-when key -acc drop
 '(lit.) Miss Tanaka drops a key when she leaves her apartment.'
- O15. A: Dooyatte Tanaka-san-wa koronbasu-ni itta -ato-ni nihon-ni kaeru-no?
 how -top Columbus to went-after Japan-to return-Q
 B: Hikooki-de.
 airplane-by
 A: '(lit.)Q: Miss Tanaka returns to Japan [after she goes to Columbus] how.'
 B: 'By airplane.'

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