

Where Do L2ers Attach Interclausal Adverbials?*

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1. Introduction

Dekydspotter, Schwartz, Sprouse & Liljestr and (2005) presented a reanalysis of Garcia (1998), a study which examined the L2 English construal of interclausal temporal and locational PP adverbials, as exemplified in (1):

- (1) a. Charles told Anne in the winter that he played tennis. [PP-Comp]
 b. Charles told Anne that in the winter he played tennis. [Comp-PP]
 c. Charles told Anne in the winter he played tennis. [No overt Comp]

To explain the asymmetrically nontargetlike L2 behavior, they offer a processing account whereby universal processing mechanisms lead to the favoring of the embedded-clause construal of the interclausal adverbial. This paper reconsiders the Dekydspotter et al. proposal by way of two experiments, both focusing on the previously unexplored class of deictic temporal adverbials such as *yesterday*, with high-beginning Japanese L2ers of English as well as native English speakers.

The paper is organized as follows: Section 2 reviews previous research on L2ers' construal of interclausal adverbials; Section 3 presents the method and results of our acceptability judgment task; and Section 4 presents the method and results of our self-paced reading task. Section 5 discusses (a) implications of our findings vis  a vis related studies, and (b) other factors that might have influenced our results. We close by highlighting our main conclusion: In the area under investigation, native processing and nonnative processing are fairly closely aligned.

2. Previous Research

Garcia (1998) tested low-level Arabic- and Chinese-speaking L2ers of English and English native speakers (NSs). Participants heard, one by one, audio-recorded English sentences of the types in (1), with distinct pauses around the adverbial PP and the complementizer, and chose from three pictures (one a distracter) the one that best represented each sentence. The two relevant pictures depicted the adverbial construed with either the matrix clause or the embedded clause. The Dekydspotter et al. reanalysis of the results showed that L2ers were more accurate on Comp-PP sentences (1b) than on PP-Comp sentences (1a), and had a preference for embedded-clause construal in sentences with no overt complementizer (1c).

Dekydspotter et al. reasoned that although these asymmetries argue for the existence of CP in the L2ers' Interlanguage (cf. Bhatt & Hancin-Bhatt 2002), the poorer performance on PP-Comp sentences requires explanation. To this end, they appealed to a general processing principle (2a) and three parsing strategies (2b-d):

- (2) a. *Principle of Incremental Comprehension* (Crocker 1996:106): The Sentence Processor operates in such a way as to maximize comprehension of the sentence at each stage of processing.
- b. *Attach Quickly* (Fodor & Inoue 2000:23): On receiving a word of the input sentence, connect it to the current partial phrase marker as quickly as possible.
- c. *Minimal Attachment* (Frazier 1979:76): Attach incoming material into the phrase marker being constructed with the fewest nodes consistent with the well-formedness rules of the language.
- d. *Attach (Anyway)* (Fodor & Inoue 2000:26): On receiving a word of the input sentence, connect it to the current partial phrase marker for the sentence wherever it least severely violates the grammar, subject to preference principles.

Relying on (2), Dekydtspotter et al. suggest that the sentences in (1) are parsed as follows. As participants encounter the verb *tell*, the parser immediately posits an unspecified theme complement—XP, which can be either DP or CP—due to the selectional properties of the verb. Upon encountering the PP, the parser selects CP, since PP cannot intervene between a verb and its DP complement in English. At this point, because of *Attach Quickly* and *Minimal Attachment*, PP is inserted into the CP (the current phrase marker), and not the matrix VP, creating the misconstrual in PP-Comp sentences and the preference for embedded-clause construal in sentences with no complementizer. Given *Attach (Anyway)*, L2ers tend to stick with this analysis, because it is less costly than reanalyzing the sentence; by contrast, NSs usually reanalyze the sentence, because it violates their grammar.

Recognizing the need for online data to back up the processing account, Dekydtspotter & Liljestrand (in press) designed a self-paced reading task, using similar sentences with interclausal locational PP adverbials, but this time in French. After reading a paragraph providing a context that forced either a matrix- or embedded-clause construal of the PP, 80 L1 English-speaking L2ers of French read sentences such as those in (3) online, where slashes indicate region boundaries.¹

- (3) a. Marie / a dit / dans la maison / que / Thomas / mangeait / de la glace.
 b. Marie / a dit / que / dans la maison / Thomas / mangeait / de la glace.
 ‘Marie said (that) in the house (that) Thomas was eating ice cream.’

Their results showed that on PP-Comp sentences (3a), the L2ers’ reading times for the PP region were significantly slower with matrix-clause contexts than with embedded-clause contexts. By contrast, on Comp-PP sentences (3b), no significant difference was found between matrix-clause and embedded-clause contexts. This asymmetry thus added support to the Dekydtspotter et al. processing account.

Our study builds on these findings. It aims to determine if similar asymmetrical performances can be demonstrated with a different constellation of L1 and target

language and with different experimental designs: an offline acceptability judgment task (Experiment 1) and an online non-cumulative self-paced reading task (Experiment 2).² Contrary to the previous studies, the experimental sentences used in the two tasks contain deictic temporal (DT) adverbials (e.g. *yesterday*, *tomorrow*, etc.), whose construal is established on the basis of tense-meaning (mis)matches between, on the one hand, the tense of the matrix or embedded verb and, on the other, the temporal meaning of the adverbial. The acceptability judgment task serves to assess L2ers' knowledge of the structural constraints governing the construal of interclausal DT adverbials in sentences with an overt complementizer and an embedded clause. The self-paced reading task is used to establish whether L2ers' asymmetrical performances (if also attested here) reflect their online processing of (DT) adverbials, as claimed by Dekydtspotter et al.

3. Experiment 1: Acceptability Judgment Task

3.1 Participants

Thirty adult NSs of American English living in Hawai'i and 30 adult high-beginning Japanese L2ers of English living in Japan participated in the acceptability judgment task. Prior to the experiment, the L2ers had received between 6 and 11 years of English instruction but had never lived in an English-speaking country. The L2ers' proficiency level was determined with a cloze test (Brown 1980). The NS scores previously reported for that test (Omaki 2005) range from 39 to 49 out of 50. The L2ers in this study scored between 5 and 15 out of 50. Participants were paid \$10 or ¥1000 in compensation for their time.

3.2 Materials

The acceptability judgment task comprised a total of 80 items. Twenty (4x5) consisted of simple sentences with a tense-meaning (mis)match between the verb and the DT adverbial, as in (4). These sentences were included to ensure that L2ers know that the meaning of DT adverbials must match the tense of the verb. Another 20 (4x5) items consisted of complex sentences with a matrix verb, an interclausal DT adverbial, and an embedded clause. Since these items all had an overt complementizer, the meaning of the adverbial therefore (mis)matched with the tense of either the matrix verb or the embedded verb, as illustrated in (5).³

- (4) a. Nancy studied with Brian yesterday. [Past, Match]
 b. *Nancy studied with Brian tomorrow. [Past, Mismatch]
 c. Nancy is going to play tennis tomorrow. [Future, Match]
 d. *Nancy is going to play tennis yesterday. [Future, Mismatch]
- (5) a. Joe told Ann last year that he is going to move to China. [Adv-Comp, Match]
 b. *Joe told Ann next year that he is going to move to China. [Adv-Comp, Mismatch]
 c. Joe told Ann that next year he is going to move to China. [Comp-Adv, Match]
 d. *Joe told Ann that last year he is going to move to China. [Comp-Adv, Mismatch]

The DT adverbials in both item sets were *yesterday, tomorrow, last week, next week, last month, next month, last year* and *next year*. These 40 experimental items were pseudo-randomized with 40 filler sentences.

3.3 Predictions

Recall that according to Dekydtspotter et al., upon encountering the adverbial after the verb *tell*, L2ers anticipate an embedded clause, which leads them later to construe the interclausal adverbial as modifying the embedded clause. If this proposal is correct, the L2ers in this task should perform worse on Adv-Comp items (5a, 5b) than on Comp-Adv items (5c, 5d), because they will position the adverbial in the embedded clause in Adv-Comp sentences, despite the fact that the complementizer *that* should block that analysis. This should lead them to reject grammatical Adv-Comp sentences (5a) and accept ungrammatical ones (5b).

3.4 Procedure

The sentences were presented visually. The participants were instructed to rate the sentences on a scale of 1 to 4 (1=horrible, 2=awkward, 3=okay, 4=perfect). They were told to select X (=I don't know) if they had no judgment.⁴ They had a maximum of 20 seconds to rate each sentence, but were encouraged to make a decision as quickly as possible. Since the sentences were presented one at a time, the participants could not go back and change their answers.

3.5 Analysis

We first collapsed the sentences rated 3 and 4 as grammatical and those rated 1 and 2 as ungrammatical (those with no judgment were excluded). We compiled the accuracy rates by calculating the percentages of grammatical sentences rated as grammatical and of ungrammatical sentences rated as ungrammatical.

3.6 Results

Table 1 presents the percentage and standard deviation of *correct* judgments for NSs and L2ers on grammatical and ungrammatical simple sentences (4).

Table 1. Percentage (Standard Deviation) of Correct Judgments: Simple Sentences

Sentence Type	NSs	L2ers
Past, Match (4a)	98.0 (6.1)	98.0 (6.1)
Past, Mismatch (4b)	99.3 (3.7)	96.0 (9.7)
Future, Match (4c)	97.3 (10.1)	92.7 (12.3)
Future, Mismatch (4d)	97.3 (8.7)	93.3 (10.9)

The results show that L2ers perform almost as well as NSs on simple sentences containing a tense-meaning (mis)match between DT adverbial and verb tense. A 2x2 repeated-measures ANOVA with match and tense as within-subject variables reveals a main effect of tense for only the L2ers ($F(1,29)=6.566, p=.016$), who do

not perform quite as well on future sentences. No significant effect of match or tense-match interaction was found for either group ($F_s < 1$). The reasonably low standard deviations indicate that there is little individual variation in each group.

Table 2 summarizes the percentage and standard deviation of *correct* judgments for NSs and L2ers on grammatical and ungrammatical complex sentences (5).

Table 2. Percentage (Standard Deviation) of Correct Judgments: Complex Sentences

Sentence Type	NSs	L2ers
Adv-Comp, Match (5a)	88.0 (19.4)	54.0 (34.1)
Adv-Comp, Mismatch (5b)	74.7 (23.4)	68.0 (31.3)
Comp-Adv, Match (5c)	93.3 (13.2)	75.3 (30.5)
Comp-Adv, Mismatch (5d)	86.0 (20.4)	80.7 (20.0)

These results show a different pattern. In the case of NSs, a 2x2 repeated-measures ANOVA with word order and match as within-subject variables reveals main effects of word order ($F(1,29)=7.932$, $p=.009$) and match ($F(1,29)=6.590$, $p=.016$), with a numerical advantage for Comp-Adv sentences, on the one hand, and for Match sentences, on the other. Similarly, a 2x2 repeated-measures ANOVA run on the L2ers' accuracy rates reveals main effects of word order ($F(1,29)=7.260$, $p=.012$) and match ($F(1,29)=4.928$, $p=.034$), also with a numerical advantage for Comp-Adv sentences, but with a numerical disadvantage for Match sentences. No significant tense-match interaction was found for either group ($F_s < 1$). The moderately high standard deviations suggest that there is considerable individual variation in the data, especially in the L2 group.

3.7 Discussion

As these results indicate, both NSs and L2ers performed very well on simple sentences containing a tense-meaning (mis)match between DT adverbial and verb tense. While not surprising for NSs, for L2ers it at least confirms they know that the meaning of DT adverbials must match the tense of the verb. On complex sentences, NSs failed to reject some Mismatch sentences when they should have (which is perhaps unexpected on the part of NSs), whereas L2ers rejected some Match sentences when they should not have. Importantly, the accuracy rates of both groups are significantly higher for the two types of Comp-Adv sentences than for their respective Adv-Comp counterparts. These latter results are precisely what the Dekydtspotter et al. analysis would predict. We return to implications of these findings in Section 5.

4. Experiment 2: Self-Paced Reading Task

4.1 Participants

The participants in the self-paced reading task were exactly the same as those in the acceptability judgment task, with the exception of one NS who was excluded for failing to meet the inclusion criterion (see Section 4.5).

4.2 Materials

The self-paced reading task comprised a total of 75 items. Of these, 30 (6x5) were experimental sentences containing an interclausal DT adverbial and an embedded clause, but no overt complementizer. The first two sentence types, exemplified in (6a)-(6b), did not evince any mismatch between the meaning of the adverbial and the tense of either the matrix verb or the embedded auxiliary (Match). These are the control sentences against which the mismatch counterparts are compared. The next two sentence types, illustrated in (6c)-(6d), had a mismatch between the tense of the matrix verb and the meaning of the adverbial (M(atrix)-Mismatch). The last two sentence types, illustrated in (6e)-(6f), had a mismatch between the meaning of the adverbial and the tense of the embedded auxiliary (E(mbedded)-Mismatch). To ensure that the participants were reacting to the tense-meaning mismatch and not to the specific verb tense, we fully crossed the verb tenses to create the (mis)matches. The slashes indicate the region boundaries.

- (6) a. Joe / told / Ann / yesterday / he / did not / play / tennis. [Past, Match]
 b. Joe / will tell / Ann / tomorrow / he / will not / play / tennis. [Future, Match]
 c. Joe / told / Ann / tomorrow / he / will not / play / tennis. [Past, M-Mismatch]
 d. Joe / will tell / Ann / yesterday / he / did not / play / tennis. [Future, M-Mismatch]
 e. Joe / told / Ann / yesterday / he / will not / play / tennis. [Past, E-Mismatch]
 f. Joe / will tell / Ann / tomorrow / he / did not / play / tennis. [Future, E-Mismatch]

The DT adverbials in the experimental sentences were *yesterday*, *tomorrow*, *last week*, *next week*, *last month* and *next month*. The 30 experimental items were counterbalanced across 6 lists and pseudo-randomized with 45 distracter sentences.

4.3 Predictions

Dekydspotter et al. predict that upon reading the adverbial after *told/will tell*, L2ers (and NSs) should immediately anticipate an embedded clause, which should then lead to their construing the interclausal adverbial with the embedded clause. If this analysis is correct, the reading times (RTs) in this task should be longer at the auxiliary + *not* region for E-Mismatch sentences (6e)-(6f) than for Match sentences (6a)-(6b), because the meaning of the adverbial conflicts with the tense of the embedded auxiliary. Crucially, no significant difference should be found between the RTs at the adverbial region for M-Mismatch sentences (6c)-(6d) and for Match sentences (6a)-(6b), even though the meaning of the adverbial in M-Mismatch sentences conflicts with the tense of the matrix verb. In this case, significantly longer RTs at the adverbial region would indicate that the adverbial had been construed as modifying the matrix predicate, *contra* Dekydspotter et al.

4.4 Procedure

The self-paced reading task was run on individual computers. At the start of each trial, the symbol “+” appeared on the left side of the screen. Participants were

instructed to press a button to make the first region of the sentence appear, and, as soon as they had read that region, to press the button again to make the next region appear. Each region disappeared from the screen as the next region appeared. Participants were told to repeat this procedure until they finished reading the entire sentence. Each trial was followed by a true-or-false comprehension question to ensure the participants were paying attention to the sentences.⁵ Participants occasionally received feedback on their answers, but never on experimental items. The main experimental session was preceded by a practice session of 5 sentences.

4.5 Analysis

Our inclusion criterion was set at 24 correct answers out of the 30 true-or-false comprehension questions on the experimental sentences. This criterion was met by all but one NS whose data were therefore excluded. Individual RTs of experimental items for which the comprehension question was incorrectly answered were also excluded from the analyses. Between-subject outliers were trimmed at 3 standard deviations from the mean. Since the error rates were approximately the same for all sentence types, they are not reported here.

4.6 Results

Given the possibility of spill-over effects, we report RTs and statistical analyses on the combined adverbial and subject regions, on the one hand, and on the combined auxiliary + *not* and verb regions, on the other. Table 3 summarizes the mean RTs and standard deviations of NSs and L2ers. Recall that to test the effect of matrix mismatch, the adverbial and subject regions of M-Mismatch sentences (6c-6d) are compared to the adverbial and subject regions of the corresponding Match sentences (6a-6b), and that to test the effect of embedded mismatch, the auxiliary + *not* and verb regions of E-Mismatch sentences (6e-6f) are compared to the auxiliary + *not* and verb regions of the corresponding Match sentences (6a-6b).

Table 3. NSs' and L2ers' Mean Reading Times (Standard Deviations) by Region

Sentence Type		NSs		L2ers	
		Adverbial + Subject	Aux. + <i>not</i> + Verb	Adverbial + Subject	Aux. + <i>not</i> + Verb
Past	Match (6a)	1031 (248)	1041 (285)	2659 (1046)	2027 (562)
	M-Mismatch (6c)	1092 (308)	1048 (430)	2899 (1099)	2434 (1000)
	E-Mismatch (6e)	1039 (272)	1150 (358)	2619 (1041)	2453 (842)
Future	Match (6b)	1120 (310)	1140 (301)	3030 (1415)	2238 (755)
	M-Mismatch (6d)	1241 (430)	1155 (404)	3175 (1444)	2010 (636)
	E-Mismatch (6f)	1106 (253)	1128 (352)	2570 (932)	2107 (723)

Note: M-Mismatch=Matrix Mismatch; E-Mismatch=Embedded Mismatch

As can be seen in Table 3, NSs' RTs are slower at the combined adverbial and subject region of M-Mismatch sentences (6c, 6d) than of Match sentences (6a, 6b)

for both past and future conditions. A 2x2 repeated-measures ANOVA conducted on the combined adverbial and subject region of Match and M-Mismatch sentences with tense and match as within-subject variables reveals significant effects of tense ($F_1(1,28)=14.779$, $p<.001$; $F_2(1,27)=10.764$, $p=.003$) and match ($F_1(1,28)=5.181$, $p=.031$; $F_2(1,27)=4.089$, $p=.053$), but no tense-match interaction ($F_s<1$).

Conversely, the NSs' RTs at the combined auxiliary + *not* and verb region are slower only for E-Mismatch sentences in the past (viz. (6e) vs. (6a)). A 2x2 repeated-measures ANOVA conducted on the combined auxiliary + *not* and verb region of Match and E-Mismatch sentences fails to reveal a significant effect of tense ($F_1(1,28)=1.509$, $p=.229$; $F_2(1,27)<1$) or match ($F_1(1,28)=3.365$, $p=.077$; $F_2(1,27)<1$), but it does reveal, only in the subject analysis, a marginally significant tense-match interaction ($F_1(1,28)=4.134$, $p=.054$; $F_2(1,27)=1.832$, $p=.187$). Subsequent paired-sample t-tests adjusted with the Bonferroni correction show a significant effect of match for only the past condition ($t(28)=-2.740$, $p=.011$).

In comparison to NSs, L2ers' RTs and standard deviations are much larger, as expected given their low proficiency. Their RTs for M-Mismatch sentences (6c, 6d) in comparison to Match sentences (6a, 6b) are numerically longer at the combined adverbial and subject region in both the past and future conditions. However, a 2x2 repeated-measures ANOVA conducted on the combined adverbial and subject region reveals only a marginally significant effect of tense ($F_1(1,29)=3.845$, $p=.06$; $F_2(1,27)=3.354$, $p=.078$) but not of match, and no tense-match interaction ($F_s<1$).

Similar to NSs, L2ers also show slower RTs at the combined auxiliary + *not* and verb region of E-Mismatch sentences than of Match sentences in the past condition (viz. (6e) vs. (6a)) but not the future condition (viz. (6f) vs. (6b)). A 2x2 repeated-measures ANOVA conducted on the combined auxiliary + *not* and verb region reveals no significant effect of tense ($F_s<1$), a marginally significant effect of match only in the subject analysis ($F_1(1,29)=3.639$, $p=.066$; $F_2(1,27)=2.598$, $p=.119$), and a significant tense-match interaction only in the subject analysis ($F_1(1,29)=8.847$, $p=.006$; $F_2(1,27)=2.339$, $p=.138$). Subsequent paired-sample t-tests adjusted with the Bonferroni correction show a significant effect of match in only the past condition ($t(29)=-3.293$, $p=.003$).

4.7 Discussion

NSs' results show significantly slower RTs at the combined adverbial and subject region of M-Mismatch sentences than of Match sentences in both the past and future conditions, which strongly suggests they had construed the adverbial as modifying—hence had attached it to—the matrix predicate. These findings, which are consistent with the idea that words are attached as closely as possible to the most recently parsed predicate (e.g. Gibson, Pearlmutter, Canseco-Gonzales & Hickok 1996), therefore run counter to the Dekydtspotter et al. proposal. Despite the lack of significance in the L2ers' results, they, too, showed a tendency to slow down at the combined adverbial and subject region of M-Mismatch sentences.

NSs' results also show significantly slower RTs at the combined auxiliary + *not* and verb region of E-Mismatch sentences than of Match sentences, but only in the past condition. Possibly, this slow down was caused by a tense-chain violation, where the tense of the embedded auxiliary (i.e. *will* in (6e)) conflicts with the tense of the matrix verb (e.g. *told*). While the embedded auxiliary in past M-Mismatch sentences (i.e. *will* in (6c)) also creates a tense-chain violation, the future meaning of the adverbial (e.g. *tomorrow*) might reduce that effect. Since no slow down was found in the future condition of E-Mismatch sentences, it cannot be argued that the slow down in the past condition was caused solely by a tense-meaning mismatch.

Like NSs, L2ers exhibit slower RTs at the combined auxiliary + *not* and verb region of E-Mismatch sentences than of Match sentences in only the past condition. This time, however, the future tense seems to be the cause, as L2ers' RTs are faster in all items in which the embedded clause contains the past auxiliary *did* compared to the future auxiliary *will* (viz. (6a) vs. (6b), (6d) vs. (6c), and (6f) vs. (6e)). A subsequent paired-sample t-test confirms that this is the case ($t(145)=4.243$, $p<.001$). Since this effect is blurring the picture, it is unclear whether the L2ers' E-Mismatch results support the Dekydtspotter et al. hypothesis.

5. General Discussion

Experiment 1 investigated the acceptability of Adv-Comp and Comp-Adv sentences, in which DT adverbials were controlled to (mis)match the tense of, respectively, the matrix verb and the embedded verb. As Dekydtspotter et al. predicted, both the NSs and the L2ers were more accurate in judging Comp-Adv sentences than Adv-Comp sentences: The accuracy of NSs was far above chance in both conditions, while that of L2ers was around chance-level in the Adv-Comp condition and above chance-level in the Comp-Adv condition. Experiment 2 employed a self-paced reading task to investigate the time course of DT adverbial attachment, when the adverbial can modify only the matrix predicate or only the embedded clause. The RT data showed that NSs slowed down when the DT adverbial mismatched the tense of the matrix verb, but not across tense conditions when it mismatched the tense of the embedded verb; for L2ers, there was a tendency to construe the adverbial as modifying the matrix predicate, but no clear evidence for embedded-clause construal. We now turn to implications of these findings in relation to the Dekydtspotter et al. proposal.

With respect to NSs, the self-paced reading data clearly show that they initially interpret the adverbial as modifying the matrix predicate, *contra* the Dekydtspotter et al. prediction. This leaves us with the question of why their accuracy rates were lower on Adv-Comp sentences than Comp-Adv sentences in the acceptability judgment task. It is important to note that NSs were much more accurate on Adv-Comp Match items (88.0%) than on Adv-Comp Mismatch items (74.7%). Given this asymmetry, we suggest that it is not the Adv-Comp structure *per se* which causes processing difficulties, but rather the particular structure of Adv-Comp Mismatch sentences, repeated in (7).

(7) *Joe told Ann next year that he is going to move to China. [Adv-Comp, Mismatch]

Let us assume that NSs initially attach *next year* to the matrix predicate. At this point, the tense-meaning mismatch between matrix verb and DT adverbial prompts reanalysis of this first parse, such that *next year* is repositioned in the embedded clause. However, this revision encounters a further snag, as it is incompatible with the presence of the complementizer *that*, which should trigger another instance of reanalysis, i.e. reattaching *next year* to the matrix predicate (which should lead to a judgment of “unacceptable”). Given that reanalyses are generally costly, NSs may sometimes fail in the second reanalysis, leaving the adverbial in the embedded clause, which in turn leads to the incorrect judgment that this sentence is acceptable (given the tense-meaning match between adverbial and embedded auxiliary).

With respect to L2ers, the results of the self-paced reading task, while not conclusive, numerically suggest that sometimes L2ers initially construe the adverbial as modifying the matrix predicate. This conclusion, if correct, also leaves unexplained the L2ers’ asymmetrical performances on Adv-Comp sentences vs. Comp-Adv sentences in the acceptability judgment task. Unlike NSs, however, L2ers performed worse on Adv-Comp Match sentences than on Adv-Comp Mismatch sentences. Therefore, in regard to the L2ers’ results, the processes about which we speculated above for NSs are insufficient. One possibility is that the L2ers, for some reason, had a “no”-bias on the acceptability judgment task, rejecting grammatical sentences more often than accepting ungrammatical ones. Combining the speculation given above for the NSs—i.e. initially attach the adverbial to the matrix predicate and subsequently attach it within the embedded clause—with this “no”-bias can accommodate both the online and offline L2 results, including chance performance on Adv-Comp Match sentences.

Of importance are the differences in empirical findings between this study and previous ones (Garcia 1998; Dekydtspotter & Liljestrand in press). Several factors may figure into the divergent results. First, locational and DT adverbials might be processed differently. It is possible, for instance, that upon processing the DT adverbial, the parser, guided by the grammar, sets the reference time for the adverbial as soon as possible by checking its temporal information against the tense of the matrix verb, whereas no such grammatical relation characterizes verbs and locational adverbials (e.g. *in the house*). Another possible influence on the results is differential frequencies with which locational and DT adverbials modify matrix vs. embedded predicates. For example, it might well be the case that matrix predicates (or rather, verbs of reporting in general) are not often modified by a post-VP locational adverbial.⁶ A third point is the issue of presentation modes used across studies (in addition to other methodological differences). For instance, the prosody of Garcia’s (1998) experimental sentences, with pauses before and after both the adverbial and the complementizer, might have biased the participants to interpret the adverbial as modifying the embedded clause. Finally, it is quite possible that sentences with vs. without a complementizer differ in the way they are processed.⁷

6. Conclusion

In this paper, we investigated the construal of interclausal deictic temporal adverbials on the part of native and nonnative speakers of English. The theoretical backdrop of our study was the processing account of Dekydtspotter et al. (2005), the first specific attempt to explain L2ers' asymmetrical treatment of interclausal adverbials, i.e. with the embedded-clause construal favored. Our 30 low-level Japanese L2ers of English and 30 native speakers participated in two tasks. The L2 results of our acceptability judgment task replicated earlier findings that L2ers prefer to construe interclausal adverbials as modifying the embedded clause. Interestingly, very similar results were found for NSs (albeit at higher levels of accuracy). The results of our self-paced reading task, however, revealed that the embedded-clause construal is not the initial analysis that NSs and L2ers give to interclausal (DT) adverbials. Instead, despite the much more robust NS data, both groups evince reading time patterns that show initial attachment of the adverbial to the matrix predicate, i.e. to the most recently parsed predicate (e.g. Gibson et al. 1996). These findings indicate that the processing sequence proposed by Dekydtspotter et al. cannot explain our NS and L2 data, since this sequence fails to capture the first parse of interclausal adverbials (at least interclausal DT adverbials). These findings furthermore suggest that for the phenomena at issue, NSs and even low-level L2ers are using very similar processing strategies.

Notes

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¹ The French variant of (1c) is ungrammatical and so was not used.

² Experiment 2 was administered before Experiment 1 so as to guard against participants' acceptability judgments influencing their reading times on the self-paced reading task.

³ In these sentences, *is going to* was used instead of *will*, because it was judged that a tense-chain violation involving *is going to* (e.g. sentences (5a) and (5c), where *was going to* satisfies the tense-chain) is less noticeable than a tense-chain violation involving *will* (where *would* satisfies the tense-chain). Since all experimental sentences contained *is going to*, the tense-chain violation (if noticed) should affect all the results equally.

⁴ The instructions defined the rating categories and illustrated them with several examples.

⁵ No true-or-false question drew attention to the interclausal adverbial.

⁶ Many thanks to Ted Gibson (p.c., 15 July 2005) for mentioning this to us.

⁷ It should also be noted that our online study is the first to compare native and nonnative processing of interclausal adverbials. Dekydtspotter & Liljestr and, for example, might also have found online evidence for matrix construal with French NSs, contrary to what they found with their English-French L2ers. Such a result would suggest that, somehow, NSs and low-level L2ers differ in their treatment of interclausal adverbials, and it would challenge the Dekydtspotter et al. hypothesis that in these interclausal configurations, universal processing principles initially favor embedded-clause attachment, where the difference between NSs and L2ers lies in how successful they are in their reanalyses to matrix-predicate attachment.

References

- Bhatt, R. M. and B. Hancin-Bhatt (2002) "Structural Minimality, CP and the Initial State in Second Language Acquisition," *Second Language Research* 18, 348–392.
- Brown, J. D. (1980) "Relative Merits of Four Methods for Scoring Cloze Tests," *Modern Language Journal* 64, 311–317.
- Crocker, M. (1996) *Computational Psycholinguistics: An Interdisciplinary Approach to the Study of Language*, Kluwer, Dordrecht.
- Dekydtspotter, L. and A. Liljestr and (in press) "(Mis)interpretations of Adverbials at the Left-Edge in Early English-French as a Reflex of the Sentence Processor," in K. U. Deen, J. Nomura, B. Schulz and B. D. Schwartz, eds., *Proceedings of the Inaugural Conference on Generative Approaches to Language Acquisition—North America*, UConnWPiL, Storrs, CT.
- Dekydtspotter, L., B. D. Schwartz, R. Sprouse and A. Liljestr and (2005) "Evidence for the C-domain in Interlanguage," in S. H. Foster-Cohen, M. Garc a-Mayo and J. Cenoz, eds., *EUROSLA Yearbook, Volume 5*, Benjamins, Amsterdam.
- Fodor, J. D. and A. Inoue (2000) "Garden Path Re-analysis: Attach (Anyway) and Revision as Last Resort," in M. de Vincenzi and V. Lombardo, eds., *Cross-linguistic Perspective on Language Processing*, Kluwer, Dordrecht.
- Frazier, L. (1979) *On Comprehending Sentences: Syntactic Parsing Strategies*, Indiana University Linguistics Club, Bloomington.
- Garcia, B. (1998) *The L2 Initial State: Minimal Trees or Full Transfer/Full Access?*, MA thesis, University of Durham.
- Gibson, E., N. J. Pearlmutter, E. Canseco-Gonzales and G. Hickok (1996) "Recency Preference in the Human Sentence Processing Mechanism," *Cognition* 59, 23–59.
- Omaki, A. (2005) *Working Memory and Relative Clause Attachment in First and Second Language Processing*, MA thesis, University of Hawai'i.