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Temporal dependency and the syntax of subjects

ELLEN THOMPSON

University of Puerto Rico & Florida International University

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This article explores the interface between the syntactic and semantic representation of natural language with respect to the interpretation of time. The main claim of the paper is that the semantic relationship of temporal dependency requires syntactic locality at LF. Based on this claim, I explore the syntax and semantics of gerundive relative clauses. I argue that since gerundive relatives are temporally dependent on the tense of the main clause, they need to be local with a temporal element of the main clause at LF. I show that gerundive relatives receive different temporal interpretations depending on their syntactic position at LF. This analysis sheds light on the behavior of gerundive relatives in constructions involving coordination, existential *there*, scope of quantificational and cardinality adverbials, extraposition, presuppositionality effects and binding-theoretic reconstruction effects.

1. Introduction

Recent work on the syntax of tense shows that there is a principled relationship between the meaning and the phrase structure representation of temporal information (Hornstein 1977, 1981, 1990; Zagona 1988, 1990; Giorgi & Pianesi 1991, 1998; Stowell 1993). I contribute to this discussion here by arguing that syntactic locality constrains the interpretation of temporal relations; temporal dependency between times requires the times to be in a local syntactic configuration at LF.

I adopt the semantic analysis of Reichenbach (1947), whereby tenses are composed of different times, and I claim that syntactically, Event time information is associated with VP, while Speech time information is associated with TP. Based on this syntax and the claim that temporal dependency requires times to be in a local relation, I present an analysis of the syntax and semantics of gerundive relative clauses. I argue that gerundive relatives are temporally dependent on the main clause tense and thus are required to be local with a matrix time at LF.

This analysis of gerundive relatives has implications for the temporal syntax of arguments: reflexes of the syntax of tense are evident in the interpretation site of subjects at LF. Since the Event time is associated with VP, a gerundive relative in subject position that is interpreted in VP-internal position receives a reading where the gerund is temporally dependent on the Event time. Because the Speech time is associated with TP, a gerundive

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relative in subject position that is interpreted in TP receives a reading where the gerund is temporally dependent on the Speech time.

This paper is organized as follows: in section 2, I outline the approach to tense adopted here and I sketch a proposal for the syntactic representation of tense. In section 3, I show that gerundive relatives have a reduced tense structure, and that the temporal interpretation of gerundive relatives is dependent on the tense of the main clause. Assuming the syntactic representation of tense developed here, I claim that the reduced tense structure of gerundive relatives correlates with a reduced clause structure, in section 4.

Section 5 argues that the tense of gerundive relatives is ambiguous between being dependent on the Event time or the Speech time of the main clause and sketches out the syntactic analysis of these readings. Evidence for the proposal is discussed from constructions involving coordination, existential *there*, scope of quantificational and cardinality adverbials, extraposition, and presuppositionality effects in section 6.

Section 7 discusses the behavior of gerundive relatives with respect to binding-theoretic reconstruction effects and section 8 presents a discussion of extraposition with gerundive relatives. I argue that their exceptional behavior as compared to full relatives in these constructions is explained by the structural consequences of their requirement for temporal dependency.

2. Framework

2.1 *Semantics of tense*

Within the framework of Reichenbach (1947), tenses are composed of three times: the Event time, the Reference time and the Speech time. This system is illustrated in (1), where the Event time is the time of Mary's leaving, the Reference time is the time by which Mary's leaving takes place (2:00 in this sentence), and the Speech time is the time at which the sentence is uttered.

(1) At 2:00, Mary had left the office.

I assume Hornstein's (1990) Reichenbachian approach to tense, according to which the structures of the basic tenses of English are as in (2), where the linear order of the Speech, Reference and Event times reflects their temporal order.[1] If two times are separated by a line, the leftmost time is interpreted

[1] The term 'time' is used here as a cover term for what are referred to in the literature as temporal points and intervals.

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as temporally preceding the other time. If two times are separated by a comma, they are interpreted as cotemporal[2,3]

(2)	S , R , E	present	E _ S , R	present perfect
	E , R _ S	past	E _ R _ S	past perfect
	S _ R , E	future	S _ E _ R	future perfect

2.2 *Syntax of tense*

In the spirit of much recent work on the syntax of tense, I assume that times are the syntactic, as well as the semantic, primitives of tense (Hornstein 1977, 1981, 1990; Zagona 1988, 1990; Giorgi and Pianesi 1991, 1998; Stowell 1993).

I adopt Hornstein's (1990) claim that the Event time is associated with VP, whereas the Speech and Reference times are associated with Inflectional projections. I propose that times are represented as semantic features of particular lexical items; the Event time is a feature of the head of VP, the Reference time a feature of the head of Asp(ect)P, and the Speech time a feature of the head of T(ense)P, located above AspP.[4]

Evidence for the structural hierarchy of Event and Reference times comes from the distribution of temporal point adverbials. In clause-final position, these adverbials may modify the Event time or the Reference time; (3) may mean that the leaving event takes place at 3 p.m. (Event time reading), or that the leaving event takes place some time before 3 p.m. (Reference time reading).

(3) Mary had left the office at 3 p.m.

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[2] The tense structure of the future perfect requires discussion. As was pointed out by an anonymous *JL* referee, the structure for the future perfect in (2) strictly orders the Speech time before the Event time; however, (i) is possible, with the Speech time occurring after the Event time.

(i) John has already finished his dissertation, and therefore it will be true next week that he will have finished his dissertation.

According to Reichenbach (1947), tenses are comprised of two separate relations: the S-R relation and the R-E relation; the relation between the E and S times is indeterminate. While in certain tense structures it is possible to derive the E-S relation from the S-R and R-E relations, in the case of the future perfect, this is left open. S is ordered before R and E is ordered before R, but E may be before or after S, correctly capturing the possible reading of (i) (see Comrie 1985 and Hornstein 1990 for discussion).

[3] The Reichenbachian approach to tense will be shown to provide an elegant system for capturing the generalizations presented in this paper. However, it is possible that other frameworks for tense which are well-developed structurally could succeed in capturing these generalizations as well (see, for example, Prior 1957, 1967; Partee 1973, 1984).

[4] Evidence for the claim that times are associated with syntactic heads comes from the syntactic behavior of temporally dependent clauses in Modern Greek. As discussed in Varlokosta (1993), in these constructions an inflectional head of the embedded clause (which is, according to my analysis, associated with the Speech time) raises overtly to the head of CP (or possibly to a position in the matrix clause).

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However, when a temporal point adverbial is unambiguously associated with VP, it modifies only the Event time; in the VP fronting construction in (4), the leaving event takes place at 3 p.m., not some time before 3 p.m.

(4) Mary claimed that she had left the office at 3 p.m., and left the office at 3 p.m. she had.

In contrast, when the adverbial occurs above VP, as in (5), with a clause-initial temporal point adverbial, this adverbial modifies the Reference time only; the reading is that the leaving takes place some time before 3 p.m., and not at 3 p.m.

(5) At 3 p.m., Mary had left the office.

The discussion of the syntax and semantics of gerundive relatives presented here will provide evidence that the Speech time is located in TP and the Event time in VP.

3. Interpretation of gerundive relatives

Enç ((1987: 645) notes that the temporal interpretation of finite relative clauses is independent of the tense of the matrix clause (see also Hudson 1973, Ladusaw 1977, Dowty 1982, Abusch 1988 for discussion of the temporal interpretation of relative clauses). This is illustrated by the example in (6), where the matrix event of complaining and the gerund event of waiting are both interpreted as occurring in the past relative to the Speech time, but are temporally independent of one another; the complaining or the waiting may take place first, or they may take place at the same time.

(6) A passenger who was waiting for flight 307 complained to the flight attendant.

Hudson (1973) notes that in contrast to finite relative clauses, gerundive relatives are interpreted as temporally dependent on the main clause (see also Comrie 1985). The gerund event of waiting in (7) may take place at the time of the matrix event of complaining (Hudson's 'derivative' reading), where the meaning is 'A passenger complained to the flight attendant while he was waiting for flight 307'. The event of waiting may also take place at the Speech time (Hudson's 'deictic' reading), where the meaning is 'A passenger who is now waiting for flight 307 complained to the flight attendant'. However, a temporally independent reading, for example, with the waiting taking place some time in the past before the complaining, is not possible.

(7) A passenger waiting for flight 307 complained to the flight attendant.

3.1 *Temporal dependency of gerundive relatives*

In order to account for the temporal dependency of gerundive relatives, in this section I analyze their tense structure. Following Hornstein (1990:

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115–117), I assume that gerunds have a reduced tense structure with no Speech time, consisting of only Reference and Event times, as in (8).

(8) R , E

Evidence that gerundive relatives lack a Speech time is that they do not permit tense morphemes, as shown in (9). Since the tense morpheme orders the Reference time with respect to the Speech time (see Hornstein 1990), given that there is no Speech time, there can be no tense morpheme.

(9) *The passengers were waiting for flight 307 left the room.

A tense structure may be interpreted by being temporally linked to the time of the event of utterance, the Speech time, or by being linked to another time which is in turn linked to the Speech time. Because the tense structure of a gerund cannot be anchored to a Speech time within its own clause, it must be interpreted by being linked to the matrix tense.

I claim that the two readings of (7) (which is repeated in (10)) are due to interpretation with respect to different times of the matrix tense. The reading of (10) where the waiting is interpreted as occurring at the time of complaining results from the tense structure of the gerund linking to the Event time of the main clause. In contrast, the reading where the waiting occurs at the time of speech results from linking to the Speech time of the main clause. From here on, I refer to these readings as the Event time reading and the Speech time reading, respectively.

(10) A passenger waiting for flight 307 complained to the flight attendant.

(11) (a) Event time reading – event of gerund (waiting) is interpreted as occurring at time of matrix Event (complaining).
(b) Speech time reading – event of gerund (waiting) is interpreted as occurring at time of Speech.

The tense structures of the Event and Speech time readings in (11a) and (11b) are as in (12a) and (12b), respectively. The tense structure in (12a) represents the reading where the event of waiting occurs at the time of complaining, with the tense structure of the gerund linked to the Event time of the matrix clause. (12b) shows the tense structure of the reading with the waiting occurring at the Speech time, where the tense structure of the gerund is linked to the matrix Speech time. (See footnote 11 for discussion of a 'Reference time reading'.)

(12) (a) E , R _ S Event time reading
|
R , E

(b) E , R _ S Speech time reading
|
R , E

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The claim that gerundive relatives are temporally dependent on the tense of the main clause is supported by the examples with temporal adverbs in (13). The waiting of the gerund in (13a) may be interpreted as occurring in the past but not in the future, and hence is possible with *yesterday*, but not *tomorrow*, because the matrix tense is past. However, the waiting in (13b) may be interpreted as occurring in the future, but not the past, and hence can appear with *tomorrow* but not *yesterday*, since the matrix tense is future.[5]

(13) (a) A passenger waiting (yesterday/*tomorrow) for flight 307 complained to the flight attendant.
(b) A passenger waiting (*yesterday/tomorrow) for flight 307 will complain to the flight attendant.

In this section, I have argued that when the event of a gerundive relative is interpreted as occurring at the time of the matrix event, the reduced tense structure of the gerundive relative links to the Event time of the matrix clause, and when the gerundive event is interpreted as occurring at the time of utterance, it links to the Speech time of the matrix clause.

3.2 *Speech time readings*

Evidence for the claim that the Speech time reading of gerundive relatives is derived by linking of the tense structure of the gerund to the Speech time of the main clause comes from the distribution of gerundive relatives in environments in which the Speech time is interpreted as a time other than the utterance time: historical present and Sequence of Tense constructions.

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[5] An apparent counterexample to the generalization that gerundive relatives are temporally dependent on the main clause is shown in (i), where the gerund receives a future tense reading, although the main clause tense is present in (ia) and past in (ib).

(i) (a) The athletes arriving tomorrow are swimming now.
(b) The band playing at the Ritz tonight was in Cleveland last week.

However, these are not instances of true future tense interpretations, but highly restricted future readings which are available with nonfinite tenses (see Stowell 1982 for discussion). Unlike true future tense interpretations, these readings require a scheduled interpretation, and hence are not permitted with certain predicates, as seen in (ii).

(ii) (a) The athletes arriving tomorrow are swimming now.
(b) *The men waiting for the flight tomorrow are swimming now.

This exceptional shifted reading is limited to future tense, as seen in the contrast between (iiia) and (iiib).

(iii) (a) The men arriving tomorrow are swimming now.
(b) *The men arriving yesterday are swimming now.

These examples thus do not constitute a counterexample to the present analysis.

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3.2.1 *Historical present contexts*

The Speech time generally acts as a deictic element that is interpretively anchored within the speech situation. However, if a time is made sufficiently salient in the discourse, it may reorient the value of the Speech time to a time other than the utterance time (Comrie 1985, Hornstein 1990). An example of this is given in (14), where the first sentence reorients the Speech time to the seventeenth century.

(14) Imagine that we are back in the seventeenth century. Erin is planting potatoes in the field and Sean is gathering hay for the barn. One of the little kids helping Sean is bothering the sheepdog.

The event of helpingin the gerundive relative of the last sentence of (14) is interpreted as occurring at the reoriented Speech time of the seventeenth century, and not at the utterance time of the discourse. This supports the claim made here that on the reading of a gerundive relative where the event of the relative is interpreted as occurring at the time of the utterance, the tense of the gerund is dependent on the Speech time.

3.2.2 *Sequence of Tense constructions*

Sequence of Tense constructions present another example of a tense structure where the Speech time links to a time other than the utterance time, and the readings of gerundive relatives with this construction provide further evidence that the tense structure of gerundive relatives may link to the Speech time.

An embedded event in English may be temporally evaluated with respect to the Speech time (temporally independent reading), or with respect to the Event time of the subcategorizing verb (temporally dependent, or Sequence of Tense, reading). The temporally independent reading is illustrated by (15a), where the embedded event of crying is interpreted as future with respect to the Speech time. A Sequence of Tense, or SOT, reading is exemplified in (15b), where the event of crying may be interpreted as present with respect to the saying event, with the crying taking place at the same time as the saying (for various approaches to SOT phenomena, see Jesperson 1931, Ladusaw 1977, Comrie 1981, Enç 1987, Abusch 1988, Ogihara 1996 and references therein).

(15) (a) Mary said that John will cry.
(b) Mary said that John was crying.

In order to account for the 'present with respect to a past event' interpretation of (15b), Hornstein claims that the embedded clause has present tense structure, and is only morphologically past tense. The temporal structure of SOT readings involves linking the embedded Speech time to the

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matrix Event time, yielding (16) for the 'present with respect to a past event' reading of (15b).

(16) E , R _ S
|
S , R , E

A gerundive relative that occurs within a SOT clause does not show the ambiguity between an Event time reading and a Speech time reading that it does in a temporally independent clause. Consider the gerundive relative of (17a), occurring within a temporally independent embedded clause. Here, the event of waiting may occur at the Speech time, with the reading 'John said that the passenger who is now waiting for flight 307 will cry'. The event of waiting may also occur at the embedded Event time, with the reading 'John said that the passenger who will be waiting for flight 307 will cry while he is waiting for the flight'. The tense structure of the Speech time reading is in (17b), where the tense structure of the gerund is linked to the embedded Speech time, which is temporally independent of the matrix clause. The structure of the Event time reading, where the waiting takes place at the time of crying, is in (17c), where the tense structure of the gerund is linked to the embedded Event time. Since in temporally independent clauses, the Speech time is not linked to the matrix tense structure, it receives the utterance time value which the gerund can inherit by linking to this time, deriving the Speech time reading.

(17) (a) John said that the passenger waiting for flight 307 will cry.
(b) E , R _ S
S _ R , E
|
R , E
(c) E , R _ S
S _ R , E
|
R , E

In contrast, a gerundive relative within a SOT clause cannot receive a Speech time reading. In (18a), on the reading where the event of crying is interpreted as occurring at the same time as the event of saying, the waiting cannot be interpreted as occurring at the Speech time: (18a) cannot mean 'John said that (as he was speaking) the passenger who is now waiting for flight 307 was crying'. Instead, the waiting is interpreted as taking place at the time of saying: on its SOT reading, (18a) must mean 'John said that (as he was speaking) the passenger who was waiting at that time for flight 307 was crying'. The relevant tense structure is provided in (18b), where the tense structure of the gerund links to the tense structure of the embedded clause, which is in turn linked to the matrix clause.

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(18) (a) John said that the passenger waiting for flight 307 was crying.
(b) E , R _ S
|
S , R , E
|
R , E

Since the Speech time is linked to the matrix tense structure in a SOT construction, as in (18b), it does not receive the default utterance time value, and therefore a gerundive relative within a SOT clause cannot be interpreted with respect to the utterance time by linking to the Speech time, and hence cannot receive an utterance time reading. This explanation provides evidence that a gerundive relative is interpreted with respect to the Speech time on its utterance time reading; when the Speech time is reoriented to the Event time of the main clause, the gerund is interpreted with respect to this Event time.[6]

This analysis of gerundive relatives within SOT clauses is supported by their contrasting behavior in another type of temporally dependent clause, temporal adjuncts. In contrast to SOT clauses, a gerundive relative within a temporal adjunct clause is ambiguous between an Event time and a Speech time reading: (19) may be interpreted with the waiting occurring at the time of complaining or at the utterance time; it may mean 'John saw Mary before the passenger complained to the flight attendant while he was waiting for the flight' (Event time reading), or it may mean 'John saw Mary before the passenger who is now waiting for flight 307 complained to the flight attendant' (Speech time reading).

(19) John saw Mary before the passenger waiting for flight #307 complained to the flight attendant.

The contrasting behavior of temporal adjunct and SOT constructions is due to the different time linking involved in these constructions. As proposed

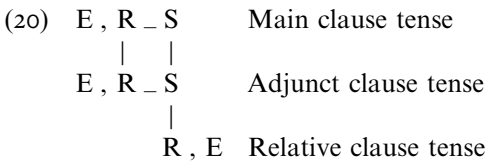
[6] According to an anonymous referee's judgment, it is also possible to interpret the Event time of the gerund in (18a) as linked to the matrix Speech time: 'John told me over the phone that the child crying over there now was at his side at that moment'. There is an additional reading for (18a) with the event of waiting occurring in the past with respect to the saying event: 'John said that the passenger who had been waiting for flight 307 had been crying while waiting for the flight'. This 'past with respect to a past event reading' of the gerundive relative is derived by the gerundive tense structure linking to the Event time of the embedded clause, as in (i). The embedded tense, which is a true past tense, links to the matrix Event time. All of the linkings are local, and both the gerundive and embedded events are interpreted as occurring before the matrix event.

(i) E , R _ S
|
E , R _ S
|
R , E

However, it is my and other native speakers' intuition that the reading with the waiting occurring at the Speech time is not acceptable.

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in Hornstein (1990), temporal adjunct clause constructions involve linking of the adjunct Speech and Reference times to the matrix Speech and Reference times. Thus the derived tense structure of (19) is as in (20).

(20)


Since the Speech time of the adjunct is reoriented to the Speech time of the matrix clause, it still receives a default utterance time interpretation (SOT clauses, on the other hand, reorient the Speech time to the Event time of the matrix clause). Therefore, a gerundive relative within a temporal adjunct clause can link to the adjunct Speech time and receive an utterance time reading.

To summarize this section, although the Speech time is typically interpreted as the deictic utterance time, when it is reoriented to another value, as in historical present and SOT constructions, gerundive relatives are interpreted with respect to this reoriented time, showing that the utterance time reading results from linking to the Speech time.

4. Reduced clause structure of gerundive relatives

As has been discussed in the literature on relative clauses, gerundive relatives seem to have a reduced clause structure when compared to full relatives (see Williams 1975, Stowell 1982).[7] Given the present analysis of tense whereby the Speech time is associated with TP, the Reference time with AspP, and the Event time with VP, since gerundive clauses consist of only a Reference and an Event time, I propose that they are structurally AspP.

4.1 *Missing CP projection*

Gerundive relatives, in contrast to full relatives, do not appear to have a CP projection. This is shown by the fact that they do not permit overt complementizers, while full relative do, as illustrated in the contrast between the full relative in (21a) and the gerundive relative in (21b).

(21) (a) The passengers that were waiting for flight 307 complained to the flight attendant.

[7] Gerundive relatives may appear to have a small clause structure; however, they differ from small clauses in that they do not permit pronouns or names as subjects, as seen in the contrast between (ia) and (ib).

(i) (a) Me/Harry wearing a fedora is a stupid idea.
(b) *I/*me/*Harry wearing a fedora walked into the room.

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(b) *The passengers that waiting for flight 307 complained to the flight attendant.

In addition, as shown in (22a) and (22b), gerundive relatives contrast with full relatives in that they do not permit fronted temporal PPs, although they do permit temporal PPs in final position, as shown in (22c).

(22) (a) The passengers [who at 6:00 were waiting for flight 307] complained to the flight attendant.
(b) *The passengers [at 6:00 waiting for flight 307] complained to the flight attendant.
(c) The passengers [waiting for flight 307 at 6:00] complained to the flight attendant.

Fronted temporal PPs are located in a position above the subject, as is shown by the example in (23).

(23) At 6:00, the passengers were waiting for flight 307.

The unacceptability of gerundive relatives with overt complementizers and fronted PPs is predicted given the claim that gerundive relative clauses are AspPs.

4.2 *Missing inflectional projections*

Gerundive relatives also lack certain inflectional projections, as shown by the fact that they do not occur with sentential adverbs or modal verbs. The data in (24) show that the sentential adverb *probably* is permitted with full relatives but not with gerundive relatives (examples from Williams 1975: 251).

(24) (a) The person who was probably playing the music you heard used to be my roommate.
(b) *The person probably playing the music you heard used to be my roommate.

When *probably* occurs between the subject and VP, it is associated with an inflectional projection, as seen by the fact that it cannot be associated with VP in VP fronting or pseudoclefting, as shown in the examples in (25).

(25) (a) *John said that Mary will probably play the music and probably play the music she will.
(b) *Bill decided not to go to the party. What he did was probably sit around and listen to jazz.

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However, *probably* can occur with the inflectional projection in these constructions, as in (26a, b) (see Chomsky 1965, Dresher 1976 and Travis 1988 for discussion of the syntax of sentential adverbs).[8]

(26) (a) John said that Mary will probably play the music and play the music she probably will.
(b) Bill decided not to go to the party. What he probably did was sit around and listen to jazz.

The data discussed here is explained if the inflectional projection that *probably* is associated with (which is plausibly Modality Phrase) is absent in gerundive relatives, since gerundive relatives are composed of only an AspP.

As shown by the contrast between (27a) and (27b), gerundive relatives, unlike full relatives, do not occur with modal verbs, indicating that gerundive relatives lack the relevant inflectional projection. (As in the examples in (26), this projection is plausibly Modality Phrase.)

(27) (a) The passengers who should/could/may/might be waiting for the flight spoke to the flight attendant.
(b) *The passengers should/could/may/might waiting for the flight spoke to the flight attendant.

In this section, we have seen that gerundive relatives consist of a reduced clause structure; in contrast to full relatives, they do not permit complementizers, fronted PPs, sentential adverbs or modal verbs. This reduced structure is explained by the current analysis of gerundive relatives; since they include only a Reference and Event time, gerundive relatives are syntactically AspPs.[9]

5. Syntax of subject gerundive relatives

5.1 *A restriction on time linking*

Recall that gerundive relatives in subject position are temporally interpreted with respect to the Speech time or the Event time of the matrix clause. These readings are summarized for (28) in (29a, b). Given that the Event and

[8] If we assume, following Huang (1993), that the projection that moves in 'VP-fronting' is a functional projection above VP, then the data in (25) and (26) show that *probably* is adjoined not only above VP but also above this projection.

[9] This line of reasoning is in the spirit of the Minimal Structure Principle of Bošković (1997: 25), provided in (i). Since it is necessary to posit only the structure of AspP for gerundive relatives, we are led to the conclusion that the structure is only AspP (see also Law 1991 for an earlier formulation of the Minimal Structure Principle).

(i) Minimal Structure Principle: Provided that lexical requirements of relevant elements are satisfied, if two representations have the same lexical structure and serve the same function, then the representation that has fewer projections is to be chosen as the syntactic representation serving that function.

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Speech time readings are the result of the linking of different times in tense structure, the syntactic issue is how these readings are represented in the sentence structure.

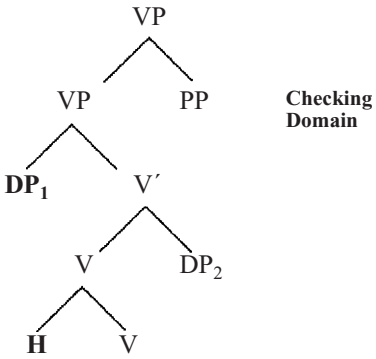
(28) A passenger waiting for flight 307 complained to the flight attendant.

(29) (a) Event time reading – event of gerund (waiting) is interpreted as occurring at time of matrix Event (complaining).
(b) Speech time reading – event of gerund (waiting) is interpreted as occurring at time of Speech.

I propose that the Event time reading requires the gerundive tense to be in a syntactically local relation with the Event time of the main clause, and the Speech time reading requires the gerundive tense to be local with the Speech time of the main clause. This locality requirement is formulated in (30a), the Condition on Time Linking, which states that in order for times to link in tense structure, they must be located in the same checking domain at LF. The definition of checking domain assumed here is illustrated in (30b), where the checking domain of V contains DP_1 and H (Chomsky 1995: 325).[10]

(30) (a) Condition on Time Linking: In order for time α to link to time β, α and β must be within the same checking domain at LF.

(b)



Event and Speech time readings of gerundive relatives thus correlate with the position of the subject at LF. Assuming the VP Internal Subject Hypothesis, the subject is generated within VP (I assume that this position is Spec,VP), and moves from this position to Spec,TP (see Zagona 1982; Kitagawa 1986; Speas 1986; Koopman & Sportiche 1988, 1991). Gerundive relatives interpreted as temporally dependent on the Event time hence involve

[10] The Minimalist framework makes available a definition of syntactic locality which straightforwardly captures the data discussed here. However, the structure of tense has been investigated in pre-Minimalist frameworks, and it may be possible to capture the generalizations discussed here concerning locality effects in these frameworks as well.

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interpretation of the subject within VP at LF, since this is the position of the Event time. On the other hand, gerundive relatives interpreted as temporally dependent on the Speech time involve interpretation of the subject within TP at LF, since this is the position of the Speech time.[11,12]

(31)

Temporal interpretation	LF interpretation site of subject
Event time reading	Spec,VP
Speech time reading	Spec,TP

5.2 *Locality of temporal interpretation*

Initial evidence for the Condition on Time Linking is provided in (32a), with a gerundive relative in subject position of a matrix clause, and (32b), with a gerundive relative in subject position of an embedded clause. The gerunds in (32a, b) can be interpreted with respect to the Speech time or with respect to the Event time of their immediate clause only. The gerund in the matrix clause in (32a) can be interpreted with the waiting occurring at the time of the matrix event of saying but cannot be interpreted as occurring at the time of the embedded event of complaining. Likewise, the gerund in the embedded clause in (32b) can be interpreted with the waiting occurring at the time of the embedded event of complaining, but cannot be interpreted as occurring

[11] Note that a 'Reference time reading', with the event of the gerund interpreted with respect to the Reference time of the main clause, does not seem to be available. In (i), the Reference time (the time by which the getting water event takes place) is made salient; it is 2:00. (i) may be interpreted with the leading event taking place at the time of getting some water (Event time reading), or as taking place at the time of utterance (Speech time reading); however, (i) cannot be interpreted with the leading event taking place at 2:00 (Reference time reading).

(i) The runner leading the race had gotten some water by 2:00.

This is as expected, given that the subject may be interpreted in Spec,VP (Event time reading) or in Spec,TP (Speech time reading).

[12] This analysis of the temporal interpretation of gerundive relatives in subject position may be extended to subject nominals in general. Musan (1995) discusses examples such as (i), where the subject of (ia) is interpreted either as people who were professors in the forties, or as people who are now professors, whereas (ib) allows only the reading where the people were professors in the forties (data from Musan 1995: 75–76).

(i) (a) In the forties, all professors were young.
(b) In the forties, professors were young.

Musan considers but rejects an analysis of this contrast according to which presuppositional subjects, such as in (ia), are interpreted in IP, and are therefore outside the scope of the tense operator, whereas cardinal subjects are interpreted within VP, and are thus within the scope of the tense operator. However, even if we assume that there is a tense operator, it is not clear how being outside the scope of this operator would result in the reading where the description is evaluated relative to the time of utterance. This proposal can be reformulated within the framework adopted here: in (ia), the subject may be interpreted within TP, where it is evaluated with respect to the Speech time, whereas in (ib), the subject may be interpreted in VP, and is therefore evaluated with respect to the Event time. I leave development of this analysis for future work.

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at the time of the matrix event of saying.[13] This is predicted; since a subject with a gerundive relative may be within a checking domain of a time of only its own clause, according to the Condition on Time Linking, it can only be interpreted with respect to one of these times.

(32) (a) The passenger waiting for flight 307 said that Mary will complain to the flight attendant.
(b) Mary said that the passenger waiting for flight 307 will complain to the flight attendant.

To summarize this section, I have proposed that the Event time reading of gerundive relatives in subject position correlates with VP-internal position of the subject at LF, and that the Speech time reading of gerundive relatives correlates with Spec,TP position of the subject.[14]

6. Structural evidence

In this section, I present evidence for the proposed analysis of the syntax of gerundive relatives from constructions involving coordination, existential *there*, the scope of quantificational and cardinality adverbials, extraposition, and presuppositionality effects.[15]

6.1 *Coordination*

Full relatives which are coordinated in subject position may receive independent temporal interpretations. This is illustrated in (33), where the first relative, *who entered the department in 1993*, is interpreted as past with respect to the Speech time (the entering takes place before the Speech time), and the second relative, *who finish their work on time*, is interpreted as past with respect to the time of the event of going to the conference (the finishing takes place before the time of going to the conference, but may be after the Speech time).

(33) Three students [who entered the department in 1993] and [who finish their work on time] will go to the conference next month.

[13] I use the sequence past-future tense here because it forces a temporally independent reading of the embedded clause.

[14] Given this correlation between Spec,TP position and the Speech time, it is plausible that what licenses Nominative Case to the subject is the Speech time, explaining why this Case is not licensed with infinitivals, which lack a Speech time.

[15] In this paper, I focus on the syntax of gerundive relatives in subject position and I do not consider objects. As is well known, objects participate in determining the interpretation of the temporal contour of the event in a way in which subjects do not (see, for example, Verkuyl 1972). Recent research suggests that the contribution of the object to the aspectual structure of the sentence is reflected in its syntactic position. Given the added variable of the influence of the syntax of objects in determining the temporal contour of the sentence, I put them aside here, leaving exploration of this area for future research.

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In contrast to full relatives, when gerundive relatives are coordinated in subject position, they must be evaluated with respect to the same time. In (34), the events of waiting and suffering may be both interpreted as occurring at the Event time, with the reading 'Three passengers called the manager at the time that they were waiting for the next ship and suffering from seasickness'. The waiting and suffering may also be interpreted with respect to the Speech time, with the meaning 'Three passengers who are now waiting for the next ship and who are now suffering from seasickness called the manager'. However, although it is pragmatically plausible, it is not possible to interpret the waiting as occurring at the time of Speech and the suffering as occurring at the time of calling the manager, with the meaning 'Three passengers who are now waiting for the next ship called the manager at the time that they were suffering from seasickness'.

(34) Three passengers waiting for the next ship and suffering from seasickness called the manager.

Since distinct temporal interpretations for coordinated relatives are possible with full relatives, it does not seem to be purely due to a semantic problem that coordinated gerundive relatives cannot be interpreted with respect to different times. This effect is predicted on the current analysis of gerundive relatives; since the subject including the conjoined relatives must be interpreted either in Spec,TP or in Spec,VP, both gerunds must be interpreted either with respect to the Speech time or with respect to the Event time.

6.2 *Existential constructions*

Support for the claim that subject gerundive relatives are interpreted within VP when they relate to the Event time and within TP when they relate to the Speech time comes from existential constructions. Note that (35a) is ambiguous; it can have an Event time reading, where the waiting is interpreted with respect to the time of storming into the room, or it can have a Speech time reading, where the waiting is interpreted with respect to the utterance time. However, the existential construction version of (35a) in (35b) does not permit the Speech time reading; the waiting here is necessarily interpreted with respect to the event of storming into the room.

(35) (a) Three passengers waiting for the flight stormed into the room.
(b) There stormed into the room three passengers waiting for the flight.

I assume, following Diesing (1992), that existential constructions involve interpretation of the associate of the expletive within VP (see also den Dikken 1995 and Groat 1995). Evidence for the VP-internal position of the associate discussed by den Dikken (1995) comes from contrasts in reciprocal

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licensing. In (36a), the subject *some applicants* can bind *each other* in the PP, but binding is not permitted in the existential construction version of (36a) and (36b). Assuming that the reciprocal *each other* must be c-commanded at LF by its antecedent, this contrast shows that whereas the subject of (36a) c-commands the reciprocal, the associate in (36b) does not c-command the reciprocal at LF. This is explained if the associate is interpreted within VP.

(36) (a) Some applicants$_i$ seem to each other$_i$ to be eligible for the job.
(b) *There seem to each other$_i$ to be some applicants$_i$ eligible for the job.

Given that the associate of the expletive is interpreted within VP at LF, the present analysis correctly predicts that only the Event time reading is permitted in the existential construction, since when the subject is located within VP, it is in the checking domain of the Event time.

6.3 *Scope of quantificational adverbs*

Certain quantificational adverbs show a scope ambiguity with respect to the subject. This is illustrated in (37), which may be interpreted with the adverb taking scope over the subject, with the meaning 'It is usually the case that there are some three passengers or other such that they get stranded here,' or may be interpreted with the subject taking wide scope, with the meaning 'There are three particular passengers such that they usually get stranded here' (see Lewis 1975, Kamp 1981, Heim 1982, de Swart 1993 for discussion of quantificational adverbs).

(37) Three passengers usually get stranded here.

This scope ambiguity correlates with Event or Speech time readings of gerundive relatives. When the gerund receives an Event time reading, the subject is interpreted as within the scope of the adverb. On this reading of (38), the meaning is 'There are usually some three passengers or other such that they get stranded here when they are waiting for flight 307'. It is not possible for the subject to take wide scope, meaning 'There are three particular passengers such that they usually get stranded here when they are waiting for flight 307'. However, when the gerund receives a Speech time reading, the subject is interpreted as outside the scope of the adverb; here, the meaning of (38) is 'There are three particular passengers who are waiting for flight 307 such that they usually get stranded here'. The reading with wide scope for the adverb is not possible: 'There are usually some three passengers or other who are now waiting for flight 307 such that they get stranded here'.

(38) Three passengers waiting for flight 307 usually get stranded here.

Given its linear order in the sentence, the quantificational adverb appears to be located between the TP subject position and VP. Therefore, since on the

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present analysis the Event time reading is linked to VP-internal interpretation of the subject, we correctly predict that on this interpretation the subject is within the scope of a quantificational adverb. Conversely, given that the Speech time reading is linked to TP interpretation of the subject, on this interpretation, the subject is outside the scope of the quantificational adverb.[16]

6.4 *Scope of cardinality adverbials*

A similar effect to the one observed with quantificational adverbs is seen with adverbials that specify the cardinality of an event. The example in (39) illustrates the scope ambiguity of subjects and cardinality adverbials: the adverb may take scope over the subject, with the meaning 'There are five events of three passengers complaining', or the subject may take scope over the adverb, with the meaning 'There are three passengers such that they complained five times', with up to fifteen complaining events.

(39) Three passengers complained to the flight attendant five times.

As expected from the previous discussion of quantificational adverbs, the narrow scope reading of the subject correlates with the Event time interpretation, and the wide scope reading correlates with the Speech time interpretation. In (40), on the reading where the waiting takes place at the time of complaining, the meaning is 'There are five events of three passengers complaining to the flight attendant while they were waiting for their flight(s)'. It is not possible to interpret this sentence as meaning 'There are three passengers such that they complained to the flight attendant five times while they were waiting for their flight(s)'. On the interpretation where the waiting takes place at the time of Speech, the reading is 'There are three passengers who are now waiting for their flight(s) such that they complained to the flight attendant five times'. The following interpretation is not possible: 'There are five events of three passengers who are now waiting for their flight(s) complaining to the flight attendant'.

(40) Three passengers waiting for the flight complained to the flight attendant five times.

These facts are analyzed in the same way as the data involving quantificational adverbs; assuming that the cardinality adverbial is located between the TP subject position and VP, since the Event time reading is

[16] I assume here that the quantificational adverb does not raise at LF, an assumption which is in the spirit of current Minimalist non-QR analyses of scope effects (see Kitahara 1992, Hornstein 1994, 1995, Beghelli & Stowell 1994 for discussion). This analysis is, however, as an anonymous *JL* referee has pointed out, inconsistent with such QR-based approaches to quantificational adverbs as Diesing (1992).

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linked to VP-internal subject interpretation, on this reading, the subject falls within the scope of the cardinality adverbial. Since the Speech time reading is linked to TP subject interpretation, on this reading, the subject takes scope over the cardinality adverbial.

6.5 *Extraposition*

Extraposition constructions provide further evidence for the proposal outlined here. Note that (41a), with a gerundive relative and an adjunct PP within the subject, is ambiguous; it permits either an Event time reading for the gerundive relative, where the waiting takes place at the time of entering the room, or a Speech time reading, where the waiting takes place at the time of Speech. However, (41b), the version of (41a) with extraposition of the PP (although slightly marginal) permits only the Event time reading; it can only mean that the waiting takes place at the time of entering the room.[17]

(41) (a) A passenger from California waiting for the announcement entered the room.
(b) ?A passenger waiting for the announcement entered the room from California.

Following Culicover & Rochemont (1990), I assume that elements extraposed from the subject are adjoined to VP. Evidence for this claim comes from VP adverbial constructions. Constituents extraposed from the subject can occur before VP adverbials, such as *as quickly as possible* in (42) (see Travis 1988 for discussion of the VP-adjunction site of manner adverbials). Given that extraposed constituents appear before VP-adjoined material, they must also be adjoined to VP.

(42) Some women came in (who were) from Chicago as quickly as possible.

I assume that in order for a modifier to modify an element, it must be adjoined to this element or to the phrase which contains this element (for discussion of the syntax of modification, see Zubizarreta 1987, Uriagereka 1988, Sportiche 1988). Therefore, assuming that extraposed elements are VP-adjoined, a subject that has been extraposed from may be interpreted in Spec,VP; the extraposed PP is adjoined to the phrase (VP) which contains the subject, and hence modification is permitted. However, interpreting a subject from which an element has been extraposed within Spec,TP is barred,

[17] As exemplified in (i), although extraposition of full relatives is possible, extraposition of gerundive relatives is not. This is discussed in section 8 below.

(i) (a) A passenger waiting for the announcement entered the room.
(b) *A passenger entered the room waiting for the announcement.

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since the extraposed PP is not adjoined to the subject in Spec,TP or to the phrase (TP) that contains the subject, and hence modification is not licensed.[18]

The absence of the Speech time reading with extraposition from a subject with a gerundive relative is thus explained on the present account; since extraposition allows only the VP-internal interpretation of the subject, only the Event time reading is permitted with this construction.[19]

6.6 *Presuppositionality effects*

The interpretation of the subject as presuppositional or cardinal influences the temporal interpretation of a gerundive relative. Cardinal subjects result in the Event time reading only; in (43a, b), the event of waiting is interpreted as occurring relative to the time of complaining, not relative to the time of Speech. For example, (43a) may mean 'Few passengers who were waiting for flight 307 complained to the flight attendant at the time that they were waiting', but may not mean 'Few passengers who are now waiting for flight 307 complained to the flight attendant'. This is predicted by the current analysis, if we assume, following Diesing (1989, 1992), that cardinal DPs are interpreted within VP at LF, and are therefore within the checking domain of the Event time.[20]

(43) (a) Few passengers waiting for flight 307 complained to the flight attendant.
(b) Passengers waiting for flight 307 complained to the flight attendant.

[18] An anonymous *JL* referee notes that this analysis, in combination with Diesing's (1992) claim that the subject of Individual-level predicates is located in IP at LF, predicts that extraction is barred from Individual-level predicate subjects. In fact, Diesing shows that *wh*-extraction from the subject of Individual-level predicates is prohibited, using data from German 'was-für' split and split-topic constructions (Diesing 1992: 39–41). See footnote 21 for discussion of the relationship between the present proposal and analyses of the Stage-level/Individual-level contrast.

[19] If it were possible for the extraposed PP to reconstruct to subject position, a reading where the subject is located in Spec,TP should be possible; however, as discussed in section 8 below, extraposition does not permit reconstruction.

[20] An anonymous *JL* referee questions whether (43b) is an appropriate example, since, according to Diesing (1992), a bare plural subject may actually have multiple interpretations, depending on the interpretation of the predicate. Diesing argues that the 'generic' reading of a bare plural subject, as in (ia), is linked to interpretation of the subject within IP at LF, whereas the 'existential' reading of a bare plural subject, as in (ib), is linked to interpretation of the subject in VP at LF (examples are Diesing's (2a, b) (1992: 16)).

(i) (a) Brussels sprouts are unsuitable for eating. (Generic reading)
(b) Carpenter ants destroyed my viola da gamba. (Existential reading)

However, the example in (43b) permits only the existential reading of the bare plural subject, and is therefore appropriately characterized as involving interpretation of the subject within VP at LF.

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In contrast to cardinal subjects, presuppositional subjects permit both Event and Speech time readings, as shown by the examples in (44); (44a) may mean 'Every passenger who was waiting for flight 307 complained to the flight attendant at the time that they were waiting', or it may mean 'Every passenger who is now waiting for flight 307 complained to the flight attendant'.

(44) (a) Every passenger waiting for flight 307 complained to the flight attendant.
(b) Each passenger waiting for flight 307 complained to the flight attendant.
(c) All passengers waiting for flight 307 complained to the flight attendant.
(d) Most of the passengers waiting for flight 307 complained to the flight attendant.
(e) Some of the passengers waiting for flight 307 complained to the flight attendant.
(f) All of the passengers waiting for flight 307 complained to the flight attendant.

Given that analyses of presuppositionality claim that cardinal DPs are within VP at LF, and presuppositional DPs outside VP at LF, the fact that presuppositional subjects are temporally ambiguous seems to be a puzzle. However, de Hoop's (1996) analysis of presuppositionality may explain this issue. de Hoop shows that in languages such as Dutch with overt scrambling of presuppositional DPs, scrambling is optional; although only presuppositional DPs may scramble, they also may remain inside VP. Carrying this view of scrambling over to English, which shows presuppositionality effects at LF, the movement of presuppositional DPs can be seen as optional, accounting for the data discussed in this section.[21]

To summarize this section, I have presented data involving coordination, existential *there* constructions, the scope of quantificational adverbs and cardinality adverbials, extraposition, and presuppositionality effects as evidence for the proposal that a subject with an Event time reading of a gerundive relative is interpreted within VP, whereas a subject with a Speech time reading is interpreted within TP.

[21] Kratzer (1989) claims that the subjects of Stage-level predicates are associated with Spec,VP, while the subjects of Individual-level predicates are associated with Spec,IP. We may thus consider whether this correlates with the Event and Speech time readings discussed here. However, only Stage-level predicates are ambiguous between Event and Speech time readings, as shown in (i). Since Individual-level predicates denote permanent properties and are interpreted as holding throughout the past and present, a Speech time reading cannot be distinguished.

(i) Three passengers waiting for the flight were Scandinavian.

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7. Reconstruction effects and gerundive relatives

It has been noted in the literature that relative clauses contrast with complement clauses in that they do not show binding-theoretic reconstruction effects with *wh*-movement (see van Riemsdijk & Williams 1981, Freidin 1986, Lebeaux 1988 for discussion). In (45a), with the complement clause *that John was asleep*, the *wh*-phrase *which claim that John was asleep* behaves as if it is located in its pre-movement position; *he* cannot be coreferent with *John*. However, in (45b), with the relative clause *that John made*, *which claim that John made* behaves as if it is outside the c-command domain of the subject; *he* can corefer with *John*.

(45) (a) *Which claim that John$_i$ was asleep did he$_i$ say was false?
(b) Which claim that John$_i$ made did he$_i$ say was false?

Gerundive relatives, unlike full relatives, do not seem to circumvent reconstruction effects. This is illustrated in the contrast between (46a), with a full relative, and (46b), with a gerundive relative; in (46a), *Chomsky* and *he* can corefer, but in (46b), coreference is not permitted. The gerundive relative, unlike the full relative, behaves as if it reconstructs.

(46) (a) Which student who was reading Chomsky's$_i$ book did he$_i$ say was smart?
(b) *Which student reading Chomsky's$_i$ book did he$_i$ say was smart?

The analysis of gerundive relatives presented here, in combination with Lebeaux's (1988) proposal for the anti-reconstruction effect of relative clauses, makes possible an explanation of this contrast between full and gerundive relatives. Lebeaux (1988) argues that the relative clause of (45b), unlike the complement clause of (45a), is not present before *wh*-movement takes place, but is adjoined to the *wh*-phrase by generalized transformation after the *wh*-phrase moves to Spec,CP. Since the relative clause is never in object position, it cannot reconstruct to object position.[22]

I claim that although full relatives can be adjoined by generalized transformation after *wh*-movement has taken place, this option is not available for gerundive relatives because they are temporally dependent on the main clause. If a gerundive relative were to adjoin to the *wh*-phrase after the *wh*-phrase moves to Spec,CP, it would not be within the checking domain of a time of the main clause, since the times are located in TP and VP. Hence the gerund would not receive a temporal interpretation. Therefore, gerundive

[22] Note that Lebeaux's proposal is incompatible with the raising analysis of relative clauses, whereby relatives are formed by movement of the head out of the relative clause into head position; if the head itself raised from within the relative, then the relative clause could not be adjoined by generalized transformation to the head after the head moves in *wh*-movement (see Vergnaud 1974, Kayne 1994, Borsley 1997, Safir 1999 for discussion of the raising analysis of relatives).

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relatives must be present before movement takes place in order to be interpreted relative to a matrix time, and thus they show reconstruction effects.

8. Extraposition of gerundive relatives

Williams (1975) notes that gerundive relatives, unlike full relatives, do not undergo extraposition, as shown in the contrast between (47a) and (47b). ((47b) is unacceptable on the relative clause reading of *wearing a fedora*.)

(47) (a) A man said hello to me who was wearing a fedora.
(b) *A man said hello to me wearing a fedora.

This contrast is predicted by the present analysis of gerundive relatives. We have seen that gerundive relatives are interpreted with respect to the Speech or Event time of the matrix clause by being located within the checking domain of TP or VP at LF. An extraposed relative, since it is adjoined, is not within the checking domain of any time.[23] Hence an extraposed gerundive relative cannot be temporally interpreted.

Note that if an extraposed gerundive relative were allowed to reconstruct, it should be able to be interpreted with respect to the time that the subject is within the checking domain of. However, it seems that extraposition does not permit reconstruction, as shown in the binding data in (48), from Guéron (1980: 650). Coreference is possible between *Mary* and *her* in (48a), but not in (48b), with extraposition, showing that reconstruction in order to avoid a Binding Condition C violation is not possible with extraposition.

(48) (a) A picture of Mary_i was sent to her_i.
(b) *A picture was sent to her_i of Mary_i.

The same effect is seen with extraposed relative clauses as with PPs, as seen in the contrast between (49a) and (49b).[24]

---

[23] Note that this analysis provides evidence for Chomsky's (1995: 325) definition of checking domain, which excludes adjuncts (see section 5.1), as opposed to Chomsky's (1995: 178) earlier formulation, which includes adjuncts.

[24] Reduced relatives with the *-ed* form of the verb are also impossible in extraposed position, as seen in (i) ((ib) is unacceptable on the intended interpretation, where *arrested in London* modifies *three men*).

(i) (a) Three men arrested in London shot a police officer.
(b) *Three men shot a police officer arrested in London.

I follow Hudson's (1973) analysis of these constructions whereby they involve a covert perfect tense, and therefore the tense structure of the relative clause is E _ R. The two meanings of (ia) are thus derived in the same way that the meanings for gerundive relatives are derived; the reading where the relative event of arresting takes place before the matrix event of shooting is represented by the tense structure in (iia), where the Reference time of the relative clause links to the Event time of the main clause. The reading of (ia) where the event of arresting takes place after the time of shooting is represented by the tense structure

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(49) (a) A picture that Rembrandt$_i$ painted was sent to him$_i$.
(b) *A picture was sent to him$_i$ that Rembrandt$_i$ painted.

9. Conclusion

In this paper, I have shown that the LF syntax of subjects provides evidence for the structure of tense proposed here. Gerundive relatives in subject position are temporally dependent on the matrix Event or Speech time, and the Event time is represented in VP. Assuming the proposal that temporal dependence requires times to be in the same checking domain, a subject gerundive relative with an Event time reading is interpreted within VP. Since the Speech time is associated with TP, when the gerundive relative receives a Speech time reading, the subject is interpreted in Spec,TP.

Constructions involving coordination, existential *there*, scope of quantificational and cardinality adverbials, extraposition, and presuppositionality effects show that when the subject is located in Spec,VP, only the Event time reading is available, whereas when the subject is located in Spec,TP, only the Speech time reading is available.

This analysis also explains why, unlike full relatives, gerundive relatives do not circumvent reconstruction effects with *wh*-movement. Full relatives avoid reconstruction effects by adjoining directly to the *wh*-element in Spec,CP, but this adjunction is not permitted with gerundive relatives, since in Spec,CP, they are not in a local relation with either the Speech or Event time, and hence cannot receive a temporal interpretation. The fact that gerundive relatives, in contrast to full relatives, do not undergo extraposition is also accounted for. An extraposed relative is not within the checking domain of a matrix time and hence a gerundive relative in this position cannot be temporally interpreted.

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in (iib), where the Reference time of the relative tense links to the Speech time of the main clause.

(ii) (a) E , R _ S
|
E _ R

(b) E , R _ S
|
E _ R

The analysis of gerundive relatives in extraposed position thus carries over to *-ed* relatives.

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Author's address: Linguistic Program,
DM-466C,
Florida International University,
Miami, FL 33199,
U.S.A.
E-mail: ellenthomps@worldnet.att.net

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