Tense, Reference Time, and Language Impairment in German Children

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1. Introduction

There is wide agreement in the field of language development that, without explicit training or didactically structured input, children usually acquire their mother tongue rapidly and with few wrong turns. It is thus rather surprising that a fairly large group of children faces serious difficulties in learning the grammar of their ambient language although they seem to fulfill all the prerequisites for language acquisition: they have a non-verbal IQ of 85 or more in standard tests of intelligence and show auditory, neuromotoric, and social abilities in the normal range. Typically, these language-impaired children fail to fully acquire the formal aspects of the target language. At early school age they often display grammatical structures usually observed in normally-developing children around 2;0–2;6 years of age. In order to capture the discrepancy in language development and cognitive development, this problem has been termed Specific Language Impairment (SLI). Though there is considerable debate on the issue of concomitant impairments in some cognitive areas other than language (see Leonard 1998, specifically chapter 5), the undeniable fact of a large gap between the language abilities and other cognitive skills of children with SLI argues strongly for the modularity of the mind.[1] Moreover, the investigation of specific grammatical problems of language impaired children can give insights into the modular organization of the language module itself. This paper explores a specific deficit of these language impaired children, namely the interpretation of reference time as part of the interface between syntax and discourse semantics.

Though language impairment is heterogeneous in its phenomena, several proposals have been made recently to account for the typical deficits observed in children with SLI. Theories for English SLI have to explain a marked weakness with respect to the

[1] The authors themselves do not quite agree on this issue. Whereas Katrin Lindner always points out that SLI children often have difficulties with some Piagetian or certain narrative tasks, Cornelia Hamann likes to base her arguments on the classical SLI definition and the fact that even if SLI children perform worse than age matches in some cognitive tasks, they are generally better than language matches – and in the context of the argument about discourse anchorage it would be language matches that count.

use of past tense morphology, the overuse of infinitives or stem forms, and the omission of articles, among other phenomena (see Leonard 1998: chapter 3). Other languages show different phenomena: In French and Italian, frequent omission of object clitics has been observed, while in German there is missing agreement (Clahsen 1988) and the frequent occurrence of finite verbs in sentence final position (Hamann, Penner & Lindner 1998). On the one hand, we find accounts which appeal to a Reduced Processing Capacity, specific or general, as in the auditory processing deficit (argued for in work by Tallal and her co-authors) or as formulated in the Low Phonetic Substance Hypothesis (Leonard 1989 and related work). On the other hand, we have accounts which assume a deficit in grammatical knowledge. Among these are the Feature Blindness Hypothesis (proposed in Gopnik 1990), the Missing Agreement Hypothesis (see Clahsen 1988 and related work), the Extended Optional Infinitives Hypothesis (first proposed by Rice & Wexler 1995), the Representation Deficit for Dependent Relationships (van der Lely 1998), and the Minimal Default Grammar (as proposed by Hamann, Penner & Lindner 1998 for German impaired children).

The accounts assuming missing agreement or an extended phase of optional infinitives, and originally also the account working with a Minimal Default Grammar assume a parallel but delayed and slow development of impaired children when compared with normally developing children. Models that have been proposed for normal development at an earlier age have therefore been transferred to language impairment. Such a general assumption of parallelism has recently been challenged, first in the area of syntax by results on the use of constituent questions as presented in Hamann, Penner & Lindner (1998), and consequently also in the areas of prosody and event semantics as shown by Penner, Wymann & Schulz (1999). Without further discussing this important issue, we want to stress that the particular difficulties seem to occur in areas where two language modules have to interact in order to allow a full specification of both sides. This seems to be true for the interface of prosody and syntax, of syntax and event semantics, and of syntax and discourse semantics/pragmatics.

As to the interface of syntax and discourse, the difficulty of children with SLI can be described in general terms as a difficulty in anchoring utterances in discourse, and there seems to be a similar difficulty for normally developing children up to their third birthday. It has been repeatedly observed that in their third year, children omit subjects, use the past tense only sporadically, often use stem forms or infinitives, and do not use pronouns in a discourse consistent way. In their analysis of these phenomena in the data of two normally developing Danish children, Hamann & Plunkett (1998:58) show that subject omission and the use of third person pronouns is in no way dependent on previous mention in the discourse up to approximately the third birthday. If it is for reasons of some cognitive development that discourse anchorage becomes obligatory in normals only around the age of three years, then we might expect not to find any such effects in children with SLI of five years or more – given that their cognitive skills (even if not quite on the same level for all tasks) are more like those of age matches than those of language matches (see Leonard 1998: chapter 5). If, however, they do show such difficulties, then it seems more likely that the problems are located in the language module, more specifically in the syntactic component. Here we want to

argue that the syntactic production of German children with SLI points to a deficit in the Complementizer Phrase (CP), and that this "weakness" of the CP can also explain their difficulties with discourse anchorage, especially their bad performance with respect to the interpretation of complex tenses. Specific assumptions about the syntax of tense are necessary, however, in order to arrive at this conclusion, so we will discuss some of these assumptions in more detail.

In the following, the paper will take a look at the CP as the syntactic side of the interface between syntax and discourse in section 2, and present the results on the "weakness" of CP in the spontaneous speech of 50 German children with SLI in section 3. Section 4 will then introduce a tense model and motivate the experiment on discourse anchorage of tense presented in section 5. Section 6 provides a discussion and conclusion.

2. The Syntax-Discourse Interface

2.1 The Task of the Interface

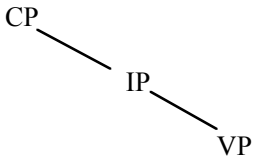
For an utterance to continue a coherent discourse in a coherent way, several conditions must be met. To mention only a few: First, usually modality is coded. This means that the utterance is marked as a question, an assertion, an order or a request. Second, "old" or "new" information must be properly marked. In particular, it must be guaranteed that a constituent is syntactically or prosodically marked as belonging to the topic or the focus of the utterance. Such marking necessarily depends on the given discourse. Third, anaphors must be properly anchored in discourse. Intuitively, we can say that an anaphoric relation must be established to a familiar element, salient in the discourse. Recent research distinguishes the degree of familiarity of an element from its accessibility. Familiarity of an element is graded as to whether it is contextually or situationally given or provided through knowledge of the world (Prince 1981). Closeness of antecedent and anaphor and status as a topic strongly influence accessibility (Ariel 1990).

Discourse also plays an important role in the choice between readings. It has even been argued that the intended reading can trigger the choice of certain syntactic operators (see Reinhart 1995 and Büring 1997). In the Chomskyan brand of generative syntax, syntax must guarantee the coding of discourse relevant factors so that the syntactic structure of an utterance determines its use in discourse. Other approaches to the interplay of syntax and discourse (see Reinhart 1995) assign the task of making syntax and discourse compatible to so-called interface strategies.

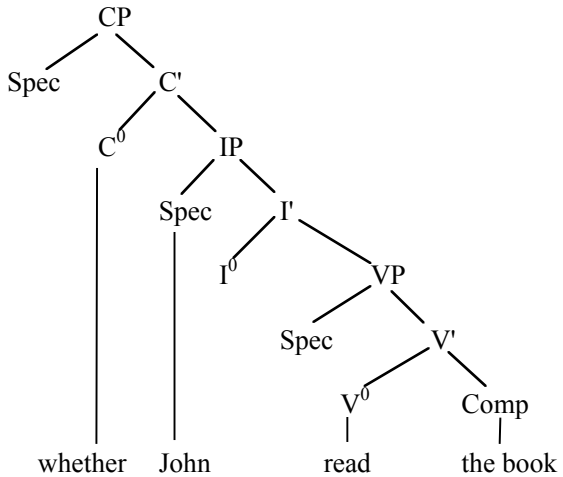
2.2 The Complementizer Phrase as the Syntactic Part of the Interface

Though there is some debate on the role of such interface strategies, there is no question about the relevance of syntax for the coding of an utterance as a question, the marking of contrastive focus (in the absence of prosodic marking), and the assignment of topic status. It is striking that in many languages such marking is effected by placing the relevant constituent into the so-called pre-field of the sentence. In recent work on generative syntax it is therefore assumed that, in parallel to question-operators, there are topic- and focus-operators that are placed in the pre-field in order to mark the rest of the sentence as their scope (see Rizzi 1997, Haegeman 1999). This pre-field is called the Complementizer Phrase (CP) in generative syntax and forms the highest layer or shell of structure in a sentence. The lowest shell is the Verb Phrase (VP), where lexical-thematic material is located, the next shell is the Inflectional Phrase (IP), where syntactic-morphological material is found, followed by the CP, where the question word or the conjunction introducing the embedded clause, the so-called complementizer, can be inserted. In a complex phrase, the matrix verb selects the type of complement and also the complementizer, which in turn selects a finite (*that*) or non-finite (*for*) complement. Parallel to selection of a complement by the matrix verb, it is assumed that it is the discourse which selects the type of CP in a matrix clause. We arrive at the sketch presented in (1) and example (2).

(1) Matrix Clause / Discourse



(2) I don't know / I know

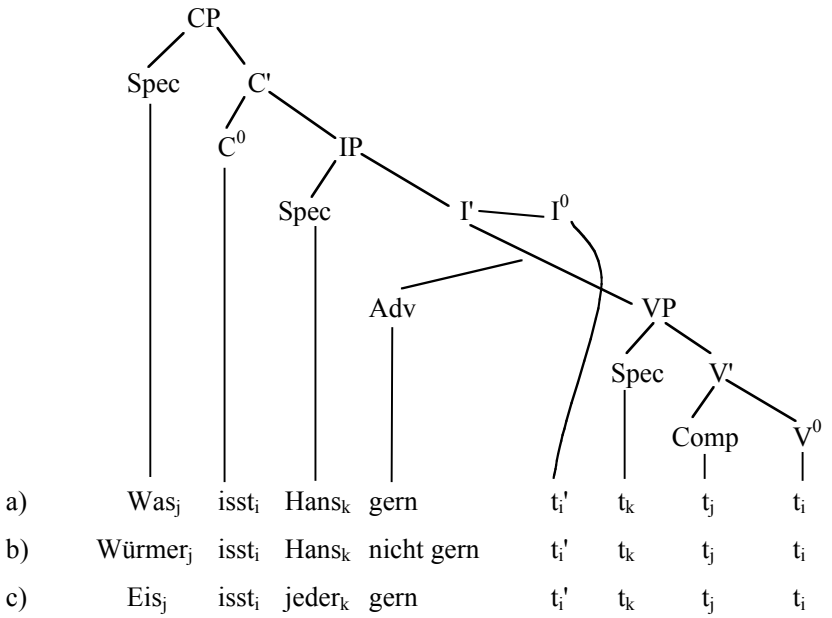


a) whether John read the book

b) that John read the book

If one participant in a discourse utters the statement "John likes ice cream", there can be an acoustic difficulty so that the second participant has to ask a question (3a). If both participants are in a game of likes and dislikes, the discourse can be continued with a statement containing contrastive focus as in (3b) or, if they are discussing the merits of ice cream, it can be continued with "ice cream" in topic position as in (3c). Let us turn to a language which consistently fronts topics like German, then we can transfer the tree from (2) in such a way as to incorporate the fact that German is traditionally analyzed as head-final in the IP- and VP-shell. Also indicating movement of the verb, the subject and the complement in the tree, we get (3a–c).

(3) Hans isst gern Eis (continued with a question, focalization, or topicalization)



The tree in example (3) assumes the head-final property of German in the IP and VP, the coding of movement by traces, and also a generalized V2 analysis for adult German. This implies that the verb moves from its base position in the VP to the second position in the clause, i.e., to C^0, in every main clause. The assumption of generalized V2 will be discussed in more detail in the section on the clause structure of German impaired grammar. Example (3) only assumes one position in the CP. There are good arguments for a Split CP, however, as first proposed in Müller & Sternefeld (1993) for German and recently in an even more elaborate system in Rizzi (1997). Rizzi argues that the CP serves as an interface between the propositional content (coded in the IP) and the superordinate structure (matrix-clause or discourse). He suggests two projections which guarantee discourse-connection and IP-connection respectively, the ForceP

and the FinP. In-between these two projections, he locates projections for topic (two of these) and unique focus, which are ordered as shown in (4).

(4) Force P > TopP > FocP > TopP > FinP

2.3 Discourse, CP, and German Children with SLI

The corpus study presented in section 3 indicates that German children with SLI do not master generalized V2. They hardly ever produce target consistent constituent questions or focus an object by fronting it. These same children frequently produce utterances with the finite verb in final position in main clauses (I^0), place negation and *auch* correctly, but do not consistently produce correct subordinate clauses. The latter phenomena point to the fact that processes concerning the IP, the middle-field, are mastered by these children, whereas it is the pre-field, the CP, which is especially problematic. We will use the locution "CP-trouble" to highlight these particular difficulties of German language impaired children.

In so far as they are mediated by the CP, we expect that discourse processes will also be affected. An experiment on the comprehension of the actual sequence of events coded by complex tenses shows that such comprehension, i.e., the anchoring of tense to events or points of time given in the discourse, is especially difficult for children who also show the above described syntactic difficulties with the CP. With the background of the "normal" non-verbal IQ of these same children and the fact that their knowledge of the world is in the same range as that of their age matches, we can conclude that anaphoric anchoring has a syntactic side in the CP shell, mediated probably by the topic position. This conclusion has consequences for the analysis of tense as it indicates that we need to formally link tense arguments to the topic position in order to mark their anaphoric status.

3. Clause Structure in German Language Impaired Children: The Data

3.1 Subjects, Features, and Methods of Evaluation

In this section we present data from 50 German speaking children with a grammatical language impairment. The data are taken from different corpora. Note that the children speak different varieties of German, including northern varieties of spoken High German, as well as Munich German and Swiss German. As some of the children also began therapy when they were first seen by the investigators, only the first recording of

each child has been used for the analysis. See Hamann, Penner & Lindner (1998) for more detail, also on the corpora.

Corpus Clahsen & the Clahsen SLI-Childes data	13 children
Corpus Hansen	4 children
Corpus Haffner	1 child
Corpus Lindner	12 children
Corpus Penner 1	10 children
Corpus Penner 2	10 children

In order to distinguish verb-end from other verb placement patterns, it is usually necessary to consider only utterances with at least three constituents. In these, verb-end (VE) position is often unequivocally documented as in (5a), (5b), (5c) and (5d), where we find modal verbs, a copula and a main verb in final position. Note that in German, modal verbs are syntactically like main verbs.

(5) a. eine streichholz hier rein soll
a match here into shall/must (Denis, Hansen)

b. haare nass wird
hair wet becomes (Julia, Clahsen)

c. bei mir federmäppchen weg war
at me pencil-satchel gone was
(my satchel was gone) (Daniel, Haffner)

d. jetzt grosser drache kommt
now big dragon comes (Daniel, Haffner)

There is a type of two-constituent utterance, however, which is standardly taken to be indicative of verb-end position in German. This is an utterance where there is no particle separation in a finite particle-verb combination; see (6a). It has a structure which in the target language is only found in subordinate clauses, i.e., in a structure where the verb is clearly in the IP, in left-most position; see (6c,d) and (3). The same holds for (6b), where *und* 'and' is a conjunction and not part of the clause, yet the rest of the utterance has the word order of a subordinate clause and so the verb clearly is in IP position. Such utterances are therefore counted with the verb-end clauses, though it would be more accurate to speak of unambiguous IP-structures.

(6) a. alles umfällt
everything over-falls (Michaela, Clahsen)

b. und das hinpaßt
and that in-fits (Julia, Clahsen)

c. alles fällt um
everything falls over target mainclause

d. ...dass alles umfällt
...that everything over-falls target embedded clause

The term "target inconsistent subordination" primarily refers to clauses which show complementizerless subordination as in (7a,b). If the finite verb or the subject is missing or if there is an infinitive in the embedded clause, the utterance was equally counted as a target inconsistent embedded clause; see Hamann, Penner & Lindner (1998) for more examples.

(7) a. gehört hab-i der Zwackelmann gut zaubern kann (Daniel, Haffner)
heard have-I (that) the Zwackelmann well do-magic can

b. feds i nis atehe tieche heiße
weiß ich nicht (wie die) anderen Tiere heißen (Jonas, Clahsen)
know I not (how) other animals named

Target inconsistent Wh-questions are such that the w-pronoun is missing altogether as in (8a), or that there is only a reduced w-particle, that there is a null subject, an infinitive or verb-end order in a clearly non-echo question (8b), or that the verb is simply missing in an otherwise clause-like construction (8c).

(8) a. das is? (Wolfgang, Clahsen)
that is

b. wo das brennt? (Sebastian, Hansen)
where that burns

c. warum hier kein wasser? (Sebastian, Hansen)
why here no water

As to the count on correct use of V2, the decision was to consider only constructions where the verb is undoubtedly in a pre-field position. There is considerable debate on this point in recent literature. On the one hand, it is argued that all V2-clauses involve the CP (Schwartz & Vikner 1996). On the other hand, there are arguments that, parallel to French and English, subject initial and adverb initial clauses involve only the IP, and that movement to CP has to be triggered semantically by marking a constituent as focalized or questioned (von Stechow & Sternefeld 1986, Reis & Rosengren 1992, Travis 1991, Zwart 1997). Moreover, it has been proposed for German that in a first phase children do not have a CP but an English-like IP with a head-first structure (Fritzenschaft et al. 1990, Clahsen 1991). It follows that only correct constituent questions and O-V-S-X declaratives can be taken as unambiguously showing the projection of a full CP shell. Thus, declaratives with a subject in first position (9a) or an adverb in first

position (9b), though V2 on the surface, were not counted as "genuine V2", as it cannot be decided whether they really involve the CP.

(9) a. eine walfisch schwimmt (Denis, Hansen)
a whale swims

b. hier bin ich (Denis, Hansen)
here am I

c. bei Frau F. sin mer jetzt (Daniel, Haffner)
at Mrs. F. are we now

Because of the possibility that the adverb in (9c) bears focus, adverb initial clauses were counted separately. Hamann, Penner & Lindner (1998) show that the occurrence of V2 remains low, even if adverb initial clauses are included in the count for genuine V2.

There is another persistent problem with regard to the status of the property "genuine V2". It is a well-known phenomenon in German developmental language impairment that the children often fail to attach clitic subject pronouns at the level of the prosodic word (cf. Penner et al. 1992). Instead, they incorporate the unstressed pronoun into the prosodic word, treating the clitic as a (parasitic) agreement marker. In many cases, the output of this prosodic misanalysis is so-called clitic doubling as in (10b). Given these considerations, examples (10a) (and probably also (9b)) are ambiguous between genuine V2 and verb-end structures. Therefore these structures (which do not occur very frequently and so do not change the results in any important way) were counted neither as genuine V2 nor as verb-end, but were excluded as ambiguous.

(10) a. das kennich (Sven, Clahsen)
that know-I

b. ich nimmich den (Sven, Clahsen)
I take-I that

3.2 The Data on Verb Placement and the CP Shell

Following these guidelines for analysis, Table 1 gives an overview of the phenomena which show directly that the CP, even if available, is not used in a target consistent way by German children with SLI. Note that the data are rather uniform although they are taken from different regional varieties of German (High German, Munich German, Swiss German). For a statistical analysis regarding group homogeneity and for the raw data, we refer the reader to Hamann, Penner & Lindner (1998).

The percentage of finite verb-end clauses (of all finite declarative main clauses) in the total of these 6 corpora is 44%. This clearly shows that verb-end position is a major characteristic of developmental language impairment in High German as well as in the

southern varieties of German (Munich German and Swiss German). The relatively low average found for the SLI children discussed by Clahsen (1988) is probably due to the fact that some of these children have morphological problems with gender or case agreement but do not show impaired clause structure.[2]

Table 1: Overview of target inconsistent Wh, target inconsistent embedded clauses, unambiguous VE, genuine V2, infinitives and finite verbs in declarative main clauses in different German and Swiss German Corpora

corpus	% target inconsist. WH	% target inconsist. embedded clauses	% unambig. VE	% genuine V2	% (unamb.) infinitives in decl. main cl.	% (unamb.) finite verbs in decl. main cl.
Clahsen	59	57	27	7	25	61
Haffner	29	80	57	9	11	82
Hansen	80	100	51	1	30	58
Lindner	76	73	36	1	39	54
Penner 1	95	97	58	2	49	52
Penner 2	82	81	53	3	37	60
total	76	81	44	3	36	57

The overall percentage of target inconsistent constituent questions (of all constituent questions) is 76%, and subordinate clauses in which the CP shell is not realized display the frequency of 81% (of all subordinate clauses). Note that the number of genuine V2 structures in the data is extremely low, namely about 3% (of all finite declarative main clauses). Both target consistent and target inconsistent unambiguous root infinitives occur in 36% and unambiguously finite verbs in 57% of all declarative verbal utterances.

Summarizing the results from all 50 children, we obtain the following picture. Target inconsistent constituent questions, target inconsistent subordination, and verb-end declaratives in main clauses are clearly the most salient features and should be considered as the most reliable diagnostics of language impairment in German (cf. Penner 1994b and Penner & Kölliker Funk 1998). The affected children display an asymmetry between an incomplete CP shell and a basically intact IP projection. There is no evidence that the impaired children have genuine V2.

[2] Our consistent finding across High German and German dialect corpora seems to contradict the study of the original Grimm corpora conducted by Rice, Ruff-Noll & Grimm (1997). These authors find finite verbs in the majority of cases in V2-position. We attribute the different results to different counting methods, especially to the exclusion of modals from the count by Rice, Ruff-Noll & Grimm (1997) and our exclusion of subject-initial utterances as ambiguous.

3.3 The Hypothesis

As a working hypothesis we assume that the IP positions are basically available to the child, and that "underspecified" COMP can best account for the cluster of phenomena listed in table 1. This has been suggested by Penner (1994a,b) and, in a slightly different form, by Hyams (1996). If the formal features of the CP are not fully instantiated and this leads to a yet unlabeled node in the sense that the properties of this projection are not fully understood by the child, then this general problem with the CP node will affect other features usually associated with the CP shell. These are especially discourse linking features. Such features concern 0-subjects, pronouns, definite DPs, focalization and especially tense.

We will now investigate the use and interpretation of tense in children with language impairment. So our next task is to introduce a suitable syntax and semantics of tense which can make precise the problem with the anchorage of tense. Following the argumentation laid out in section 2, this will involve a link to CP (see Enç 1987, Guéron & Hoekstra 1995), as opposed to in semantically oriented approaches where discourse semantics itself provides anchorage (Heim 1982, 1994, Kamp & Reyle 1993).

4. On the Semantics of Tense

4.1 Motivation

In recent treatments of tense it is fairly uncontroversial that tenses not only place the event time in relation to the speech time, but that reference time is needed to mediate this relation. Partee (1973, 1984) was the first to compare tenses to anaphoric pronouns because, in the absence of temporal adverbs, this reference time has to be identified in discourse. See also Hinrichs's (1986:80) formulation: "In their anaphoric use, tense morphemes refer to a reference point independently provided by the discourse." The idea that tenses are like pronouns has recently been developed in more detail by Stowell (1993) and Guéron & Hoekstra (1995). In these treatments some tenses come out as counterindexed with the tense operator so that we get a sort of polarity item approach to tense. This approach may lead to an elegant syntactic system, but it is rather hard to arrive at a model theoretic implementation as von Stechow (1995) points out. We will therefore use a semantics as suggested in von Stechow (1994, 1995), especially as it lends itself to a straightforward syntactic representation.

4.2 The Formal Semantics of Tense

Though there still is a debate between relational and referential analyses of tense, we assume three tense arguments: event time (ET), speech time (ST), and reference time (RT). This is in agreement with most authors' treatment of tense (see especially Reichenbach 1947, Enç 1987, Hamann 1987, Guéron & Hoekstra 1995, Stowell 1993, Klein 1994, von Stechow 1994). Note especially the term "topic time" employed by Klein (1994) in the place of the old term "reference time". Klein's terminology ties in nicely with the proposal we will make as to the anchoring of tenses in discourse.

Following Abusch (1993), Stowell (1993), Heim (1994), Zeller (1994), and von Stechow (1994), we distinguish morphological and semantic tense: morphological tenses are T-heads, where semantic tenses are arguments and occur in specifier positions. In earlier work on tense, Hamann (1987, 1989) assumed that the temporal relations expressed by the tenses make a direct contribution to the truth conditions, which leads to some problems if one considers the conditions under which tensed sentences can come out as false. If temporal relations are treated as presuppositions as Heim (1994) and von Stechow (1994) suggest, these problems vanish.

So we want to say that *John left* is true in a world w_0 at a time t_0 if *John leave* is true at the reference time of this utterance, t_2, and it is presupposed about t_2 that $t_2 < t_0$ (where t_0 is the designated time, normally the speech time). We write this as (11), which shows the surface form, the Logical Form and the interpretation. For the interpretation we need the definitions (12a) and (12b) for the past and the present tense, where "o" signifies overlap of the intervals and "<" signifies precedence.

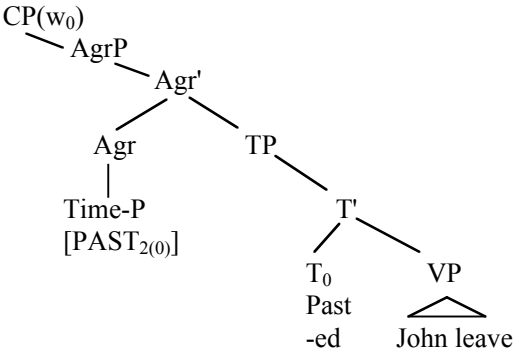
(11) SS: John left
LF: $PAST_{2(0)}$ John left
Interpretation: leave (John) (t_2: $t_2 < t_0$) (w_0)

(12) a. $PRES_{i(0)}$ translates as (t_i; t_i o t_0)

b. $PAST_{i(0)}$ translates as (t_i; $t_i < t_0$)

If we write "Past" for the past tense morpheme which is a head, and $PAST_{2(0)}$ for the past tense argument, this argument will occupy the specifier position of the TP. This tense argument is not the event time but the reference time and can be identified by a temporal adverb. In order to arrive at an interpretation as in (11), the TP part of our LF must roughly look like (13), where the utterance situation w_0 also provides the designated time index in the PAST argument. We extend von Stechow's (1995) original tree to CP and evaluate the whole structure at w_0, which thus is an index on CP.

(13)



This is obviously only part of the story because we have not introduced any argument which might correspond to event time. In order to capture the interplay of aspectual information (morphological or lexical), event time and reference time, i.e., in order to distinguish the relation of the time span of the adverbial time and the time described by the two types of event in (14a,b) we stipulate that event times are denoted by aspect variables. So we follow Klein (1994) and von Stechow (1994), who define tense as the relation between speech time and reference time and aspect as the relation between reference time and event time.

(14) a. John came home yesterday

b. John was home yesterday

This means that event times occur in the specifier of the Aspect Phrase. Now the aspects "perfective" and "imperfective" have to be interpreted in such a way as to capture the interplay exemplified in (14a,b). We read (15a) roughly as: the event time of a perfective verb phrase (lexically or morphologically marked as perfective) is fully contained in the reference time, and we read (15b) as: the event time of an imperfective verb phrase fully contains the reference time.[3] Again, the temporal relations of including or being included in another interval are introduced as a presupposition about the relevant time argument t_i.

(15) a. Perfective $PERF_{i(j)}$ translates to t_i; $t_i \subset t_j$

b. Imperfective $IMPERF_{i(j)}$ translates to t_i; $t_i \supset t_j$

[3] Note that the truth conditions for tense given in Hamann (1989) are based on distinctions in event notions due to Schopf (1976) which are of an aspectual nature and try to capture the problem exemplified in (14). In effect, the inclusion of the event in the time of yesterday in (14a) and the inclusion of the time of yesterday in the time span of the state in (14b) could be derived by these distinctions. The notion of aspect takes care of the event notion distinctions quite nicely, however, and unifies these lexical distinctions with grammatical aspect marking so that the ideas of Schopf (1976) are captured in a more principled and more formal way in the system proposed by Klein (1994) and von Stechow (1995).

Since Reichenbach (1947), it has been repeatedly pointed out that certain adverbs identify or narrow down reference times as is shown in (16a-d). The point of (16d) is that in English the reference time of the perfect tense corresponds to speech time so that a true past adverbial will lead to a contradiction. Therefore (16d), where the event is undoubtedly in the past, shows that certain adverbials as a rule identify reference time, not event time. Later we will see that there is a special context where this rule does not hold.

(16) a. John came at five o'clock

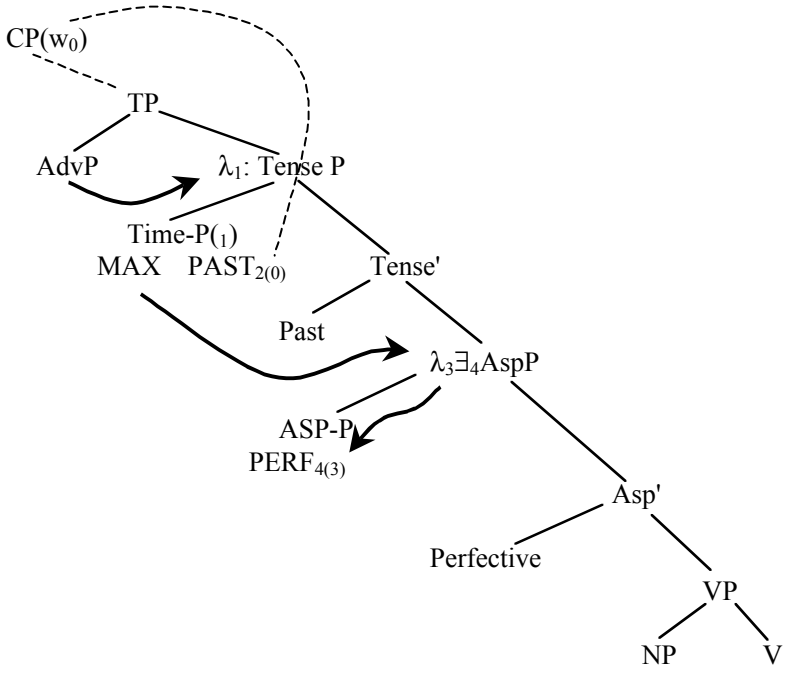
b. John came yesterday

c. Yesterday John came

d. *John has come at five o'clock

For reasons of scope, the adverb has to be higher than the tense, and we obtain an LF tree as shown in (17), which we have adapted from von Stechow (1995) to capture (16c).

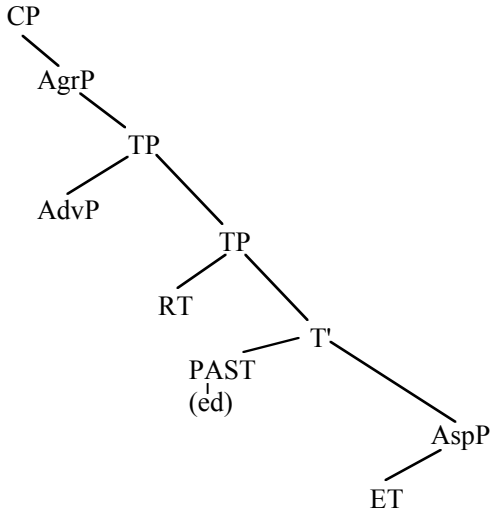
(17)



We cannot go into the details of the notation and the λ-calculus here,[4] so it must suffice to say that we have applied the definitions (12a), (15a) and have then written the adverb *yesterday* as an argument of the function created by the expression λ_1[....]. In the next step we apply λ-conversion in replacing all the variables which have the right index, i.e., the index 1, by the term *yesterday*. We indicate this replacement of indices in the expressions by the appropriate terms in the tree (17) by drawing a sort of mnemonic arrow line into the derivation.

We see that the presence of an adverb identifies the reference time because the time span referred to by the adverb becomes the value of the RT variable by λ-conversion, which is then put into the appropriate relation with the ET. Let us now strip the tree in (17) of all the interpretative apparatus and try to capture the most important facts: the reference time occupies SpecTP (or the specifier of a special Time Phrase – ZP) and the event time occupies SpecAspP. So we simplify (17) to (18a):

(18a)



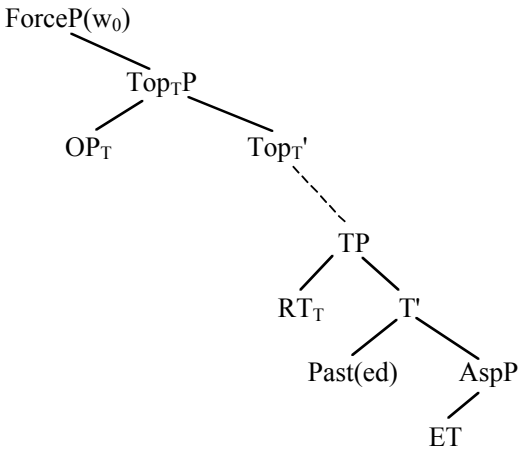
Here also the presence of the adverb "identifies" the time variable in the TP (see λ-conversion above). If there is no adverb, we have an unidentified empty argument in SpecTP. This could be a variable as we have assumed in (17), but it could also be ana-

[4] The syntax of the λ-operator:
Whenever x is a variable of type a and α is a well-formed expression of type b, then [λ x α] is a well-formed expression of type <a,b>.
The interpretation of the λ-operator:
Whenever x is a variable of type a, α is a well-formed expression of type b, and I is an interpretation with I=(M,β), then λ x α is satisfied in I iff there is a function f: $D_a \rightarrow D_b$, such that for any object k in D_a, f(k) is the donation of α in M,βk/x.
λ x α (k) ↔ α [k/x] where k is any appropriate term and α [k/x] is the result of substituting k for all occurrences of x in α.

lysed as a null constant, or as a temporal PRO as Stowell (1993) and Zeller (1994) argue. In any case, this empty category has to be identified from higher up, most likely by a discourse operator in CP. Let us briefly indicate how this can be done by taking Klein's (1994) term seriously and treating the reference time as a silent topic. We only have to apply Huang's (1984) analysis for topic drop, modify it so that it fits a Split CP analysis, and restrict it in a suitable way to variables denoting times. This can be done if we postulate that we always have a projection for topic times which may be occupied by an empty operator or by an overt adverb. We obtain a tree like (18b).[5] Note that marking a constituent as a topic or as bound to the topic position will mark it as old information. This will amount to identifying it with some salient time argument in the given discourse, or – in the terms of Huang (1984) – to identifying the operator in the discourse. The semantics of this operator will be roughly: "at that time" or "at the time when".

For reasons of uniformity, we may further assume that overt adverbs raise to SpecTopT at LF if there is no reference time specified already in the context. If, however, this is the case and the reference time is already bound by a topic operator which itself is already identified in discourse, then the adverb will modify another time, presumably the event time.

(18b)



So even if there is no need to postulate a tense operator in the CP from the semantic point of view – the interpretation or model is well able to assign a truth value directly to (17) – the traditional (syntactic) way of handling discourse identification through an operator in the specifier of a CP projection suggests that the CP is needed to give an

[5] Rizzi (1999) suggests a separate adverbial projection in the CP shell which is responsible for sentence modification. This can be taken as the natural position for temporal adverbs and could also be used for the time topic. Marking as old information must then be achieved otherwise, however, so that we tend to take the necessary position to be essentially a topic position – specialized for time arguments.

interpretation to tense. Note that all the necessary temporal arguments are present in the representation and are all found in the TP projection and its complements. This may seem surprising as we have expressly mentioned the third time argument, the speech time, which subsequently has not received a special position in (17) or (18). We could now be tempted to follow Enç (1987) and claim that it is speech time which must be located in the CP and so provides the anchoring point. On the other hand, there are arguments from Guéron & Hoekstra (1995) that it is reference time which is located in the CP. The analysis sketched above is a compromise between both points of view: we have linked the reference time to the CP via the operator, and the speech time does not need a syntactic position, it is given by the world index of the CP. This seems reasonable, as any utterance, and be it just the utterance of the sound "uh", can establish the time of utterance without recourse to any syntactic property of this utterance, whereas it does not make sense to try and identify a reference or event time for such an utterance. Therefore, even if tenses semantically have three arguments, only two of these are coded in the syntax, which corresponds to the fact that only two have morphological reflexes (tense morphology and aspect morphology).

4.3 First Implications for Child Language

These considerations lead to several conclusions with respect to child language. First, the child could simply not have TP, and so not have the reference time, and thus produce utterances which lack anchorage on the time line. This is a semantic view of the approach Wexler (1994) suggests. Second, the child can have the full IP (both AgrP and TP) structure and still produce infelicitous temporal utterances if the anchoring via a discourse operator is not guaranteed because there is "CP-trouble". Third, a "deictic" model which assumes the "here and now" as interpretative indices and identifies the reference time with the "now" will always be available as a default. Fourth, in parallel to child (diary) null subjects, random identification of the temporal empty category in the "here and now" or with whatever the speaker has in mind is possible as long as this "CP-trouble" persists.

In view of the phenomena observed in the foregoing section, it seems reasonable to suppose that it is indeed a problem of anchorage which is responsible, and not a direct lack of TP. Lack of the TP could not account for the frequent verb-end position and the other phenomena directly concerning the CP shell.

In order to test the problem area of discourse anchorage with respect to the RT, we can consider two areas where the RT plays a distinguishable role of its own. First, we study a tense phenomenon where the RT does not coincide with ET or ST and where it is often identified in previous discourse. This is the Past Perfect, which in Reichenbach's mnemonic notation gets roughly the interpretation in (19). The identification of the RT is exemplified in the mini-story in (20), where the event of Mary's coming home as given in the first sentence serves as the RT for the Past Perfect in the third sentence.

(19) ET < RT < ST

(20) Mary came home at five and was looking forward to having tea with John. She was rudely disappointed. John had already left.

Another area where reference times play a structuring role is past tense narratives. Since Partee (1984), Nerbonne (1986), and Couper-Kuhlen (1987) it has widely been accepted that it is the RT which is the carrier of the time position in a narrative. Partee's (1984) rule of narrative progression states that the RT is shifted forward each time a telic verb is used, but is kept constant if a stative verb is used. The next event can then be anchored to this new current (shifted) reference time.

So the areas where we expect difficulties if there is indeed trouble with RT anchorage are a) the use of the Past Perfect and b) the ordering of events in narratives. Before we can look at the data, however, we have to address an additional difficulty of the German tense system.

4.4 Complications

In Southern German the Simple Perfect, not the Simple Past, is the colloquial past tense; see examples (21a,b). Moreover, double participle constructions are the colloquial Past Perfect constructions in the dialects we investigated, especially in Bavarian and in the different varieties of Swiss German; see (22a,b). Note that contrary to recent arguments for a clear difference in Simple Past and Simple Perfect use in Standard German (see Klein 1998b, von Stechow 1999), we assume here that in the dialects and the cases we investigated, this difference does not exist (see also Bäuerle 1979 for similar arguments).

(21) a. ???Hans kam gestern nach Hause
Hans came yesterday home

b. Hans ist gestern nach Hause gekommen
Hans is yesterday home come

(22) a. Er hatte das handout ((erst) gestern nacht) geschrieben
he had the handout ((only) yesterday night) written

b. Er hat das handout ((schon) gestern nacht) geschrieben gehabt
he has the handout ((already) yesterday night) written had

We thus need an analysis of complex tenses. Following Zeller (1994) we assume 2 TPs for complex tenses, so that TP_1 embeds AuxP and TP_2 embeds the participle, which is treated as a tense head. The argument for such a treatment – or for having at least two RTs for complex tenses – is the notorious ambiguity of time frame adverbs in combination with the Past Perfect. (22a,b) each have the two readings given in (23a) and

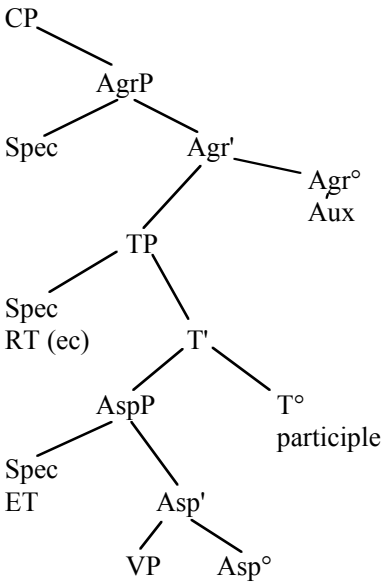
(23b) respectively, and can be disambiguated by the addition of modifying adverbs like *already*.[6]

(23) a. the handout was finished yesterday night "ET-modification"

b. the handout was finished **before** yesterday night "RT-modification"

In the suggested analysis we have two positions available for modification, the Specifier of TP_1 or of TP_2. We further assume that in the case of the German Simple Perfect and the "Double Participle (DP) Past Perfect", the auxiliary is not a carrier of tense, but an agreement marker. We also assume that the TP is head-final in German. This leads to (24) as a representation of the IP-VP shells for the Simple Perfect and to (25) for the DP-Past Perfect. In (25), the tree for the Simple Perfect is inserted in the place where normally we would have a TP with the tense head *had*. German "Double Participle Past Perfect" as a composition of the Simple Perfect *hat gehabt* (standing in for the Simple Past *hatte*) and a second TP with the main verb participle as tense head leads to (25) as a representation of the IP-VP shells.

(24)

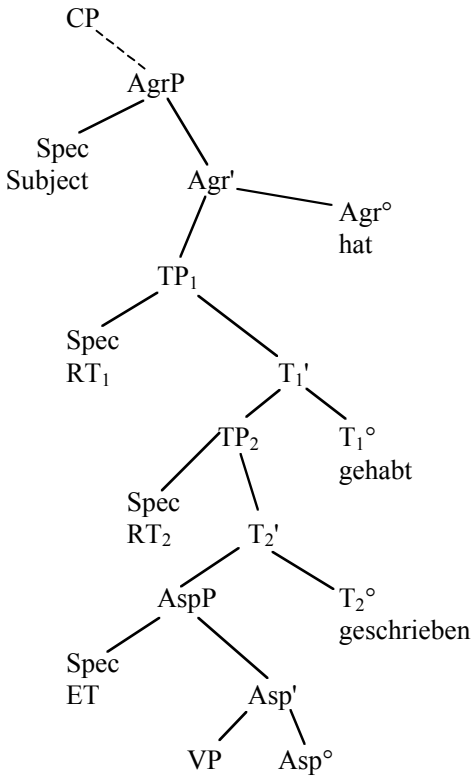


We obtain the usual reading in the following way. The aspect is perfective due to the main verb participle, telling us that the ET is contained within RT_2. The presence of an adverb could identify RT_2, which would give the "ET" reading of (22a,b). If there is no adverb, we know from the semantics of PAST (which is the marking on the participle)

[6] But see the analysis given in (18b) and the suggestion made in connection with it which also explains the ambiguity of adverbs in Past Perfect contexts. That suggestion needs more investigation of preferred readings for examples with pre-field and middle-field adverbs, however.

that RT_2 is before a designated time. The first time argument which can serve as designated time is RT_1. RT_1 could be identified by an adverbial which would lead to the "RT" reading of (22b). If there is no adverb, we have an empty argument (variable or PRO) in $SpecTP_1$. The PAST marking only tells us that this empty argument must be before a designated time (speech time), but does not identify it. Identification must be achieved in discourse via an operator in the CP! The combination of these interpretative steps gets us to the usual Reichenbachian reading of: ET < RT < ST with $RT=RT_2=RT_1$.

(25)



4.5 Predictions

We can now elaborate our predictions with respect to the grammar of impaired children. The assumption is that these children have "CP-trouble" (see section 3) and that RT anchorage is mediated by the CP. The predictions in (26) concern the areas of tense itself and of narrative progression of the reference time.

(26) 1. In the presence of a temporal (frame) adverb in the TP (middle-field), we expect no problems with the use and comprehension of tense. In particular, we expect no unanchored events, i.e., no infinitives, and we expect correct ordering of events in a narrative.

2. In the absence of temporal (frame) adverbs, problems in production and comprehension are expected. In particular, we expect unordered events, infinitives and difficulties with the comprehension of the Past Perfect.

The analysis of narrative passages of SLI children showed that events may be unordered in the absence of temporal adverbs, but that frequent use of *dann* 'then' enables these children to reproduce a narrative in parts. In the presence of such adverbs, infinitives did not occur in the children we investigated at the time. Some children do produce infinitives in the presence of adverbs, however, as shown in Lindner (to appear). Clearer evidence for the particular analysis of temporal anaphors comes from a pilot experiment with SLI children run in Switzerland and Munich.

5. An Experiment on the Discourse Identification of the Reference Time: Comprehension of the Past Perfect

5.1 The Experiment

The experiment consisted of 6 picture selection tasks. There were 3 control tasks assessing reference time with:

(a) an overt discourse-independent (DIA) temporal adverb (*am Abend* 'in the evening' vs. *am Mittag* 'at noon'),

(b) a discourse-dependent (DDA) temporal adverb (*vorher* 'before(hand)'), and

(c) a story where the event sequence followed from the causal relation (CAU) of the two events (not from any linguistic coding of their sequence) presented with the cause mentioned last in the story so as to exclude a "first mention" strategy.

There were 3 Past Perfect tasks, which apart from the use of the Past Perfect did not contain any overt adverbs or obvious cognitive help for event sequencing. Children were told a two-to three utterance story, such that there occurred a telic verb in the Past Perfect in the second utterance. They were then shown a pair of colour pictures. One picture matched the events as encoded by the story, whereas the other picture was not compatible with the reference time and thus the event sequence established by the use

of the Past Perfect. In the case of the control tasks, the event sequence implicit in one of the pictures was not compatible with the adverb or with the causal relationship of the events. The participants were then asked to point out the picture which did not match the story. Consider examples (27) and (28).

(27) Overt time adverb (DIA):
Papa hat den ganzen Tag gearbeitet und ist (erst) am Abend nach Hause gekommen. Das Baby hat geschlafen. Es hat am Mittag gebadet
'Father worked the whole day and came back home (not until) in the evening. The baby was sleeping. It had a bath at noon'

Fig. 1 a,b: The overt time adverb task (DIA)

1a. wrong picture

1b. correct picture

(28) Past Perfect:
Grossmutter hat auf dem Markt Blumen gekauft. Am Briefkasten **hatte** sie den Brief eingeworfen (**hat** ... eingeworfen **gehabt**)
'Grandma bought flowers at the market. She had posted the letter at the mail box'

Fig. 2 a,b: One of the Past Perfect tasks (PP)

2a. correct picture

2b. wrong picture

5.2 Participants

As a control group we first piloted 20 Swiss German speaking Kindergarten children at the age of 5;0–7;0. Later, we tested 5 children of the same age group with the standardized form of the tasks. The standardized test includes a learning phase in which the children were trained to pay attention to the differences in the details between the wrong and the matched picture (e.g., the letter in grandma's basket in the above picture).

All the impaired children we tested came from therapy centres in Munich and Berne and were tested with the standardized test. The 15 participants from Berne (age range 5;0–7;0) had been conventionally diagnosed. The 12 children from Munich (age range 5;0–7;0) meet the criteria for specific language impairment and thus for normal non-verbal IQ. For the Munich group concomitant data on the children's use of the CP shell were also elicited and will be discussed below.

5.3 Results

Table 2 gives the mean values for the different tasks achieved by the language impaired children from Munich and Berne and by the control group.

Table 2: LI subjects' correct performance on the different tasks, percent mean values, Munich (12 children, age: 5;0–7;0), Berne (15 children, age: 5;0–7;0), Controls (5 children, age 5;0–7;0)

	DIA	DDA	CAU	Past Perfect
Controls	66	66	80	73
Munich	66	41	50	38
Berne	47	40	47	31
total	57	41	49	35

The results of the experiment show that German children with a developmental specific language impairment do not have consistent comprehension of the Past Perfect. With 35% correct answers they perform below chance level. Comparing this result to the control group, where target performance was 73% (63% in the pilot control group without a training phase), we conclude that the affected children perform significantly worse on the Past Perfect task than normally developing children of the same age.

As to the control tasks, the best performance was achieved with the DIA task, i.e., with a discourse-independent adverb *am Abend* 'in the evening' (vs. *am Mittag* 'at noon'), which does not require anchoring of any sort. In this task, the results from the impaired children and the age-matched control group are very much the same. Worst performance was observed with the DDA-task, where the adverb *vorher* 'before(hand)' is anchored to a previously established reference time. Because of the parallel to *nachher* 'and then, afterwards', which occurs in spontaneous speech and seems to be used in a target consistent way, the task was originally ranked among the control tasks. The results seem to indicate that the task of interpreting the overt adverb *vorher* 'before(hand)' is more like an experimental condition than like a control. In other words, the impaired children seem to have severe difficulties in anchoring to reference time both with lexical markers of the type *vorher* 'before(hand)' and with a purely grammatical tense marking. Interestingly enough, the difference between the control group and the affected children in the *vorher* 'before(hand)' task comes close to what we have seen in the Past Perfect task (see (29)), indicating that both tasks are syntactically and semantically related.

(29) *vorher* 'before(hand)' task control: 66% LI: 41%
Past Perfect task control: 73% LI: 35%

Unexpectedly, the results on the causal control task (CAU) show performance at chance level in the impaired group. These results seem to be due to the elicitation method used in the experiment. That is, for this task we should have shown two pictures coding the event sequence and asked the children to order the pictures, instead of showing one picture (with the event sequence implicit) and asking the child to judge

whether this was a wrong or a good picture of what happened. As a consequence we cannot yet exclude that these children adhere to a "first mention" strategy.

5.4 The CP Shell and the Interpretation of Reference Time

In order to examine whether there is a tight relationship between CP phenomena and RT we tested the 12 children of the Munich group with the "V2-Kit". The V2-Kit is part of the diagnostic battery developed in Penner & Kölliker Funk (1998). It comprises three CP shell tasks: elicited production of fronted focused objects, elicited production and comprehension of constituent questions, and elicited production of subordinate clauses. Table 3 summarizes the results of the V2-Kit (passers are marked as +CP, non-passers as *CP) and the comprehension of the Past Perfect. The table reveals the following: There is a general trend for "CP-trouble" to go hand in hand with RT-trouble. However, this trend is not absolute. There are cases where [+CP] co-occurs with [*RT] and vice versa: Children (7) and (8) meet the criteria of [+CP], but fail in the Past Perfect task. Child (6) is a non-passer of the V2-Kit, but has [+RT] in the Past Perfect task. Clearly, further tests are necessary to establish a correlation. With this aim, a new experiment with simpler pictures and a simpler design has been developed and is now being run.

Table 3: CP and the comprehension of Past Perfect in German LI children

child	age	CP	% correct Past Perf.
1.	5;3	*CP	66
2.	6;0	*CP	33
3.	6;0	*CP	33
4.	6;0	*CP	0
5.	6;0	+CP	66
6.	6;0	*CP	100
7.	5;10	+CP	0
8.	5;10	+CP	33
9.	5;0	*CP	33
10.	6;5	*CP	33
11.	5;4	*CP	33
12.	6;4	*CP	33

6. Discussion and Conclusion

The data discussed in section 3 can best be accounted for if we assume that there is a basic problem with the CP shell in the grammar of German children with SLI: Constituent questions and subordinate clauses do not conform to the target grammar, genuine V2 is rare, and finite verbs often occur in clause-final position. The experiment described in section 5 shows that identifying a reference time in the discourse is likewise problematic. There seems to be a general trend for the CP problems to go hand in hand with the problems of anchorage.

This means that there is a clear syntactic deficit common to these children's language performance. There is, however, no clear candidate for a cognitive problem common to these children and related to their difficulties in identifying anaphoric reference in discourse. Though some problems with symbolic play and mental imagery have been reported for children with SLI (see Leonard 1998: chapter 5), their performance may be worse than that of age matches but is always better than that of language matches, and a connection with anaphoric anchorage cannot be easily established. General limitations of memory or processing capacity could make it difficult for children with SLI to keep earlier discourse available while processing a new sentence. Hypotheses on processing limitations have been discussed in connection with a generally slower response time of children with SLI in many tasks (see Riddle 1992, Ellis Weismer & Hesketh 1996, and Kail 1994), but cannot be applied to the problem at hand without a better model of what is involved in processing discourse or a narrative. In this particular case, such a model would have to explain why discourse information is harder to process than information inherent in the utterance situation, given that only the linguistic module is active in the first case, whereas visual, auditive and linguistic information have to be verbalized, co-ordinated, ranked and integrated in the latter case.

More explicit models like the surface hypothesis (see Leonard 1989) assume that a general processing limitation has "an especially profound effect on the joint operation of perceiving grammatical morphemes and hypothesizing their grammatical function" (Leonard 1998:247), but clearly cannot explain why the adverb *vorher* 'before' should be more difficult than *am Mittag* 'at lunch time' or why the comprehension difficulties show up in the Past Perfect and much less in the German Simple Perfect.

Note also that the comparison of reaction times or processing times in different tasks is normally of children with SLI to age matches. Studies where the comparison is to language matches are rare. This, however, would be the relevant comparison given the fact that normally developing children have difficulties with anchorage up to their third birthday (see section 1). Presumably, children with SLI are better than language matches in these processing tasks as they are better than language matches in most other cognitive tasks. For these reasons the difficulty in anchoring reference times are

much more likely to be located in the language module, more specifically they seem to be located on the syntactic side of the discourse-syntax interface, in the CP.[7]

This conclusion is the more plausible as the CP system is the place for coding the difference between old and new information in the topic and focus projections. It follows that links from the CP to discourse are available in the target grammar – otherwise a coding as old or new information would remain without consequences and could not be verified in a given conversational situation. It also follows that the syntax of tense has to provide a link to discourse via the CP. We have suggested that this link is established by an anaphoric operator in a special "topic time" projection that binds the reference time variable and marks it as old information. It is possible that this projection is closely related to the so-called FinP (Rizzi 1997) and the finiteness specification.[8]

In this model of tense the difficulties in the comprehension of the Past Perfect follow from the underspecification of the CP. If the Topic Projection is not available or the feature is not specified then the relevant variable cannot be marked as old information. Without such marking, there will be no search in the discourse for a salient element which could serve as anchor. Events will remain unanchored or be anchored to speech time as the default.

These ideas about the syntax and semantics of tense are not totally new, but try to capture such notions as von Stechow's (1991) dummy *then*, Klein's (1994) Topic Time, and the tense-chain approaches as suggested by Enç (1987) or Guéron & Hoekstra (1995). Though these approaches provide their own arguments, we hope to have added a truly empirical argument for linking the TP and the CP by a tense-chain in pointing out the difficulties of German children with SLI concerning traditional CP phenomena together with the comprehension of the Past Perfect. As long as there is no articulated hypothesis as to why and how general processing difficulties should affect discourse anchorage, the grammatical explanation is more convincing: It involves linking reference time to discourse via the CP.

Acknowledgements

This paper reconsiders the results of two studies completed in collaboration with Katrin Lindner and Zvi Penner, who provided some of the corpora and ran the experiments with their groups of language impaired children. The results on impaired clause struc-

[7] The grammatical deficit could also be a more global one as described by van der Lely (1998). Note that her account of difficulties whenever non-local relationships have to be established for checking would predict difficulties with focalization and question formation. It would also predict difficulties with tense, provided a complex tense-chain has to be established to some position in the CP. So the analysis suggested in (18b) together with van der Lely's account of grammatical SLI would also arrive at an explanation of the data. Note that van der Lely predicts chance performance, however, whereas the German data on question formation show almost 80% non-target use.

[8] See Klein (1998b) and van Geenhoven (1998) on similar speculations concerning finiteness.

ture have been published in Hamann, Penner & Lindner (1998), and the results on the tense experiment in Hamann, Penner & Lindner (1997). In this article, the focus is on the role of the CP as an interface and the conclusions that must be drawn for the formal analysis of tense, for which Cornelia Hamann takes sole responsibility.

Of course, her ideas on tense could not have developed without the DFG-project on the English Tenses directed by Alfred Schopf 1984–1986, and the stimulating discussions among the collaborators, whom she thanks individually and as a group.

Without Arnim von Stechow, however, these ideas would probably have been forgotten, which brings me, as the first author, to the more personal side of these acknowledgements. My contacts to Arnim were my life-line to formal semantics in the times when I was collecting corpora and counting child utterances. Reading his papers and lectures on tense (von Stechow 1991, 1994, 1995, 1999) kept my interest alive and enabled me to also analyse child data from a semantic point of view. The idea about a difficulty with anchoring reference times has been with me since I first saw the data on infinitive use in normally developing children and was fuelled by discussions with Wolfgang Klein and Veerle van Geenhoven at the Max-Planck-Institute in Nijmegen, where I also redesigned the tense experiment. Thanks to Wolfgang and Veerle for their thoughts on how to treat certain aspects of tense. And thanks to Arnim for his direct criticism, helpful comments and unflagging support throughout all my life as a researcher in linguistics. Without his support in the most difficult period of my life, I might not have decided to stay in the field and this paper would certainly not have been written: The formal approach and framework are his, the speculations on tense and the faults are my own.

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