

On Grammatical Errors in English SLI Children: A Corpus-based Study

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1. Introduction

Specific Language Impairment (SLI), also known as *developmental dysphasia*, refers to a delayed or deviant language development of children in the absence of neurological trauma, cognitive impairment, psycho-emotional disturbance, or motor-articulatory disorders (Eisenbeiss, Bartke, & Clahsen, 2006). Although SLI is a heterogeneous disorder, tense marking has been argued to be a good clinical marker of SLI in English-speaking children (Rice & Wexler, 1996). However, different models have been proposed to explain whether tense-marking errors are syntactical in nature. This paper is also concerned with the nature of grammatical errors made by children with SLI, which involve core syntactic operations such as movement, agreement and case assignment. Therefore, three current accounts of grammatical errors produced by children with SLI, namely, the *Agreement and Tense Omission Model*, the *Agreement Deficit Model*, and the *Deficit in Computational Grammatical Complexity Model*, will be evaluated on the basis of the Leonard corpus in the Child Language Data Exchange System (CHILDES). In the next section, the key claims and predictions made by each model are presented.

2. Literature Review on Three Linguistic Accounts of SLI

2.1 Agreement and Tense Omission Model

The Agreement and Tense Omission Model (ATOM) of SLI originates from Wexler's (1994, 1996) studies on clause structure and inflection in young typically-developing (TD) children. The grammar of TD children can be captured in terms of Wexler's *Optional Infinitive (OI)* stage. He claims that TD children undergo a protracted stage during which they alternate between producing finite and infinitive forms of verbs in contexts where finite forms are required in adult grammar. Additionally, TD children at the OI stage tend to omit auxiliaries and copula BE¹ in finite contexts as Wexler observed. Further, Wexler asserts that optional infinitives arise because of the *underspecification* or omission of the tense feature in the clause representation.

Adopting Wexler's idea, Rice, Wexler and Cleave (1995) propose that children with SLI go through an *Extended Optional Infinitives (EOI)* stage in which a similar pattern of optional infinitives is found until they are 7 or 8 years of age. Rice and her collaborators propose that the grammar of

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¹ In this paper, the capitalised word is the label for various forms of that word.

children with SLI is characterised in terms of the *tense omission model*. They predict that children with SLI will display limited proficiency in the use of morphemes marking tense while leaving other inflectional morphemes unaffected. Additionally, when these children do specify the tense feature, they respect all its morphosyntactic properties. That is, when children with SLI use tense morphemes or auxiliaries, they use them correctly in the same way as TD children do. Nevertheless, such a tense-deficit hypothesis wrongly predicts that children with SLI never use accusative subjects with past tense verbs.

In later work, Schütze and Wexler (1996) claim that TD children's optional infinitives can result from the underspecification or omission of either the tense or agreement features (or both) in their mental representation of a sentence. As a result, Wexler, Schütze and Rice (1998) revise their account of SLI with a two-factor theory. They assume that SLI involves a syntactic feature deficit leading to the optional specification of tense [TNS]² and agreement [AGR] features in obligatory contexts. They refer to their model as ATOM. Further, they argue that the case-marking of subjects as nominative (Nom) or non-Nom by children with SLI directly correlates with whether or not the agreement is marked on verbs. In other words, the case-marking difficulties of SLI are a secondary effect of problems with verb agreement.

From their study, Wexler and his collaborators report that English SLI children (ESLI children) are more likely to use non-Nom subjects and to produce non-Nom subjects at a much later age than TD children. Additionally, they find that both TD and SLI children virtually always correctly mark the case of object. Moreover, their data show that the optional occurrence of Nom and non-Nom subjects is correlated with the optional occurrence of finite and non-finite verb forms. More specifically, they point out that non-Nom subjects almost never appear with agreeing auxiliary/main verbs that are inflected for both tense and agreement. Therefore, Wexler and his colleagues take the subject case errors as a reflection of the OI stage.

In summary, Wexler and his collaborators draw the following main conclusions from their study:

- (i) children with SLI make more frequent case-marking errors with subjects than MLU-matched TD children;
- (ii) children with SLI use an accusative (Acc) form of subjects in contexts where adults require a Nom form;
- (iii) the case-marking of subjects is determined by whether clauses contain an auxiliary/main verb³ which agrees in person and number with the subject or not;
- (iv) children with SLI may leave verbs underspecified for [TNS] and/or [AGR] features in finite contexts, resulting in the production of OI structures with Acc subjects;
- (v) ATOM makes predictions about the relative frequency of case and tense/agreement errors made by children in different types of clause structure (e.g. with subject case-marking errors predicted to be most frequent with uninflected verbs, less frequent with ambiguous verbs, and least frequent with agreeing verbs).

However, ATOM makes no specific claims about whether the [TNS] feature is omitted more frequently than the [AGR] feature – or conversely.

2.2 Agreement Deficit Model

The Agreement Deficit Model (ADM) of SLI is firstly introduced by Clahsen (1989) in the framework of Generalised Phrase Structure Grammar (GPSG) (Gazdar, Klein, Pullum, & Sag, 1985). He argues that SLI involves a selective impairment in the grammatical mechanism. The Control-Agreement Principle (CAP) which establishes an asymmetric relationship between two categories (one of the categories is a functor, while the other one is an argument controlling the functor) is claimed to be selectively impaired in SLI grammar. Afterwards, Clahsen, Bartke and Göllner (1997) rephrase the agreement-deficit model in the terms of *interpretability* within Chomsky's Minimalist perspective (1995).

Exploiting Chomsky's system of morphosyntactic features, Clahsen and collaborators claim that

² By convention, features are enclosed in square brackets and often abbreviated.

³ More precisely, an Infl or Agr constituent.

children with SLI have specific problems with the acquisition of uninterpretable features. However, the agreement-deficit hypothesis based on the interpretability of features can be deduced in two possible ways. A broad view of this hypothesis assumes that all uninterpretable features are affected in the grammar of children with SLI. That means, individuals with SLI will have difficulties with case features, with movement that is triggered by strong categorical features, and with ϕ -features and tense feature of verbs and adjectives. On the other hand, a narrower view holds that only the ϕ -features of verbs and adjectives are affected in the grammar of children with SLI. Clahsen and colleagues take the narrower view to characterise the grammatical deficit of SLI. They predict that person and number inflection on verbs will be severely damaged in SLI while the person, number and gender features of subject-DPs⁴ and the [assign nominative] feature on T will be intact. That is, children with SLI will specify the subject-DPs for case and for ϕ -features and leave the ϕ -features of verbs underspecified. In other words, children with SLI will have trouble with agreement morphemes on verbs as the use of these morphemes is controlled by ϕ -features of verbs, and they are not expected to have difficulties with other inflectional morphemes. Indeed, that is what Clahsen and collaborators found from their data of nine ESLI children⁵ whose age range is from 10;00 to 13;01. They show that ESLI children use the preterite marker much more accurately than the third-person, singular, present tense (3SgPres) agreement marker. Furthermore, they report a 100% correct score on Nom case-marking in obligatory contexts.

In summary, Clahsen and colleagues' narrow interpretation of ADM claims that only the uninterpretable ϕ -features of verbs, namely the agreement features of verbs, pose specific problems for children with SLI. More specifically, they suggest that children with SLI have greater problems in marking agreement on verbs and auxiliaries than in marking tense. Additionally, they claim that the feature [assign nominative] on T is still active in SLI grammar.

However, as work in other studies (e.g. Bishop, 1994; Loeb & Leonard, 1991) has shown that younger children with SLI do have problems with case-marking, Stavrakaki (1996) reports that a Greek SLI child, Eva, indeed has difficulties with case-marking with regard to first person Nom subject pronouns. Moreover, Tsimplici and Stavrakaki (1999) show that Eva has a morphosyntactic deficit in the determiner system, which supports the dissociation between interpretable and uninterpretable features. Therefore, Tsimplici and Stavrakaki embrace the broad view of ADM which assumes that all uninterpretable features are affected in the grammar of children with SLI.

2.3 Deficit in Computational Grammatical Complexity Model

The Deficit in Computational Grammatical Complexity (CGC) model is a development of van der Lely's (1994) Representational Deficit for Dependent Relations (RDDR) hypothesis (van der Lely, 2005). It aims to characterise the underlying deficits of SLI at the core of the syntactic system. This account suggests that SLI involves a deficit in the computational system, which leads to the inconsistent use of certain grammatical operations (van der Lely 1994, 1998, 2005; van der Lely & Stollwerck, 1997; van der Lely & Battell, 2003).

What van der Lely and Stollwerck (1997) propose is that children with SLI have a deficit with *structure-dependent* relationships that can be observed on subject-verb agreement, tense marking, case marking and movement. They argue that both subject-verb agreement and tense marking are dependent on a syntactic relationship between two constituents. In more detail, the agreeing form of the verb (e.g. the 3SgPres morpheme *-s*) requires a syntactic relationship between a nominal expression and the verb (e.g. they are in a subject-verb or Spec-Head relationship) and the specification of the grammatical person [PER] and number [NUM] features. As for tense marking, it relies on a syntactic relationship between the verb and the functional head Tense (T). Therefore, the proposal that children with SLI have a deficit with structure-dependent relationships can account for SLI children's deficit with agreement and tense marking.

Since the CGC account embraces Chomskyan theories, *long-distance dependencies* which

⁴ DP stands for determiner phrase.

⁵ The data are originally collected by Heather van der Lely. She performs two elicitation tasks, one of which prompts the children to produce 3SgPres forms and the other one preterit forms.

necessitate movement in terms of Chomsky's Minimalist Programme (1998, 1999) become a strong test of the CGC hypothesis. As a result, van der Lely (1998) proposes that SLI children's syntax is characterised by optional movement operations. That is, while the basic grammatical operation *Move* is obligatory for TD children, it is optional for children with SLI. In more detail, van der Lely takes SLI children's difficulties with A-movement as the source of their problems in the assignment of thematic roles to DPs, especially in passive sentences.

In later work, van der Lely and Battell (2003) claim that Wh-movement and auxiliary inversion (Aux inversion) are problematic in SLI grammar, resulting in particular problems in forming object questions. It is reported that 80% of their ESLI participants⁶ show these two sorts of errors whereas only 4% of the control TD children do so. That correct and incorrect wh-questions are found in the speech of children with SLI supports the CGC account whereby movement is taken as an optional operation in SLI grammar. Moreover, van der Lely and Battell propose that children with SLI merge the wh-word as an interrogative marker in the specifier position of CP instead of moving the wh-word.

In summary, the CGC hypothesis argues that SLI within syntax includes impairment in marking tense and agreement and assigning case. In addition, the movement operations (e.g. Wh-movement, A-movement and Aux inversion) are predicted to be problematic for children with SLI.

3. Method

The SLI data examined in this paper is from the Leonard corpus in the CHILDES, which is collected before the formulation of the ATOM, the ADM and the CGC. This corpus is composed of eleven files of spontaneous speech production data. Each file contains one transcript of the utterances of a monolingual ESLI child. The eleven children range in age from 3;8 to 5;7. Four of them are girls, seven are boys. All of them are clinically diagnosed as SLI. The speech samples are obtained while the child is playing with an adult female research assistant. Common toys and picture books form the main source of conversation. The transcripts only include the utterances of the child (MacWhinney, 1995).

Since this study aims to empirically evaluate the three models outlined in the previous sections, special emphasis is given to phenomena about which one or more of the above models make specific predictions. The phenomena focused on are:

- Tense and agreement marking on auxiliaries and verbs in finite contexts
- Case marking
- A-movement (the position of subjects with respect to auxiliaries, infinitival *to*, negative adverb *not*, and verbs with no external arguments)
- Wh-movement
- Aux inversion

Since the ATOM claims that children with SLI go through an EOI stage which involves the underspecification of either [TNS] or [AGR] features (or both) and that the case-marking of subjects as Nom or non-Nom by children with SLI directly correlates with whether or not agreement is marked on verbs, it is predicted that frequent tense, agreement and case-marking errors will be found in the Leonard corpus. As for the narrow view of ADM, it predicts that more agreement errors will be identified than tense errors since it assumes that only the ϕ -features of verbs are affected in the grammar of children with SLI. On the contrary, the broad view of ADM predicts that all except tense marking of the afore-mentioned phenomena will become problems for ESLI children, since there are uninterpretable features involved in these operations. As for the CGC model which asserts that children with SLI have a deficit with structure-dependent relationships, it predicts that all of the error types above will be found in the corpus data. For a more comprehensible summary of the predictions made by each account, a table is given below:

⁶ They are fifteen children and teenagers (three girls and twelve boys) aged between 11;5 to 18;2.

Table 1. Summary of Predictions Made by Each Model

Type of Error \ Model	Agreement and Tense Omission Model	Agreement Deficit Model		Deficit in Computational Grammatical Complexity Model
		Narrow	Broad	
Tense marking	frequent	infrequent		frequent
Agreement marking	frequent	frequent		frequent
Case marking	frequent	infrequent	frequent	frequent
A-movement	infrequent	infrequent	frequent	frequent
Wh-movement	infrequent	infrequent	frequent ⁷	frequent
Aux inversion	infrequent	infrequent	frequent	frequent

4. Results

It is found that the children with SLI in the Leonard corpus frequently commit errors on tense marking, agreement marking and Aux inversion as reported in other studies. In more detail, their mean correctness score for tense marking on main lexical verbs is 53.87%, and their mean correctness scores for agreement marking on lexical and auxiliary verbs are 34.78% and 37.11%. In addition, the overall frequency of Aux inversion in non-subject questions is 52.45%. By contrast, it is found that the children correctly perform some syntactic operations such as case assignment, A-movement and Wh-movement. More specifically, their mean percentage implementation of the correct Nom case is 97.26%. As for genitive and Acc case, the figures are 94.03% and 100%. In addition, both of their mean percentage implementations of A-movement and Wh-movement are 100%.

Although these children do experience difficulties in the use of the 3SgPres *-s*, it is doubtful that the agreement marking errors are caused by a deficit in some syntactic mechanism. In line with Chomsky's (1998, 1999) proposal that agreement plays a key role in case assignment and A-movement, the findings that these children do not have any problems with these two syntactic operations suggest that the agreement marking errors are merely spellout errors. In addition, the observation that they can establish an agreement relation between constituents but fail to invert auxiliaries sheds light on the mechanism of Aux inversion. It suggests that Aux inversion is triggered by an affix carrying a [TNS] feature requiring it to attract the closest head marked for tense (Pesetsky

⁷ Chomsky (2005) suggests that an uninterpretable *edge feature* [EF] is the mechanism which triggers Wh-movement. More specifically, the functional head C in questions carries an [EF] feature requiring C to be extended into a CP projection containing a specifier.

& Torrego, 2001; Radford, 2004) rather than by an affix carrying a set of strong agreement features requiring it to attract the closest head specified for agreement (Radford, 2005).

5. Discussion

It is found that the ATOM is compatible with some of the key research results of this study – for instance, it correctly predicts that the children in this study will make frequent errors on tense (46.13%) and agreement marking (65.22%) – though it does not account for the relative frequency of the two. Moreover, if Aux inversion is triggered by a [TNS] feature on C, and if C (as well as T) can be underspecified for tense, ATOM can be extended to account for Aux inversion errors. However, its prediction that children with SLI will have problems with case assignment is not supported by the data presented. Therefore it would appear that ATOM needs to be modified in some way. One possibility would be to assume that some interpretable feature of T other than the [TNS] feature is responsible for spelling out the [CASE] feature on a subject as Nom – and as Radford and Ramos (2001) suggest, this feature may be the [MOOD] feature. An alternative (very different) approach would be to reject the claim made in ATOM that tense and agreement errors are *syntactic* in nature, and instead suppose that the high implementation rate (97.26% correct) for Nom case marking suggests that T (in finite contexts) is fully specified for both tense and agreement in the syntax (and hence triggers A-movement and assigns Nom case in the same way as in adult English). This would then lead to the conclusion that tense and agreement errors on verbs are *spellout* errors, relating to the mechanisms by which tense and agreement features are given an overt phonetic form in the PF component. However, this would entail rejecting the core assumption of ATOM that the relevant deficit is *syntactic* in nature.

The ADM predicts that children with SLI will have substantial problems with agreement marking, though not with Nom case marking or tense marking. The first two of these predictions are seemingly borne out for the children with SLI in the Leonard corpus (with their mean implementation rate being 34.78% for agreement and 97.26% for Nom case marking), but not the third (their mean implementation rate for tense marking being 53.87%). Since [TNS] is an interpretable feature, the high frequency of tense errors observed in the Leonard corpus poses a substantial empirical challenge to the ADM.

Moreover, if A-movement is driven by agreement features on T, the fact that the children showed 100% correct implementation of A-movement suggests that agreement errors are not due to underspecification of agreement on T in the syntax, but rather to spellout errors in the PF component. In other words, this means that agreement errors are morphophonological rather than syntactic in nature. Furthermore, if Nom case is assigned to a DP via *agreement* with a *tensed* head, this would further suggest that tense-marking errors too are spellout errors, rather than the result of syntactic underspecification. On this view, neither tense nor agreement would be underspecified in the syntax, but children with SLI would have considerable problems in spelling out tense and agreement features on verbs in the PF component. If one generalises this conclusion and supposes that children with SLI have few problems with syntactic operations but substantial problems with PF operations, this can account for why these children perform well (100% implementation) on the syntactic operations such as A-movement and Wh-movement but poorly (52.45% implementation) on Aux inversion, which Chomsky (1999) argues to be a PF operation. This in turn would lead to the more general conclusion that SLI is a PF deficit rather than a syntactic deficit.

Consider now the broad view of ADM and its proposal that all uninterpretable features are impaired in SLI grammars. This correctly predicts the problems that the children in the Leonard corpus have with marking agreement on verbs. Moreover, if one extends the hypothesis somewhat and supposes that Wh-movement and A-movement are interpretable movement operations (in the sense that they create syntactic structures of a kind required for interpretation at the semantic interface) whereas Aux inversion is not (as would be the case if – as Chomsky claims – Aux inversion were a PF operation), one could also say that the broad view of ADM can account for the fact that the children with SLI in the Leonard corpus had no problems with Wh-movement or A-movement (showing 100% implementation of both), but had considerable problems with Aux inversion (showing only 52.45% implementation). However, the broad view of ADM is proved to be

incompatible with two key sets of findings reported in the present study. One of these is the high (97.26% correct) implementation rate for Nom case marking. Since [CASE] is an uninterpretable feature, the broad view of ADM wrongly predicts that the children would perform poorly on case-marking. The second problem for the broad view of ADM is the low (53.87% correct) implementation rate for tense marking. Since [TNS] is an interpretable feature, the broad view of ADM wrongly predicts very high scores for tense marking.

As for the CGC account, it would appear to be the model of SLI which is least compatible with the findings of the present study. Its prediction that children with SLI will frequently commit errors on case marking, A-movement and Wh-movement is shown to be false for the children in the Leonard corpus. The children's good performance on these three syntactic operations suggests that they have no problems in establishing the relevant feature-dependency relationships. This means that the CGC model needs to be modified into a more restricted version which supposes that children with SLI have problems in handling certain types of dependency – perhaps morphological dependencies in the PF component (these leading children with SLI to have problems with spelling out tense and agreement feature on verbs, for example).

6. Conclusion

In this paper, the three linguistic models of the “syntactic” errors produced by children with SLI have been evaluated on the basis of the Leonard corpus. It is reported in the present study that the children with SLI in the Leonard corpus do indeed have problems in the use of the 3SgPres –s and the past-tense verb forms as predicted by the three models. However, it is indicated that case marking and A-movement are unimpaired in these children's grammars. According to Chomsky's theories of Nom case marking and A-movement, the findings suggest that ϕ -features on T are fully specified. Therefore, the agreement marking errors found among these children are merely spellout errors but not syntactic errors. Furthermore, given that the Nom case is assigned to a DP via agreement with a tensed head, this paper argues that tense-marking errors are also spellout errors, instead of the result of syntactic underspecification. On this view, both tense and agreement features are not underspecified in the syntax, but children with SLI would have considerable problems in spelling out tense and agreement features on verbs in the PF component. If one generalizes this conclusion and supposes that children with SLI have few problems with syntactic operations but substantial problems with PF operations, this can account for why these children perform well (100% correct) on the syntactic operations such as A-movement and Wh-movement but poorly (52.45% correct) on Aux inversion, which Chomsky (1999) argues to be a PF operation. However, given that SLI is a heterogeneous disorder, this paper does not argue that SLI must be a PF deficit. Instead, what is suggested here is that one should take different syntactic operations into consideration together before claiming that SLI involves a syntactic deficit.

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