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Argument Structure and Specific Language Impairment:

retrospect and prospect

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ABSTRACT

This article reflects a collaboration between the Universities of Groningen and Reading of which Frans Zwarts was the promoter. One of the outcomes was a close attention to the learning of various aspects of argument structure by children with specific language impairment (SLI) in Dutch and English. At that time and since, the focus on deficits in grammatical morphology in these children has left verb complementation as something of a syntactic Cinderella. Here we review the findings from our studies in the 1990s. We confirm that children with SLI in both languages have problems with verb specificity, with argument structure alternations and with resultative verb predicates. The very limited number of subsequent studies on verb syntax appear to support our findings. We conclude that this is an area which will repay further scrutiny – it is high time argument structure received an invitation to the ball.

1. Grammatical deficits in specific language impairment (SLI)

In 1990, when this story begins, research on specific language impairment in children (SLI) was influenced by a couple of significant publications. In the first, Myrna Gopnik (1990) wrote a case study on a boy with ´developmental dysphasia´, an alternative label for SLI. This boy suffered from what Gopnik named ´feature blindness´: a grammar that lacked ´syntactico-semantic features´. Such features were those that controlled grammatical morphology, for instance, number, grammatical gender, tense. The ´blindness´ showed in the child´s inability to mark these features or to mark them consistently: if they were marked at all, the use of features lacked a system. In stark contrast to this, thematic relations or argument structure were claimed to be intact. The fact that there was no problem in argument structure served to highlight the ´isolated´ nature of the problem with features. At about the same time, there was much interest in the three generation KE family. This was a British family half of whose members showed a severe speech and language disorder, which was eventually linked to a mutation in the FOXP2 gene (Lai et al. 2001). Gopnik and Crago (1991), in analysing data from the KE family, concentrated on their grammatical problems, which they claimed showed a similar profile as the child in Gopnik (1990) - a deficit restricted to grammatical morphology. (An alternative line of research would establish that the most prominent problem of the affected members of the family involved a severe developmental dyspraxia; Vargha-Khadem et al., 1995).

But at more or less the same time, Mabel Rice pointed to the possibility of a broader grammatical deficit in children with SLI in a chapter entitled ´Children with Specific Language Impairment: Toward a model of teachability´. The notion of teachability for children with SLI is encompassed in a single line: ´When children cannot learn a language on their own, they must be taught´ (Rice, 1991: 448). Prior to being taught their problems have to be identified.

In her chapter, Rice outlined how problems with verbs could be at the basis of many collateral language difficulties in SLI (and, serving the purpose of the chapter, what the challenges were in teaching verbs). Some factors she identified were: verbs occur in a sentence frame that determines (part of) their meaning, so children must know about these frames, together with the verb lemma; verb argument structures must be learned but so also must alternation between argument structures; verb learning depends on semantic and syntactic bootstrapping, for both of which children with SLI may lack sufficient resources. The chapter postulated verbs as pivotal in the difficulties encountered by language-impaired children.

Finally, in 1989 Steven Pinker published a monograph on the acquisition of argument structure (to which Rice, 1991, also referred). Alternations (and the learnability of alternations) were at the centre of his book. In it, he proposed a fine-grained semantic categorisation of verb classes (cf. Levin, 1993) that would assist children in learning about the syntactic behaviour of verbs (i.e. argument structure). Children must know much about the semantics of verbs to get their syntax right.

It was in those same years that the linguistics departments of the universities of Reading and Groningen began a collaboration under the auspices of the Erasmus Programme[1]. As part of this collaboration a joint research project came about. In a study on verb argument structure in English and Dutch children with SLI, this explored the issues that Rice raised. The preparation of the project took place at Frans´ dining-room table, in a hotel in Barcelona, as well as via fax exchanges (remember fax?) between the UK and the Netherlands. In this chapter we take a look back at that joint study and assess the interest in verb argument structure in later research as well as the diagnostic status of argument structure in SLI.

[1] The prime mover in this enterprise was Frans Zwarts. Frans was also the accommodating landlord of the second author during his sabbatical in Groningen. We wish Frans well on his retirement (if retirement it is).

2.1. The Reading- Groningen study: the plan

The Reading-Groningen study was a reaction against the view espoused by Gopnik and colleagues that that the grammatical deficits are limited to morphology. There seems no *a priori* reason why syntagmatic phenomena such as the organisation of verbs and their complements should not present problems for impaired acquisition systems. The project can be divided *in partes tres*, involving children's control of the verb lexicon, of argument structure alternations, and of resultative verb phrases:

Verb specificity. A number of articles had suggested that the verb lexicon of children with SLI is not only less diverse (as reflected by lower type token ratios for lexical verbs), but also less specific. It was observed that language-impaired children relied on verbs like *put*, *go*, that are semantically underspecified. Such verbs were named General All Purpose (GAP) verbs (Rice & Bode, 1993). The implication is also that children, in using GAP verbs, would not have to learn the argument structure of the more specific verbs. Consequently, some argument structure deficits, e.g. the absence of a particular argument structure type, could be epiphenomenal on lexical limitations. To test the Rice and Bode claims concerning GAP verbs, video clips were constructed. These pictured actions which could be labelled by a GAP verb, e.g. *put* or a verb with a more restricted reference, such as *stand*, *hang*, *pour* (Ingham et al., 1998; de Jong, 1999). It should be added, this being a cross-linguistic study, that English and Dutch organise this part of the lexicon differently.

Verb argument structure alternation. A further aspect of the knowledge of argument structure concerns argument structure alternation – the potential for a verb to link thematic roles to different positions in syntactic structure. Pinker (1989) suggested that alternations would be learned by semantic bootstrapping: children use detailed semantic knowledge to

predict the behaviour of lexical verbs. Rice commented that those resources (as well as those used in syntactic bootstrapping) would be less accessible for children with SLI. In using video sequences of actions each biased to elicit one of the alternants, we investigated three types of alternation: the causative-inchoative alternation, the locative alternation and the dative alternation.

The causative alternation involves the expression of the theme of the verb as either the subject or the object of the sentence: *the car moves* / *he moves the car.* Because alternation was the desired response, each verb item was presented in two separate settings. In one segment, the action was shown in the presence of the agent (with the causative - transitive - verb frame as the target outcome); in the other, the inchoative frame was encouraged by showing the referent of the theme only. For instance, the alternation for *move* was elicited by a clip in which a car was seen moving in the absence of a visible agent, and one in which the car was visibly manipulated (moved) by an agent.

The production of resultative verb phrases. Watkins & Rice (1991) found that children with SLI performed significantly worse than both age matched and language age matched typically developing (TD) children on argument structures with resultative particles (e.g. *kick off the shoe/kick it off*). In our collaborative study we extended the use of resultatives, one type of which included items with non-canonical linking. This can be illustrated by one of the actions pictured in the task (for a more elaborate description, see Ingham et al., 1998; de Jong, 1999), in which the video clip shows a boy shaking a tree from which a ball falls out. Verb complementation here may be complicated by the fact that the target direct object, *ball*, is not directly manipulated in the course of the action. Nevertheless this non-canonical theme has to be linked to the direct object position, and the canonical theme, *tree,* linked to a prepositional phrase.

The complexity of the structure is characterized by Ingham al. (1998) as follows: ´The syntactic structure of resultative VPs (…) involves a complex dependency relation between the verb, the direct object NP and the oblique constituent (PP or particle, together expressing an action and the result of that action. (…) (the action verbs (..) do not by themselves express a resultant state.´ (Ingham et al. 1998: 93-94). The word dependency is worth stressing. Van der Lely (1994), who also investigated argument structure (in particular non-canonical linking) has formulated a Representational Deficit for Dependency Relations (RDDR) in SLI. This account claims that dependency relations (subject-verb agreement, but also the relation between a verb and its arguments) are disproportionally affected in SLI. This remains the only theoretical account of SLI that explicitly predicts difficulties with argument structure.

2.2. The Reading- Groningen study: some outcomes

Results from the Reading-Groningen study were previously reported separately for English (Ingham et al., 1998) and Dutch (de Jong, 1999). Here, we will make a comparison between the results from both studies. A full comparison will not be possible, since not all items were identical, due to differences in lexicalisation between the languages and some differences in methodology between the studies. We will restrict ourselves to those items for which a genuine comparison is possible. To address our research questions, we needed to identify children with specific language impairment and typically developing children as controls, in both languages. Children with SLI between 6 and 8 years old constituted the group of interest in both English and Dutch. We also selected typically developing groups for comparison. In English there were three TD groups – one was matched for chronological age, another was MLU-matched, and a third group was matched on vocabulary age. In Dutch there

was one TD group, matched on vocabulary age (for full details see Ingham et al., 1998 and de Jong, 1999). Results for the domains outlined earlier are as follows:

Verb specificity. Here we find comparable results between the languages for ´put verbs´ (Levin, 1993). The English manner verbs included in the experiment are (Dutch equivalents between brackets): *sew* (naaien), *hang* (ophangen), *pour* ((in)schenken, gieten), *stick* ((op)plakken, lijmen), *pin* (opprikken). The translations show that the specific verb in Dutch often involves a particle (like in-, op- (*in, on*)). The descriptive categories that were used to code the children's responses were as follows:

troponym : a semantically specific verb that reflects the manner of the action as well as the core meaning (Miller and Fellbaum, 1991);

hypernym : a general verb, not specified for manner. This verb is hierarchically higher than the troponym;

mismatch: a verb that is semantically related to the target, but has different manner features - the manner is misinterpreted by the child;

irrelevant: a verb that reflects an aspect of the action that was not targeted and that is not covered by the target verb (unlike a mismatch, this verb has no troponymic relationship to the target's hypernym);

responses without a verbal predicate: the child produces one or more constituents (arguments) but omits the verbal predicate that plausibly projects them.

Short scenes designed to elicit the target manner verbs were constructed, and tested first on an adult group, to confirm the validity of the task. In both languages adults overwhelmingly preferred troponyms to the hypernym *put* or *doen.* Here are some examples of the actions pictured in the video clips:

stick: A boy sticks pieces of card onto a large piece of paper.

pin: A man pins a piece of paper onto a notice board.

sew: A woman sews a button onto a coat.

hang: A man hangs a camera by its strap on a hook on the back of a door.

pour: A man pours milk from a jug into a cup of tea.

The outcomes for the Dutch and English data were very much in agreement. Manner verbs were used less often by English or Dutch children with SLI than TD controls. Rather than describing the action in the video clip with the specific target verb, they would either use *put/doen*, produce mismatches or one of the other response categories.

The conclusion here is that there is indeed a tendency among children with SLI to name actions in a less specific manner[2], implying weak representations for some verbs in their lexicon. A further finding from this part of the study implies that this can have possible effects on syntax. When we compare verb complementation for troponyms and hypernyms, we find that arguments are produced more consistently for hypernyms.

Verb alternations. The alternations considered in this phase of the study were causative-inchoative, locative and dative. King et al. (1995; summarised in Fletcher, 2009) found that in English children, elicitation of alternating argument structures resulted in children with SLI preferring one alternant: in contrast to the younger typically developing children, across all alternations the children with SLI tended to prefer one description for both scenes they saw. In the causative-inchoative case, the preferred version was causative, with agent as subject and the theme as direct object, as in the *the man moved the car*. In the Dutch group, TD children produced twice as many instances where both alternants were expressed, compared

[2] Theakston et al. (2004:89) dispute the preference for ´light verbs´ in TD children, claiming that ´rather than children's early verb learning depending on the semantic generality of the verbs in question in a way that specifically aids early verb learning, children are learning verbs they hear in the input as a function of their relative frequency.´

to the children with SLI. In the dative alternation (*he gave a flower to the girl*/*he gave the girl a flower*) children with SLI were prone to omit one of the arguments (most often the goal). When they did – infrequently -- supply both arguments, they predominantly used the prepositional dative, like their TD peers. The final alternation of interest was the locative, using verbs such as *load*, *rub*, which have a complex complementation: *she loaded the truck with bricks*, *she loaded bricks onto the truck*. Children with SLI were limited in their ability to use both alternants, and in fact tended not to realise both arguments. If they used an argument at all it tended to be the direct object as goal e.g. *she loaded the truck* / *ze laadt de kar in* (in the Dutch version a particle is required). The conclusions here differ according to the alternation involved. For the causative-inchoative alternation children with SLI are more comfortable with the causative version, which in naming the agent maintains a canonical transitive structure. For the dative and the locative, the complexity of the complementation appears to affect the performance of children with SLI, as with the manner verbs in the previously discussed task.

The production of resultative verb phrases. The results from these studies in the two languages showed that children with SLI are significantly less likely than their TD peers to use complex resultative VPs. The methodology again involved children describing video clips, and again adult responses guaranteed the validity of the task. Here is the full set of verbs and the scenes they described:

> *Kick:* A man kicks a football so that it comes to rest under the rear of a stationary car. *Target sentence*: The man kicked the ball under the car.
>
> *Sweep:* A man sweeps a pile of leaves that is standing on a lawn so that they go under a nearby bush. *Target sentence*: 'The man swept the leaves under the bush.
>
> *Cut*: A girl cuts a string that is attaching a small toy rabbit to the back of a rucksack

worn by another child. *Target sentence*: The girl cut the rabbit off the rucksack.

Knock: A man accidentally brushes against a garden table, and a large cardboard box, which is on the table, falls off it. *Target sentence*: The man knocked the box off the table.

Blow: A bay blows a balloon from one side of a fence over to the other. *Target sentence*: The boy blew the balloon over the fence.

Shake: A boy shakes a small tree so that a ball falls down on the ground. *Target sentence*: The boy shook the ball out of the tree

All of the target sentences, in both languages, involved complex verb phrases (VPs). A comparison of the participant English groups found that the children with SLI had very limited complex VP responses. They produced VPs with two arguments at about one third of the rate of their peers who were matched on vocabulary age. The pattern for the Dutch children with SLI was not dissimilar, with complex VPs being supplied at a slightly higher rate than in English, but still significantly below that of their TD peers.

3. Discussion

The results from the Reading-Groningen study provide strong support for the profile of difficulties with verbs that were predicted by Rice (1991). They also make clear that the grammatical problems of children with SLI go beyond morphology, in contrast to the claims made by Gopnik (1990). It seems clear from the results of our studies that the control of complex verb complementation also constitutes a locus of difficulty for these individuals. We might express one generalization from the data in this way: children with SLI find the projection of the arguments of ditransitive verbs problematic. An exception to this is if the verb in question is a hypernym like *put* or *doen*, for which children with SLI are able to supply

NP + PP sequences. This is one indication that our findings with regard to fewer arguments from children with SLI are not attributable to a general shortening of sentences. How far are these issues from the previous century reflected in later research in relation to children with language impairment?

The short answer is that, regrettably, not a great deal of investigation into argument structure problems has ensued, but we can review the most relevant studies here. One important study which covers the same ground as ours but uses narrative language samples comes from Elin Thordardottir and Ellis Weismer (2002). While recognizing that children with language impairment sometimes make argument structure errors in their spontaneous output (e.g. Fletcher, 1992), they see the need to analyse the diversity of argument structure. In their study the ground that we covered experimentally is explored via the stories children tell. The children with SLI in their study were on average 7 years 9 months, so about a year older than our groups. The narratives the children produced were analysed for the thematic roles that arguments realized (theme, goal, agent etc.), the diversity of argument structure (one-place, two-place and three-place predicates) and verb alternations. There were two control groups, one matched for chronological age and another by mean length of utterance (MLU). Elin Thordardottir and Ellis Weismer (2002) found that children with SLI used significantly fewer argument types, argument structure types and verb alternations than age-matched controls. In a conclusion that resonates with our own, they write:

> These findings suggest that the impoverished argument structure use of school-age children with SLI is not merely attributable to production limitations such as utterance length, and that these children may have only partial representations of complex verbs, resulting in overall correct but less sophisticated use of verbs. (2002, p.246).

Ebbels (2005, reported in Ebbels et al., 2007) found that errors with the linking of arguments to correct syntactic positions were more common, in older children with SLI, with change-of-state verbs (like *fill*) than with change-of-location verbs (like *pour).* In an intervention study whose pre- and post-test consisted of a video elicitation procedure very similar to our own, Ebbels et al. (2007) enrolled children with SLI (aged between 11 and 16 years) for therapy. The therapy concentrated, via two intervention methods, on the provision of obligatory arguments and the linking of arguments to the correct syntactic positions. They also looked at verb alternations. We will ignore the intervention study but the pre-test results give an indication of the problems that these older children with SLI present with. These confirmed the advantage seen in Ebbels (2005) for change-of-location over change-of-state verbs. Also, if a verb required both NP and PP complements, PPs were more vulnerable. This is a finding which echoes our results for verb complementation.

Murphy (2012) also addressed verb argument structure in an elicitation task. She identified subtypes in her SLI group, one of them being a group of children that showed ´difficulties across sentence production operations with good semantic knowledge´. For these children, ´their errors might be better explained by poorly established knowledge of more complex verb argument structures and/or syntactic frames, which results in omissions and errors at the point where lemmas are mapped to syntactic functions.´ (Murphy, 2012: 197). The implication here is that – contra (or complementing) what we mentioned earlier (´weak representations for some verbs in their lexicon´) – argument structure problems may also occur in the absence of ´poor verb lexical development´ and can be caused by shortcomings in the sentence production process. Murphy refers to the work of Van der Lely (1994) and Ebbels et al. (2007) in claiming that ´argument structure problems cannot be attributed solely to lexical deficits.´

To summarize, we can certainly claim that verb argument structure is a vulnerable area in SLI. However, apart from some notable exceptions, it is relatively ignored in research and in diagnoses of language impairment. This is surprising, given the (pivotal) role that Rice (1991) attributes to verbs in the symptomatology of SLI. Rice´s chapter can be read as a research agenda, but has had a modest follow-up.

There are several explanations for the relative lack of research on argument structure. One of them is the strong focus in the field on verb morphology at the expense of sentence structure (see also Fletcher, 2009). Another explanation is the common assumption that verb mastery constitutes only a lexical issue and if it is tested, it is done in vocabulary tasks. Assessment of verbs ´in context´ (i.e. with their arguments) is difficult due to a lack of diagnostic materials. Argument structure is at the interface of syntax and semantics. The strict separation between measures for lexicon and syntax prohibits adequate analysis of argument structure. Finally, apart from van der Lely´s (1994) RDDR theory, there are no readily available frameworks for describing and explaining argument structure problems. This lack of theoretical interest has certainly discouraged researchers from addressing argument structure.

The obvious conclusion is that argument structure in SLI is a field that deserves fresh attention, in research as well as diagnostics, if only to move away from a symptom profile of SLI that focuses on morphology almost exclusively. A methodological concern, however, is the proper analysis of argument structure. Research on morphology has put strong emphasis on errors: the omission or substitution of morphemes in obligatory contexts. While errors in argument structure are found, difficulties in this domain also show as a lack of complexity. We have shown here that verb complementation by children with SLI may not always be ungrammatical, but it is certainly sparse. Research as well as diagnostics should take this into account.

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