Specific language impairment in children: research findings and their therapeutic implications

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ABSTRACTS

This paper reports the findings from a research project investigating a subgroup of specifically language-impaired (SLI) children. The subgroup of SLI children consists of those characterised by persisting grammatical deficits in comprehension and expression of language. The paper summarises the findings in order to highlight the therapeutic implications from the investigations. The main focus of the investigations was to characterise the SLI children's grammatical knowledge of sentence comprehension, specifically their ability to learn the semantic and syntactic properties of verbs. In addition, an investigation of verbal short-term memory (STM) was carried out, and an analysis was undertaken of the expressive morpho-grammatical characteristics of the children. The investigations revealed that the SLI children did not differ in their STM abilities from children carefully matched on language abilities. Thus, the data do not provide support for therapy directed at increasing auditory memory with an aim of improving expression or comprehension of sentences. It is hypothesised that the SLI children have a deficit in syntactic representations and are unable to specify the structural relationships between constituents in syntax. The implications of the study are that this subgroup of SLI children may be unable to use syntactic cues to help learn semantic properties of verbs, but semantic cues may facilitate learning the syntactic properties of verbs.

L'article rend compte des résultats d'un projet de recherche qui s'est intéressé à un sous-groupe d'enfants souffrant de déficiences linguistiques à spécifiques (DLS), caractérisées par des déficits grammaticaux persistants dans la compréhension et l'expression du langage. Le résumé des résultats que l'on donne ici de cette étude doit servir de base à des implications thérapeutiques. Les recherches ont eu pour but principal de définir les connaissances grammaticales des enfants atteints de DLS, en ce qui concerne la compréhension des phrases et les capacités de ces enfants d'apprendre les particularités sémantiques et syntaxiques des verbes. En plus l'on a examiné leur mémoire verbale à court terme et analysé leurs caractéristiques expressives morpho-grammaticales. Les recherches ont montré que les capacités de mémoire à court terme des enfants atteints de DLS n'étaient pas différentes de celles d'enfants soigneusement appariés du point de vue des capacités linguistiques, de sorte que les résultats ne justifient pas les thérapeutiques qui s'efforcent d'augmenter la mémoire auditive en vue d'améliorer l'expression ou la compréhension des phrases. L'hypothèse que l'on avance est que les enfants atteints de DLS souffrent d'un déficit de représentations syntaxiques et sont incapables de spécifier les relations structurales entre les constituants de la syntaxe. Les implications thérapeutiques suggèrent que ce sous-groupe d'enfants atteints de DLS sont peut-être incapables d'utiliser des indices syntaxiques pour apprendre les propriétés sémantiques des verbes; mais les indices sémantiques peuvent faciliter l'apprentissage des propriétés syntaxiques des verbes.

Dieser Aufsatz berichtet von einem Forschungsprojekt, in dem eine Untergruppe spezifisch sprachbehinderter (SSB) Kinder untersucht wurde. Die SSB-Untergruppe bestand aus Kindern,
This paper is based on the findings from my investigations into a subgroup of specifically language-impaired (SLI) children. One aim of this work has been to further theoretical knowledge about the underlying nature and cause of SLI in children and the mechanisms of language acquisition. However, another important aim is to help facilitate appropriate remediation for children with SLI. This paper provides a summary of some of the findings as a background to therapeutic implications which have arisen from this work.

**BACKGROUND AND UNDERLYING ASSUMPTIONS**

**Specific Language Impairment: A Multi-syndrome Disorder**

Approximately half a million children between the ages of 3;0 and 16;0 years suffer from speech and language impairments in the absence of any hearing loss, mental handicap or physical or emotional disorders (AFASIC, 1989). However, it is now recognised that SLI children are heterogenous. Moreover, it is probable that SLI in children consists of many syndromes with different underlying or ‘core’ deficits.

Subgroups of SLI children have been identified which may be differentiated by different linguistic characteristics. These subgroups include the semantic-pragmatic SLI (Bishop & Adams, 1989), those with primarily phonological SLI (‘speech’ and ‘speech plus’, Haynes, 1992), and those with primarily grammatical SLI (‘classic SLI’, Haynes, 1992). More recently a group has been found who are characterised as having a ‘familial aggregation’ (Gopnik & Crago, 1991). This indicates that there could be a genetic basis to this group’s language impairment and possibly other subgroups of children with SLI. Clearly contrasting characteristics distinguish some groups. For example, the semantic–pragmatic SLI children and the grammatical SLI children may be distinguished by relatively spared syntactic processing versus impaired...
syntactic processing respectively.* (For further details of the characteristics of these SLI groups see Adams & Bishop, 1989; Bishop & Adams, 1989). Other categories of SLI appear to share a pattern of linguistic performance and differ only in the degree of impairment in different subcomponents of language. For example, children with a primarily expressive, phonological impairment, typically also have some deficit in syntactic comprehension (Adams, 1990; Haynes, 1992) and those with a primarily syntactic impairment often show (or previously showed) some phonological impairment. It is, as yet, unclear to what extent the underlying causes of the impairment in these subgroups may be related. Thus, detailed description is required to identify which group of SLI children is under investigation.

Subject Description
The group of SLI children that I have been investigating are those characterised primarily by persisting grammatical deficits in both expression and comprehension of language. There is some indication that these children may be particularly likely to have a family history of SLI, e.g. an uncle or brother may also be affected (Haynes, 1992). Thus, it is indicated that there could be a genetic basis to their disorder. However this suggestion awaits further research.

A ‘thumb-nail’ sketch of the selection criteria and typical characteristics of the group of SLI children is provided in order that the reader may identify other similarly impaired children. However, the reader is referred to the references for more detailed subject description including the raw data from standardised tests.

First, all the children had been identified by speech and language therapists as having persistent difficulties with language comprehension, i.e. their scores fell by more than 1.5 standard deviations below the expected normal range of abilities on some standardised tests, and they were being educated in language units. In addition two tests of comprehension – the Reynell Developmental Language Scales (Reynell, 1985) and the British Picture Vocabulary Scale (Dunn, Dunn, Whetton & Pintilie, 1982) – and two tests of expressive language – the Grammatical Closure sub-test from the Illinois Test of Psycho-linguistics Abilities (Kirk, McCarthy & Kirk, 1968) and the Naming Vocabulary from the British Abilities Scales (Elliott, Murray & Pearson, 1978) – were administered to provide a uniform measure of language abilities (see van der Lely and Harris, 1990). Non-verbal abilities of all the children fell within the normal range using standardised performance IQ tests (e.g. WISC-R; Wechsler, 1976). The SLI children were aged 6;1 to 9;6 years and their language ages ranged from 3;7 to 6;5 years. SLI children were excluded from the study if they displayed any of the following characteristics: articulatory dyspraxia; phonological impairment of the severity making speech partially unintelligible and/or frequent omission of final phonemes; or any mild autistic-like behaviours (typically characteristic of semantic-pragmatic SLI children).

* This is, of course, a gross generalisation and simplification of the differences between the groups but is useful for basic identification purposes.
For the initial investigations there were 16 SLI children who were matched to 24 language–age control children on the basis of three standardised tests of language (van der Lely & Harris, 1990). Later investigations involved six SLI children who were selected from the larger group and were representative of the group as a whole. The six SLI children (five boys and one girl) were each carefully matched to three language–age controls on the basis of the raw scores from the three language tests cited above (i.e. all the tests except the Reynell Developmental Language Scale) (see van der Lely, 1992; van der Lely & Howard, 1993).

**INVESTIGATIONS**

The main focus of the investigations was to characterise the SLI children’s grammatical knowledge about sentence comprehension and their ability to learn the semantic and syntactic properties of verbs, which enables correct expression and comprehension of a verb in varying syntactic frames. In addition, an investigation of verbal short-term memory was carried out and an analysis undertaken of the expressive morpho-grammatical characteristics of the children based on the data collected in the investigation of the semantic and syntactic properties of verbs. The findings from these last two areas will be reported first.

**Expressive Language**

Although expressive language was not explicitly studied, the details given below of the morpho-grammatical characteristics of the SLI children’s language may provide additional cues to identifying the type of SLI children in this study. As previously found by other researchers (e.g. Johnston & Kamhi, 1984; Leonard, 1989; Gopnik, 1990) this group of SLI children’s expressive deficit was most pronounced in the morpho-grammatical aspects of language. Previous research has shown that their expressive deficit is not uniform. For a given area of language, e.g. inflectional morphology, some structures are impaired whereas other areas are not impaired (Clahsen, 1989; Leonard, 1989; Rice & Oetting, 1991; Bishop, 1992a,b). For example, subject–verb agreement {-s}, which is dependent on the number of the noun (She jumps/They jump) is impaired whereas noun plural {-s} (dog/dogs) is not impaired over and above their general language abilities (Clahsen, 1989; Rice & Oetting, 1991; Clahsen, Rothweiler, Woest & Marcus, 1992).

An analysis was carried out on data collected during a description of a scene in which a novel verb had been taught. The task involved the children watching the experimenter act out with toys the meaning of a novel verb, e.g. a boy was made to jump up and down on a girl’s back. This was accompanied by the experimenter say ‘This is zeking’. Following three practice demonstrations, a further three demonstrations were given, each accompanied by a question. The questions were:

1. ‘Tell me what’s happening.’
2. ‘Tell me about the boy’ (or whoever the agent was).
3. ‘Tell me about the girl’ (or whoever the patient was).
An example of one set of responses given by one of the control children was:
1. ‘The boy’s zeking.’
2. ‘The boy is zeking the girl.’
3. ‘The girl is being zeked by the boy.’

Analysis of the SLI children and language–age (LA) control children’s responses revealed that the frequency of morphological errors in relation to the total number of responses was considerably higher for the SLI children than for the LA matched controls (8.26% and 2.70% respectively) (van der Lely, 1992). Furthermore, the SLI children’s errors showed differences in comparison with those made by the LA controls. Three of the six SLI children did not inflect the verb to achieve correct subject–verb agreement and/or used the -ing form of the verb (e.g. zeking) with ‘by’ when, possibly, trying to form a passive sentence (e.g. ‘The man is zeking by the girl’). One SLI child only used the novel verb in the form demonstrated (e.g. ‘zeking’). These morphological errors suggest that the SLI children have difficulties analysing the form into a stem (zek) and affix (-ing) and the re-inflecting the stem with a zero, {-ed} or {-s} affix. In contrast, the matched LA controls generally gave correct responses, as illustrated above, and did not make any of the type of errors illustrated for the SLI children. Thus, the expressive characteristics shown by the SLI children in this study concur with those of the previous studies cited above.

Short-term Memory
An investigation was carried out to see if this group of SLI children differed from children matched on language abilities in their memory for linguistic material. The linguistic requirements of the test procedure, the characteristics of the test materials and the development of linguistic representations were considered. Two experimental tasks were used: a verbal repetition and a picture pointing procedure. The tasks used auditory presentation and were designed to explore different underlying processes during immediate recall. The linguistic characteristics of the test materials were designed to explore the influence of semantic, lexical and phonological factors on short-term memory (STM). Therefore, recall of lists of unrelated words (e.g. bed, pen, doll, pig) were compared with semantically similar words (e.g. mouth, eyes, nose, head), non-words (e.g. sart, bof, neek, tem) and phonologically similar words (e.g. rat, hat, mat, cat). Previous research (e.g. Baddeley, 1986; Hulme & Tordoff, 1989) showing poorer recall performance for non-words in comparison to real words, and semantically similar and phonologically similar words in comparison to dissimilar words, has been interpreted as indicating the influence of lexical, semantic and phonological knowledge and processing on STM.

The findings from this investigation showed that both the SLI children and the LA control children were differentially influenced by the materials as a function of the test procedure (see van der Lely & Howard, 1993). Recall of words was not significantly worse for semantically related lists of words than unrelated lists in STM tasks using either a picture pointing or a verbal repetition paradigm. Thus, the results indicate that semantic–cognitive
processing is not primarily used by SLI children in immediate recall of words in a picture pointing task or a repetition task. The results showed that for both groups non-words were recalled less well than words in the repetition task, indicating sensitivity to processing of the lexical characteristics of the test material. Finally, phonological processing was found to influence recall in the picture pointing and repetition paradigms. These findings concur with many previous findings from investigations of adults and children developing normally and may be taken to indicate the linguistic–phonological nature of short-term storage of speech sounds (see, for example, Baddeley, 1986).

Perhaps one of the most surprising and important findings from the investigations of STM in this group of SLI children was that the subject group and individual subject analyses revealed no significant difference between the performance of the SLI children and LA controls. This finding contrasts with many previous findings in which an impairment in immediate recall has been attributed to defective STM or subcomponents of STM (Eisenson, 1972; Gathercole & Baddeley, 1990). Van der Lely and Howard claim that the reason for these apparently conflicting results may be attributed to the cognitive and linguistic demands of the experiments and the test materials. It is claimed that the linguistic abilities of the SLI children also contribute to their performance in immediate recall of linguistic material. Performance in skills apparently unrelated to SLI children's developmental language deficit may, on closer inspection, be attributed to their underlying linguistic impairment. In addition, these data further indicate heterogeneity in the SLI population and suggest that different subgroups of SLI children show different patterns of STM abilities. Thus, it is possible that the SLI groups in Gathercole and Baddeley's study differed in both their STM abilities and their linguistic abilities.

The data from this investigation suggest that caution should be exercised in relation to hypotheses which indicate a causal relationship between a memory deficit and SLI in children. It appears that this hypothesis cannot be generalised to SLI children as a whole.

**Sentence Comprehension and Learning the Semantic and Syntactic Properties of Verbs**

Recent studies, including the investigations from this project, have highlighted consistent deficits in SLI children's comprehension of sentences. The most significant findings to be revealed by these data are the following:

1. Children previously classified as suffering from an expressive disorder as well as those with a receptive language disorder are usually impaired in their comprehension of sentences (Bishop, 1979; Adams, 1990).

2. The deficits have been found for complex sentences such as passive and embedded sentences (Bishop, 1982; van der Lely & Harris, 1990) and also simple active transitive sentences (van der Lely & Dewart, 1986; van der Lely & Harris, 1990).

3. Particular difficulties have been found for semantically reversible sentences in which word order is particularly important in signalling the relationship between syntactic and semantic thematic roles. The SLI children's performance in these studies has been characterised by an overall high
number of errors, inconsistent use of word order and a high proportion of ‘word order errors’, i.e. when (correct) assignment of thematic roles (e.g. agent, patient/theme) to syntactic functions such as subject/object is reversed. For example, on hearing the sentence ‘The lorry is hit by the car’, the SLI children would make the lorry hit the car.

4. Finally, SLI children’s comprehension deficits have been found for a variety of sentences (transitive, locative and dative) (van der Lely & Harris, 1990).

A further study was undertaken to establish if this group of SLI children’s superficial difficulty with word order in the comprehension of reversible sentences could be attributed to faulty ‘mapping mechanisms’ for learning verb–argument structure.

In the developmental literature concerning learning, the semantic and syntactic properties of verbs in relation to their verb–argument structure, linking or mapping of thematic roles (e.g. agent, patient) to syntactic structures (e.g. subject, object) is seen as crucial (Pinker, 1984; Bowerman, 1990). The importance of semantic knowledge in learning the mapping relations between semantic and syntactic structure has been emphasised by, for example, Bowerman (1982) and Pinker (1984, 1989), who propose that verb meanings are learned from real-world observations. Specific ‘linking rules’ then map the semantic thematic roles onto syntactic functions, based on regularities between the semantic and syntactic structure. For example, a predicate such as the verb ‘hit’ has two open arguments and the thematic roles agent and patient (see (1) below). Therefore, for this ‘causal’ predicate the thematic roles agent and patient are mapped onto the subject and object respectively in simple active sentences.

1. ‘HIT’  
<agent, patient>  
[Subj, Obj]  
‘The boy hits the girl’

However, as can be seen in (2) and (3) below some verbs, such as intransitive predicates (e.g. ‘yawn’) have only one open argument, whereas dative verbs such as ‘give’ have three.

2. ‘YAWN’  
<thing/agent>, manner/‘yawning’  
[Subj]  
‘The boy yawns’

3. ‘GIVE’  
<agent, theme, goal>  
[Subj, Obj, Oblique Obj]  
‘The boy gives the car to the girl’

It can be seen that for causative predicates occurring in active sentences, the agent is linked or mapped onto the subject, the patient to the direct object, and the goal to the indirect or oblique object. Semantic bootstrapping (Pinker, 1984), i.e. ‘forward linking’ (in which semantic cues are used to map from semantics to syntax), may be used in the absence of linguistic experience of the syntactic frame in which the verb could occur. For example, a child may hear the verb ‘carry’ accompanied by an observation of the appropriate event. This may or may not be accompanied by a range of different sentences.
However, by observing the event the child could deduce that the verb has two arguments (an agent/the carrier, and patient/the person or thing carried), and that ‘carry’ represents some kind of ‘CAUSE’ predicate. With the application of linking rules for the predicate CAUSE the child could then map the thematic roles onto a syntactic structure such as ‘the man is carrying the little boy’. Thus, this ‘productive learning’ (Pinker, Lebeaux & Frost, 1987) enables the child to express the meaning of a verb in a sentence appropriately without previously hearing it in a sentence.

An alternative mechanism which may also guide the child to the correct representation of the semantic–syntactic properties of verbs is the use of syntactic cues to map from syntax to semantics (Landau & Gleitman, 1985). There are two different ways these syntactic cues may be used: one is in ‘reverse linking’ (Pinker, 1989), the other is in ‘syntactic bootstrapping’ (Landau & Gleitman, 1985). In either case the child is required to attend to the linguistic input, i.e. the syntactic subcategorisation frame in which the verb occurs. Pinker (1989) proposes that for reverse linking the child ‘runs linking rules backwards’ and deduces the possible semantic roles (e.g. agent, theme) based on the syntactic functions (Subject, Object) in the input sentence and the regular or typical relationship between semantic and syntactic roles. For syntactic bootstrapping it is mandatory that both the observable event and the syntactic structure occur simultaneously. However, this is not so for reverse linking, which may occur in the absence of an observable scene. Therefore, prior semantic information may not be available. Reverse linking may be taken as productive learning from syntax to semantics, i.e. learning from ‘rules’ or based on previous general experience rather than explicit examples or evidence. This study investigated reverse linking which provided the opportunity to tap the underlying syntactic representational ‘knowledge’ of the child and thus assess whether the subgroup of SLI children were able to specify the syntactic cues from an utterance.

Because there are no semantic cues to constrain the possible meanings of the verb in reverse linking, I proposed that additional specification of the syntactic cues is needed in reverse linking which may not be necessary in forward linking (semantic bootstrapping) or syntactic bootstrapping (see van der Lely, 1992). In reverse linking it is insufficient to merely parse or identify a phrase in a sentence into, for example, the first NP (noun phrase); the child also needs to ‘know’ that this first NP is the subject of an active transitive sentence. Another reason for the need for additional syntactic specification is the many-to-few mapping between thematic roles and syntactic functions: if something is the agent in an accusative language it is almost certain to be the subject in a simple active sentence. However, if something is the subject it may not be the agent, but it could be the recipient (e.g. receive) or a location (e.g. contain) etc.

In summary, I have proposed that the syntactic cues involve specific identification of each and every argument position (e.g. NP–subject vs NP–object) within a particular syntactic frame (e.g. transitive active vs transitive passive). For example, in a sentence with a novel verb, such as ‘the lorry rits the car’, the ‘car’ would be identified as the subject-first NP in a transitive active sentence.
Three experiments were undertaken to investigate productive forward linking (from semantics to syntax) and productive reverse linking (from syntax to semantics). In experiment 1 – forward linking – the children described an event which demonstrated the meaning of a novel verb. Experiment 2 – a comprehension task – required acting out sentences containing the newly learned verb. In experiment 3 – reverse linking – the child made up, and acted out, an event that went with a novel verb in a sentence, assigning thematic roles (e.g. agent, theme/patient) on the basis of the syntactic frame (e.g. active transitive, passive transitive etc.). For example, the child heard the sentence ‘The car hits the lorry’ and (based on reverse linking) had to assign the car an agent role and the lorry a patient role, and then make up an action which conformed to this mapping such as getting the car to tap the lorry making it move sideways. Significant differences between the performance of the SLI children and LA controls were only found for experiment 3, reverse linking. The normally developing children, matched on language abilities to the SLI children, showed a good use of productive forward and reverse linking. The SLI children also demonstrated good productive forward linking, but were significantly worse at reverse linking. For example, for the test sentence given above, instead of making the car do something to the lorry, they made the lorry do something to the car. Individual subject analysis showed that all six SLI children were at a chance level of performance on the reverse linking task. From an analysis of the errors, van der Lely (1992) argued that the data suggest that the specification of the syntactic–structural relationship between the verb and its arguments by the SLI children is in some way insufficient to enable differential identification of the NPs, i.e. as subject-first NP and object-second NP. Thus, the SLI children appear unable to specify the syntactic cues to identify a particular syntactic frame and activate assignment of the thematic roles to syntactic functions based on linking rules. Further specification and discussion of the linguistic differences between forward and reverse linking, and a hypothesis about the underlying deficit in this group of SLI children, may be found in van der Lely (1992).

Two alternative proposals are made which can account for the defects found in this group of SLI children. One possibility is that the SLI children have a deficit in the area of syntactic ‘government’ (i.e. broadly speaking, the building of structural relationship between constituents within a clause) which underlies c (categorical) selection. Thus, the linguistic specification required for reverse linking may be provided by syntactic government (Chomsky, 1981, 1986) which differentially ‘marks’ the noun phrases in a sentence (e.g. subject NP vs object NP) through categorical selection (c selection) (or subcategorisation) and enables correct assignment of the thematic roles to the subject and object (Chomsky, 1986). Without this particular specification each noun phrase within, for example, an active transitive sentence would not be uniquely identified. Therefore, there would be nothing to determine which thematic role should be assigned to which NP. Of course, some non-linguistic strategy such as a ‘word order strategy’ (e.g. first NP = agent) could be used. However,

* See Haegeman (1991) for an introduction to ‘government’ and government and binding theory.
such a linear-based strategy would provide insufficient identification of the relationship between sentence constituents in anything but simple sentences, e.g. it would not work for passive, or cleft sentences. If a word order strategy was used for passive sentences they would make the first NP (the patient/theme) the agent and the second NP (the agent) the patient/theme.

The hypothesised deficit in government makes clear predictions, but these involve a very broad range of syntactic processes. Thus, caution is expressed in relation to the hypothesised deficit. However, it would be predicted that the children would have problems with, for example, case assignment (e.g. the nominative/accusative ‘him/he’ distinction associated with subject vs object syntactic positions respectively), thematic role assignment as discussed above, the distribution of the empty category PRO (i.e. subjects of infinitives and potentially noun phrases: ‘John wanted [PRO to go]’), Spec head agreement (e.g. agreement of number between the determiner and NP ‘the boys/a boys’), and binding theory (which states the syntactic principles that determine pronominal reference in sentences such as ‘John said Paul hit him/himself’), as well as with c (categorical) section. However, other syntactic modules may be intact, such as the X-bar module (phrase structure), which could provide elementary hierarchical structure through lexical categorisation.

The second possibility is that the SLI children lack (some) syntactic functional categories. Recent developments within the maturational approach to language acquisition have suggested that normally developing children initially lack functional categories (determiner phrases, inflectional phrases and complement phrases) and that these develop around 18 months to 2 years (Radford, 1990). For example, young children omit determiners such as ‘the’, ‘a’ and ‘these’; inflections such as the auxiliary ‘is’ or the inflectional /s/ on the verb ‘jumps’, signalling subject–verb agreement, or complements such as ‘if’, ‘because’ or ‘whether’. Considering SLI children to be at a pre-functional stage of language acquisition, with lexical though not functional categories (but, it must be remembered with more advanced non-linguistic cognitive abilities and general experience than children usually at such a stage of language development) can account for the data from these investigations and those showing deficits with aspect of inflectional morphology (e.g. problems with case, gender and agreement) found in previous studies (e.g. Clahsen, 1989; Bishop, 1992; Clahsen et al., 1992).

At present it is not possible to conclude whether the apparent deficit in forming and specifying the structural relationships between constituents in the syntax, which was indicated by the SLI children’s performance, is due to an underlying deficit in the area of government or locality or whether it is due to a lack of (some) functional categories themselves. However, it does appear that the ability to identify syntactic structural relationships of constituents within a particular syntactic frame can explain the data from these investigations. However, it is only with further research testing of this hypothesis (which is currently being undertaken) that this claim will be able to be

* The functional system corresponds roughly to closed class words and morphemes and incorporates purely syntactic notions such as syntactic agreement, case, gender and tense.
substantiated. In addition, it has yet to be established whether the hypothesised
deficit is ‘domain specific’ to just grammatical representations, or restricted
to specific modules within grammar, or whether it is a more general linguistic
deficit for dependent structural relationships between representations.

THERAPEUTIC IMPLICATIONS
The results of the investigations presented above have clear, but tentative,
implications for therapy. One may optimistically hope for a symbiotic relation-
ship between treatment and an increase in knowledge enabling a clearer
definition of the underlying nature and cause of SLI in children. However,
before discussing the therapeutic implications it is necessary to state some
underlying assumptions (which it is acknowledged are a contentious issue!)
that influence directly the basis for treatment, i.e. (1) to provide symptomatic
treatment of the deficit or (2) to use the linguistic strengths of the child to
facilitate learning.

First, the assumption concerning the relationship between language and
general non-linguistic cognitive processing is considered. It is a debatable point
whether or not specific aspects of language (e.g. syntax or modules within
syntax) are ‘modular’ and, by implication, qualitatively different from other
aspects of language, such as semantics or pragmatics, and non-linguistic
processing, i.e. if syntax (or parts of syntax) functions independently or
autonomously from other aspects of cognitive functioning. If a modular view
is taken and the additional assumption is made that the underlying cause of
SLI is due to a (possibly innate) deficit in one or more module, then it is
unlikely that therapy directed towards ‘stimulating’ or ‘repairing’ the deficit
will be warranted. The assumption taken here can be contrasted with a non-
modular view. This view stresses the qualitatively similar mechanisms and
representations underlying both language and non-linguistic functioning, in
which case, therapy would be directed to the general impairment, i.e. to both
the impaired language area(s) and related non-linguistic areas which are
deemed to share common processing requirements.

For the purposes of this paper, a modular view of language is taken; the
linguistic characterisation of the group of SLI children presented above is
taken to represent a deficit in one or more linguistic modules and, thus, is
specific to linguistic representations and/or processing. Thus, the additional
assumption is made that it is unlikely that therapy directed towards ‘stimula-
tion’ of or ‘repairing’ the deficit is warranted. It must also be pointed out that
the therapeutic implications may only be applicable to similarly impaired
subgroups of SLI children and are necessarily tentative in view of the ongoing
nature of this research.

The most significant implications for therapy from the investigations concern
the learning of the semantic and syntactic properties of predicates such as verbs
and prepositions. The data suggest that this group of SLI children can learn
the verb–argument (semantic–syntactic) properties ‘conservatively’ through
direct evidence where both semantic and syntactic information are given. For
example, a ‘real world’ demonstration of the verb’s meaning may be provided
simultaneously with the use of the verb in a particular syntactic frame. The
data also indicate that the SLI child may learn the syntactic properties of verbs productively (i.e. without explicit experience of the syntactic frame) with the use of forward linking rules (semantic bootstrapping), if they have knowledge of the semantic properties of the verb.

However, the converse learning mechanism, i.e. learning the semantic properties of a verb from the syntactic frame in which it may be presented with use of reverse linking rules, is not supported. One of the reasons for this is due to the many-to-few mapping between thematic roles and syntactic functions: it can be recalled that if something is the agent of a transitive active verb it is sure to be the subject, but if something is the subject of a transitive active verb it need not be an agent (it could be a recipient, as in ‘receive’, a location, as in ‘contain’ and so on). Therefore, further specification of the syntactic frame is required. It is in this area, i.e. identifying the syntactic-structural relationship between a verb and its arguments, that I have hypothesised that these SLI children are impaired. It follows from the assumptions above that a ‘direct’ therapeutic route will, therefore, be blocked, i.e. one which focuses on symptomatic remediation of the deficit rather than using the strengths of the child as a route to facilitate language development.

Various therapeutic strategies follow from these implications – for example, to facilitate correct use of a verb in various syntactic frames, the verb may first be presented in a real world context so that the semantic-thematic roles may be abstracted. Probe questions can be used to facilitate production of a particular syntactic frame – for example, for a scene showing a boy pushing a girl, the following question may be posed, ‘Tell me about the boy’ (agent), facilitating a transitive active sentence. It can be noted that it is only with reversible sentences that the child will be forced to use syntactic knowledge. With non-reversible sentences, e.g. ‘The boy pushes the box’, semantic-pragmatic knowledge may provide sufficient information for the child to produce a sentence with correct assignment of thematic roles.

Once the child has accurately established the semantic properties of the verb in a particular syntactic frame, which can be tested by presenting reversible sentences in an acting out comprehension task (see van der Lely & Harris, 1990; van der Lely, 1992), then the verb may be presented in multiple syntactic frames, such as: ‘The lorry hits the car’ (active); ‘The lorry is hit’ (stative/adjectival passive); ‘The lorry is being hit’ (short verbal passive); ‘What hit the lorry?’ (subject question) and ‘What did the car hit?’ (object question), to name but a few!

However, it is a contraindication to present a verb for which the child has only partial or no semantic knowledge in multiple syntactic frames as a means of facilitating knowledge of the verb’s semantic properties.

Another therapeutic strategy could be to present series of semantically related verbs in the same syntactic frame. Pinker (1989) provides a theoretical psycholinguistic basis on which groups of verbs may be semantically related which has consequences for the syntactic frames in which a verb may occur. These groups of verbs may differ from those one intuitively assumes are related, perhaps because of more general (non-linguistic) cognitive similarity, e.g. shout, whisper vs tell, or die vs kill which although semantically related have different syntactic properties as can be seen in (4) below.
4. (i) ‘The boy told/*shouted/*whispered me the news’
   ‘The boy told/shouted/whispered the news to me’
(ii) ‘The woman killed/*died the fish’
   ‘The woman *killed/died’

It is of course early days in which to apply this approach to therapy, but in
due course such theory-driven therapy may prove more fruitful than ‘intuition’
and symptomatic treatment.

Finally, it is clear that therapy is not possible without full assessment of the
linguistic abilities of the child, identifying both his or her strengths and
weaknesses. The research findings from this project have significant and
important implications for assessment and provide a new avenue in which
linguistic abilities may be analysed. I have waited until the end of this section
to mention assessment as I believe that it is only in the light of theoretical
knowledge and therapeutic value that its worth can be evaluated.

The final therapeutic implication I wish to discuss briefly derives from the
findings from the investigation of short-term memory (STM). The tentative
implications for this group of SLI children are that, although impaired auditory
STM may correlate highly with linguistic impairment (C. Haynes, personal
communication) this study does not indicate a causal relationship between
STM and specific language impairment. It may well be that the STM impair-
ment in comparison to chronological age-matched controls is a reflection of
their impaired language abilities. Thus, although work on STM may be justified
from the standpoint of attention control etc., the data do not provide any
support motivating therapy directed at increasing auditory memory with an
aim of improving expression or comprehension of sentences, or more specific-
ally, increasing the child’s knowledge of the semantic–syntactic properties of
verbs or other predicates.

CONCLUSION
The investigations suggest that these SLI children’s impairment, characterised
by differential impairments of syntax in expression and comprehension
of language, may be caused by a specific linguistic deficit in one of the
‘mechanisms’ or modules in universal grammar. However, other modules
within syntax and non-linguistic processing may potentially function normally.

Current, ongoing research is testing this hypothesis in both English- and
German-speaking SLI children, to substantiate the hypothesis. Thus, further
insight into the nature of SLI in children will, it is hoped, be provided.

Finally, therapeutic implications are revealed by these investigations. How-
ever, caution is expressed in the application of the findings, particularly to
groups of SLI children who show different characteristics, and also because
of the necessity to test and explore the proposed hypothesis further.

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RESEARCH FINDINGS AND THERAPEUTIC IMPLICATIONS FOR SLI IN CHILDREN


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