Selective verb deficits in SLI: another look at the autistic spectrum problem

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Abstract. Bishop (2000) has recently raised the question of discriminating between grammatical SLI, pragmatic impairment, and social cognition problems linked to a spectrum of autistic behaviour. In this paper we report pilot findings which indicate that grammatical SLI may be associated with a lexical deficit in verbs that involve interpersonal action, and in particular verbs whose meanings involve mental states. These findings offer some support for Bishop's multi-dimensional model permitting grammatical SLI and certain autistic characteristics to be non-exclusive of each other. On a test of verb use elicited by video pictures, with the verb prompted, a group of 10 children aged 5;10-8;0 with grammatical SLI showed a marked deficit in the use of verbs expressing the intention of an agentive subject towards another person (e.g. *help*), and the mental state of another person (e.g. *frighten*) as compared to their BPVS peers. They failed the majority of the time to express the person affected by the action as a grammatical argument of the verb. With verbs whose meaning involves the physical action of an agent on an inanimate entity (contact verbs and causative verbs of motion) their performance was equivalent to that of their BPVS peers. The entity affected by the action strongly tended to be syntactically realised as in adult-like use. Overall, despite their apparent vocabulary equivalence, the children with grammatical SLI were significantly less able to encode an event where the verb denoted interpersonal action. Possible reasons for this outcome are discussed.

1. Introduction

Specific language impairment (SLI) and autism are at first sight two very distinct conditions. SLI presents age-abnormal traits of language structure, which may well co-exist with otherwise appropriate patterns of linguistic interaction. In autism, there are asocial behaviour patterns, including a lack of interest in communication even though language form may be intact and accompanied by normal fluency.[1] Nevertheless, it has long been recognised in the diagnosis of children with SLI that individuals may fall on some kind of continuum between the two conditions. Recent research into both the phenotypic evidence and possible underlying genetic links is

[1] About a quarter of a sample of 82 children with autism analysed by Kjelgaard & Tager-Flusberg (2001) came into this category.

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beginning to uncover associations between them that are of considerable interest in the appropriate identification of developmental language disorders.

Bishop (1997:214), in a discussion of these two conditions, considered that 'there are children who do not fall neatly into one or the other category because they do appear to have undue difficulty with the social aspects of communication and show some autistic-like behavioral oddities, but their problems are much less pervasive and severe than those seen in autistic children.' She referred to the widely accepted view that 'difficulty in understanding the mental state of others is a core deficit in autistic disorder', and reported a study in which three out of 12 'typical SLI children' failed the false belief question in the Sally-Anne task, which is usually taken to indicate a deficit in understanding the mental state of others (Leslie & Frith 1988, Baron-Cohen 1995), conventionally referred to as the Theory of Mind (TOM) problem. Such results seem to be *prima facie* evidence for overlap in the two conditions. Bishop (2000) follows this up by proposing that one or more of the triad of factors underlying classical autism - impaired language, lack of social interaction, and a restricted repertoire of behaviors and interests - can show up in different combinations. The 'social use of language' dimension may be impaired by itself, giving rise to a condition she identifies as Pragmatic Language impairment. The language structure dimension can also be impaired by itself, giving SLI, and 'there are children who have a mixed picture of problems with language structure and pragmatics.' (Bishop 2000:111).

This mixed picture may be compared to what one finds with the language abilities of children with autism. Here too, Kjellgard & Tager-Flusberg (2001:304) found a very mixed picture and reported that the language abilities of borderline or impaired cases of children with autism 'mirrors what has been reported in the literature on SLI': poorer performance on tests of grammatical ability than of vocabulary knowledge, and difficulties with non-word repetition even in individuals with good articulation skills. They conclude that 'some children with autism may have a parallel or overlapping SLI disorder.' Baron-Cohen (2000:7) in a review of characteristics of children with autism, observes that they ‘produce fewer mental-state words in their spontaneous descriptions of picture stories … than their normal counterparts’. They also have difficulty in distinguishing mental state words from physical action verbs; Baron-Cohen (loc. cit.) posits that their deficient mental state lexicon ‘may well be an indicator that conceptual development in this domain is …less well-developed than would be expected for the child’s general mental age’.

In addition, recent genetic research has uncovered intriguing relationships between autism and language deficits. Alarcón et al. (2002:68) report that 'a language related susceptibility locus … may reside on the long arm of chromosome 7.' A plot of age at first word, as recalled by caregivers, showed that sibling pairs having similar phenotypic scores tended to have the same proportion of alleles 'shared identical by descent' at loci on this chromosome. Fisher et al. (1998) found that members of the KE family with SLI also exhibited a genetic impairment on chromosome 7. These similarities are discussed in Folstein & Mankoski (2000) who review a number of findings associating autism with developmental language disorder. In particular, it has been observed that the siblings of probands with SLI are much more likely than the general population to have autism, and there is a higher than expected occurrence of language disorder in the families of autistic individuals. Such disorders have been linked by the Collaborative Linkage Study of Autism (1999) to the long arm of chromosome 7. Research has also shown other loci associated with language impairment (SLI consortium 2002): chromosomes 16 and 19 were linked to SLI traits, in each of two different subject pools. Interestingly, the long arm of chromosome 19 showed a link to autism in a study of genetic linkages with autism by Liu et al. (2001). There are clear indications, then, of shared genetic overlap between the underlying aetiology of autism and SLI which suggest that it is worth researching phenotypical similarities between the two conditions.

We have already seen that Kjelgaard & Tager-Flusberg (2001) found language disorders in many children with autism, as measured by standardised tests such as the Clinical Evaluation of Language Fundamentals (CELF), which concern word and sentence-structure. Interestingly, vocabulary measures showed a smaller deficit. This latter point echoes earlier work by Tager-Flusberg (1985) who found that autistic children were non-distinct from normally developing children in their semantic representations for natural kind and artifact object names. Another area found to be problematic in children with autism is, perhaps unsurprisingly, their interactional discourse abilities. According to work summarised in Tager-Flusberg (1988) their discourse abilities were much depressed in terms of their ability to maintain a topic through a number of conversational turns in spontaneous speech.

Leonard (1986, 1998) reported work on the conversational abilities of SLI children and finds that the observable tendencies are quite mixed. At the one-word stage, children with SLI were found by Leonard (1986) to be actually more informative conversation partners than language-age peers, but whether this is so with more advanced SLIs is not known.

Conversational repairs and topic maintenance have also been identified as areas of difficulty for children with SLI. Bishop (1997:215ff) discussed children who have been referred to as having a semantic-pragmatic disorder, part of which takes the form of unexpected topic-changes and irrelevant responses in conversation. But a semantic-pragmatic disorder was postulated only where problems with language form had been excluded. In Bishop (2000), however, a three-way distinction is made between underlying deficits, in such a way as to allow for the co-existence of semantic-pragmatic deficits in children with grammatical SLI.

An issue arising from Bishop's (2000) report of overlap in terms of understanding mental states is whether any such deficit has repercussions on the semantics of a language. A substantial part of a mature speaker's lexicon involves words which denote others' states of mind, so the question arises as to whether this area of the lexicon would form the locus of a semantic impairment in an individual having a TOM deficit. One might ask what lexical items such as 'lie' (in the sense of tell a falsehood) would mean to an individual with autism, for instance.

To the best of our knowledge, studies of autistic individuals' lexical abilities have focused exclusively on object names, so it is not possible at present to make a direct comparison between attested abilities of autistic individuals in the area of the lexicon in which we are interested. This paper therefore limits itself to reporting a preliminary investigation of the verb lexicon of SLI children in terms of their ability to use verbs whose meanings involve understanding the mental state of the agent, rather than just carrying out physical actions. Two subgroups, both grammatically impaired, are identified on the basis of whether they experienced difficulties in successfully using such verbs, as compared with a control set of physical action verbs. While recognising that this is an indirect way of addressing autism-SLI commonalities, we believe that the area of the lexicon involving mental state meanings is one which may fruitfully be investigated, given the accumulating evidence for overlap in genomic linkage of these two conditions.

2. The study

The work reported here is drawn from a research project that sought to identify verb deficits in children with SLI conducted at the University of Reading, partial findings of which have been reported in Schelletter, Sinka, Fletcher & Ingham (1996) and Ingham, Fletcher, Schelletter & Sinka (1998). At an early stage the project had estimated that using physical

action verbs in sentences posed no serious problem for this group of children with SLI, and therefore sought to explore areas where their lexico-grammatical competence might be expected to experience a greater challenge. A group of verbs - shown in (1) below - was therefore included as an initial exploration of such areas. It should be stressed that they were not designed in to the research as a way of testing hypotheses about language impairment and the autistic spectrum. They were nevertheless designed to reveal problems children with SLI might have in an area of verb semantics beyond 'actor act on patient', and if some such areas of verb semantics can be characterised in terms of mental states, their relevance to the general issue under discussion here will be of interest. Because their meanings each make it necessary to conceive of another person's state of mind, the convenient label 'mental state' verbs will be used to refer to them from now on.[2] The label 'mental state verbs' will be used as a descriptive linguistic label, to indicate merely that if one is to understand what e.g. *annoy* means it is necessary to understand the reality of a consciousness other than one's own which is undergoing the mental experience of e.g. 'being annoyed'.

Autistic children have difficulty in reading others' mental states (Baron-Cohen 1995:130) and also lack the capacity to introspect on their own mental states. If so, it might be hard for language-impaired children on the autistic spectrum to identify the semantics of verbs involving a mental state. Since verbs' semantics are conventionally described in terms of the argument structure afforded by their semantic roles, we might thus expect a difficulty in using such verbs appropriately in sentences. The rest of this paper will present and discuss findings relevant to this issue.

2.1 Subjects

Subjects consisted of a group of children diagnosed as having a specific language impairment on the standard Stark & Tallal (1981) exclusion criteria. In addition, they met a criterion of showing a deficit on past tense use proposed by (Rice, Wexler & Cleave 1995) as a hallmark of grammatical impairment. The group profile shows a fair range of ages and abilities, with some low MLUs and some considerably higher. Test for the Reception of Grammar (TROG) scores ranged from 55-85, and the past tense omission rate also ranged considerably.

[2] An issue that will not be explored is the distinction that Baron-Cohen (1995) makes between Intentionality Detection and actually attributing beliefs to mental states.

The comparison group consisted of ten children with no known language disorder, matched one to one to the 10 children with SLI on the basis of performance on the long form of the British Picture Vocabulary Scales (BPVS), a test of lexical comprehension. Each Language Normal (LN) match was up to 3 months either side of his/her SLI counterpart in terms of age-equivalent scores (see Appendix 1 for individual details).

2.2 Procedure

Children were individually shown a video with 45 items, each of which a short scene was depicted illustrating the meaning of a particular verb. The child was prompted with this verb by the investigator and asked 'What happened?' in order to elicit the target item in a sentence. If the child did not respond or responded with another verb, the investigator gave a further opportunity saying 'Can you try again and tell me, using the word [*target verb*] , what happened?' If the verb was still not produced, the investigator said 'OK', and moved on to the next item. The present paper reports on the results taken from elicitation of three subtypes of verbs. The first of these featured verbs one of whose semantic roles is an experiencer or an intentional agent, viz.

(1) annoy, frighten, help, pretend, try

With *annoy* and *frighten* the object of an active sentence denotes an entity experiencing the action mentally, while with *help*, *pretend* and *try* a state of mind is asserted of the agent encoded as the subject of an active sentence, e.g.:

(2) The gardener frightened the cat/!!!slug
(3) The cat/!!!slug tried to eat the lettuce

Whether or not sentences like (2) - (3) above are found to be anomalous (indicated above by ‘!!!’) is likely to depend on speakers' beliefs about the cognitive states attributable to particular animals - the three exclamation marks in (2) - (3) represent the author's own judgments of anomaly. We take no strong position on the issue of animal cognition as such, merely asserting that the semantic well-formedness of such sentences is likely to co-vary with such beliefs. Hence these five verbs in one way or another have to do with the existence of mental states.

The other verbs tested fell into two categories, both involving physical action carried out on an affected entity, without a mental state being asserted of any participant entity:

(4) contact verbs without motion of the affected entity
cut rub touch scrape

(5) non-directed motion verbs
move open wave bounce

These eight items were selected *post hoc* from the overall 45 items in the test video because the meanings they illustrated contrasted clearly with those of the mental state verbs, and because each subgroup had some semantic consistency. They all involved basic 'actor-affect-patient' semantics.

The short video scenes, each lasting about 10-15 seconds, depicted an agent performing an action which would be suitably described using the target verbs and a patient entity in the case of the physical action verbs. In the case of the mental state verbs the denotatum of the verb complement depended on the particular verb. It was a person affected in the case of *annoy* and *frighten*, but a process in the case of *pretend*, *try* and *help*. It should be stress that the commonality among these verbs is not in their argument structure, but in an aspect of their meaning, i.e. the need to attribute a mental state to a participant entity, whether agent, as with *try, pretend*, and *help*, or a patient, as with *frighten* and *annoy*.

Responses were scored according to whether the target verb was used in at least a Verb Phrase constituent including the entity with the direct argument of the verb: the person helped, annoyed or frightened, and the action tried or 'pretended', as it were. If so, it was scored 'T' for 'targetlike'. Other responses were 'V' if the child used the target verb with a possible tense inflection, but no complement, 'Vin' if the verb form was a bare form or an -ing form, 'N' for no comprehensible verbal response, and 'other' for all other cases. The following sample responses will serve to illustrate how scoring was done:

T	
A man helped a little girl to climb up a tree	SM23
A man helped the little girl up the tree	SM25
The man helped the girl come up the tree	SF02
The girl try to lift the bin	SF02
Pretend to be a pirate	SF02

A girl is pretending her is a Peter Pan	SM23
The girl was annoying the lady	SM23
Somebody frightened the girl	SM25
V	
frightened	SM20
he's pretending	SM20
him trying	SM33
Vin	
the girl's pretending with a pirate	SM04
frighten a ghost	SM12
lady helping the man	SM33
Other	
(Try) picking that up	SM01
(pretend) a fighting	SM01

2.3 Results

Broken down into the five response types presented above, the group results by verb class for the 10 children with SLI and their LN matches were as follows:

move verbs

	SLI	LN
T	33	37
Vin	-	1
V	6	1
O	1	1
N	-	-

contact verbs

	SLI	LN
T	32	29
Vin	4	-
V	4	8
O	-	3
N	-	-

mental state verbs

	SLI	LN
T	18	37
Vin	7	2
V	11	2
O	9	6
N	5	3

Table 1 Group results by verb class

It can be seen that on the first two verb classes, those where physical action was involved, the performance of the SLI group was similar to that of the LN matches, slightly lower on the *move* verbs and slightly higher on the *contact* verbs. A Wilcoxon signed ranks test on matched subjects was not able to find a significant between-group difference (W: 3.5, N=4). As this statistic shows, the number of pairs where performance differed was too small to obtain a significant result. There is certainly no evidence for any widespread impairment in the linking of arguments to these verbs in the SLI group.

When we inspect results in the mental state verb category, however, a clear difference is apparent. The overall performance level of the children with SLI is very substantially below that of the controls: they did just under half as well, with a percentage success rate of 36% as compared with their vocabulary matches success level of 74%. For subjects with SLI - as a group - mental state verbs represented a far greater challenge. The results for the SLI and LN groups were tested for statistical significance, using the Wilcoxon signed ranks test, appropriate for matched subjects, as these were. The result was significant at the 0.05 level, W: 5, 2-tailed (N=9).

However, it is of some interest to observe that the SLIs' performance appeared somewhat bi-modal: half of them obtained no target-like scores, but three more got 4-5 right, leaving only two subjects in between. As shown in figure 1, the BPVS matches did not perform in this way:

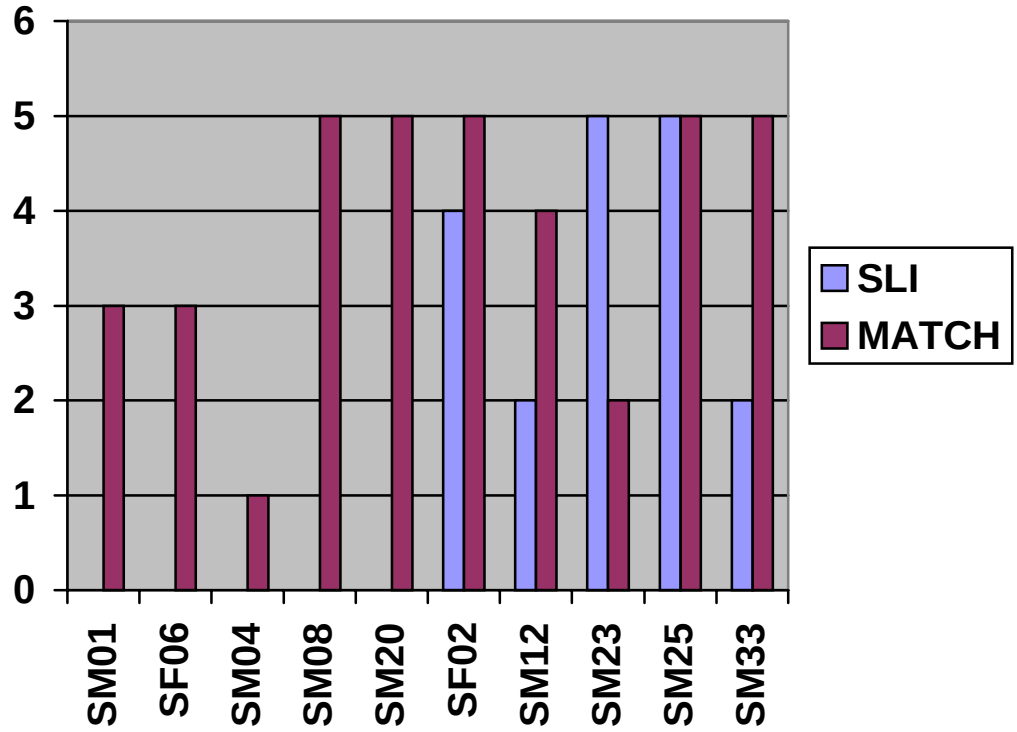

Fig. 1 No. of target-like responses on mental-state items

We shall refer to the five children with SLI who scored 0 on the mental state verbs as subgroup 1. Their matches achieved an overall success rate of 68% on these verbs, indicating that target-like use of the mental state verbs tested was not beyond the capabilities of lexically comparable LN children, as measured by BPVS scores. As shown in Figure 2, SLI subgroup 1 (SM01, SF06 SM 04 SM08 SM20) managed to produced numerous target-like responses on *contact* and *move* verbs:

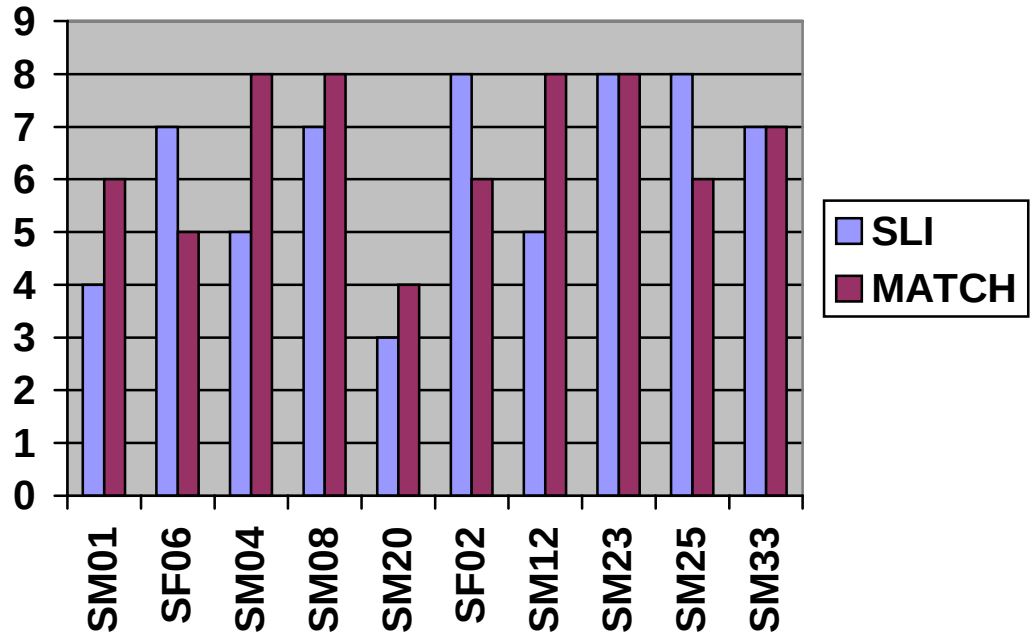

Fig. 2 No. of target-like responses on other items

Their overall target-like rate on the physical action items (*cut* and *move* subtypes) was 65%. The BPVS matches of subgroup 1 achieved a 77% target-like rate across these two subtypes. The second group of children with SLI (SF02, SM12, SM23, SM 25 and SM 33) achieved a distinctly higher rate of target-like performance on the physical action verbs (90%). Their matches scored an overall 88%. Breaking down each sub-group, we find an impressive similarity within each set of verbs between the SLI subgroup and their matches, except between the subgroup 1 SLIs and their matches on mental state verbs, as shown in table 2:

	T	V	Vin	O	N	TOTAL
contact verbs						
SLI subgroup 1	15	2	3	0	0	20
matches	13	6	0	1	0	20
SLI subgroup 2	17	2	1	0	0	20
matches	16	2	0	2	0	20

	T	V	Vin	O	N	TOTAL
move verbs						
SLI subgroup 1	14	5	0	1	0	20
matches	18	0	1	1	0	20
SLI subgroup 2	19	1	0	0	0	20
matches	19	1	0	0	0	20
mental state verbs						
subgroup 1	0	8	4	13	0	25
matches	14	1	2	6	2	25
SLI Subgroup 2	18	3	3	1	0	25
matches	23	0	0	1	1	25

Table 2 Response category frequencies for SLI subgroups and matches

As expected, overall targetlike performance across both the SLI and LN subjects was much better on the physical action verb sets. But on the mental state verbs the severely depressed scores of subgroup 1 relative to their matches, as compared with their similar performance on physical action verbs, are rather striking.

2.4 Discussion

Small though these pilot figures are, they suggest a number of children with SLI are able to construct sentences using physical action verbs, but will largely fail to do so when the verb involves an interpersonal process involving a mental state. It cannot be that they failed to understand the task demands as such, since the task was identical to what it was on the other verb classes, on which they performed well. It must therefore be that the mental state verbs presented a particular challenge for them.

There is a suggestion in the bimodal distribution of the SLI subjects' results that children with SLI may tend to either have no real problem with such verbs, or have exceptional problems with them. That would be in line with the proposal by Bishop (2000) that SLI may or may not overlap with an autistic-like problem. Half these children appear to have a problem with mental state verbs which is far more pronounced than problems in constructing sentences with the other verbs studied.

Of course, one should be wary of prematurely interpreting the small-scale pilot findings on this sentence construction task as evidence of an underlying deficit. For one thing, one might predict that these children's pragmatic abilities are defective, exhibiting not just inadequate but also anomalous utterances. I inspected these five children's free conversation transcripts for evidence of such utterances. There were a few seemingly rather odd contributions, but I saw no gross communication failure. Still, failure to find such evidence is certainly not conclusive. Much of the dialogue in these sessions consisted of what appeared to be description of the child's family and routine daily activities, which the child may well have practised many times with therapists and possibly other researchers visiting the unit. Bishop (2000) found that pragmatic impairments were subtle problems that only appeared when teachers were consulted, rather than in examination of conversational transcripts. So it may be that these children's representation of linguistic meaning was influenced by a subtle disorder on the autistic range.

Perhaps the difficulty for the SLI subgroup 1 children stemmed from some developmental factor having nothing to do with social cognition. Could sentence-length restrictions have been responsible for their general failure to produce targetlike structures with the mental state verbs, supposing that the latter in some way posed more processing difficulty than verbs of physical activity? This of itself cannot have been the explanation: subgroup 1 actually had a slightly higher MLU(m) than subgroup 2:

SLI subgroup 1		***SLI subgroup 2***	
No 'mental state' verb sentences		***2-5 'mental state' verb sentences***	
SM04	4.92	SM23	4.67
SF06	3.98	SM12	3.32
SM08	3.88	SM33	2.73
SM20	2.83	SM25	3.28
SM01	2.34	SF02	2.15
	m = 3.59		m = 3.23

Table 3 MLU(m) figures of children with SLI

With SLI subgroup 1 the problem with producing sentences with mental state verbs was not due to a length restriction *per se* on sentence production.

Was it just a question of delayed lexical development? In terms of lexical comprehension this might at first sight seem a possibility, because the BPVS mean score of subgroup 1 was a year lower in age-equivalent terms than that of subgroup 2 (see Appendix 1). But the BPVS scores do not suffice to explain the differing outcomes between the two subgroups. The BPVS matches of SLI subgroup 1 apparently recognised and were able to use the mental state items at least two-thirds of the time, since they obtained a 68% target-like score on the sentence construction task with these verbs. This being so, it is implausible that their general lexical level as measured by BPVS was solely or chiefly responsible for the SLI subgroup's poor performance.

Another way of interpreting this outcome which would not require us to appeal to the autistic spectrum factor is the proposal by Chiat (2001) that SLIs are particularly vulnerable to what she refers to as the 'mapping problem' in language acquisition. Put simply, language acquirers map sequences of speech into meaning-relevant chunks, the latter being available from the aspects of a scene to which the language they hear relates in some way. Chiat predicts that when the semantics of a target is close to a pre-linguistic perceptually based concept, acquisition should be least affected in SLI. Where these bootstraps are not available, a verb's semantics may have to be worked out by syntactic bootstrapping, which will involve the processing of the argument structure in which the verb appears. And at that point SLI children's well-known difficulties with carrying out phonological processing will become crucial. Chiat (2001:125) mentions the acquisition of non-observable event verbs, such as verbs of mental state, e.g. *think, dream, guess*. She states (loc. cit.):

> 'The sentential complement they take which could serve as a syntactic bootstrap to the verb's mental state meaning … entails phonological processing which would by hypothesis be an obstacle for children with SLI.'

Such verbs will often have been encountered by children in situations without visual support, and then perhaps not acquired, in the worst case. So we might say that the deficit observed with the SLI subgroup 1 children arose because mental state verbs are harder to map. Interestingly, the very thing that on Chiat's mapping proposal is supposed to be used to fix the verb's meaning, i.e. its complement, is the measure on which the subgroup in our data so conspicuously had difficulty.

However, the data set on which SLI subgroup 1 children failed included not only complement taking verbs but 'psych' verbs (*frighten, annoy*) which do not take sentential complements. There is no syntactic category difference between an NP complement with these verbs and an

NP complement with physical action verbs such as *rub* or *open*. Again, therefore, this alternative interpretation of the results would not seem entirely adequate. We believe that the source of the difficulty with these verbs resided in their semantics, and involves the conceptualization of mental states. To this extent we concur with Chiat's (2001:136) suggestion that the difficulty experienced by children with SLI is one of 'thinking for speaking'. If some children with grammatical SLI are also on the autistic spectrum, we would expect the difficulties known to be experienced by individuals with autism, summarized by Baron-Cohen (2000) to show up in the form of conceptual semantic deficits in mental state verbs.

3. Conclusion

To summarise, a subgroup of school-age children with SLI had exceptional difficulty in a sentence construction task on verbs whose meanings seemed relevant to the other-mind problem characterising people with autism. Given the overlap found by researchers both in language problems and in genomic linkages, this finding is not wholly unexpected. It could very tentatively be seen as a semantic deficit of a type that might be expected, following Bishop (2000), if a subgroup of grammatically impaired children with SLI also has a deficit on the autistic spectrum. The point to note is that the semantic representations of linguistic items, rather than just the pragmatic use of language, would be vulnerable on this hypothesis. A great deal of work remains to be done, of course, before more substantial claims could be made. In this paper we wish to state the possibility that the deficit on 'other -mind' verbs is a reflection of a semantic deficit in representing meanings involving mental states, with which we believe our findings are consistent. The implication is that we need to look much harder at the semantic knowledge of children with SLI, especially in domains that could be problematic if there is overlap with the autistic spectrum.

The study to be presented here was *post hoc*, reporting on the performance on particular parts of the whole project where an interesting discrepancy was found between SLI children's performance on 'mental state verbs' and two classes of physical action verbs. This was surmised at the time of the project but the key material was effectively being piloted in that larger piece of research. With due caution the findings of what should be regarded as no more than modest pilot investigation are presented in this section. They are small-scale but suggestive when seen against a background of recent investigation of language in autism, and of potential overlaps between the language of children with autism and those with SLI.

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APPENDIX 1: SLI subgroups and matches

SUBGROUP 1

	C.Age	BPVS a.e.	Renfr a.e	TROG a.e.	MLU(M)	past tns %
SF06	6;7	3;3	4;7	5;5	3.98	57
SM01	5;10	4;3	5.3	4;7	2.34	23
SM04	8;0	5;5	5;9	5;5	4.92	40
SM20	6;2	3;5	4;7	5;10	2.83	21
SM08	7;1	6;9	6;7	6;1	3.88	13
Mean	6;9	4;7	5;4	5;6	3.59	30.8
BPVS matches						
NM06	3;10	3;1	4;0	N/A	3.84	82
NF01	3;6	4;2	5;2	N/A	6.10	89
NM37	6;2	5;7	N/A	N/A	N/A	100
NM01	3;10	3;4	4;11	N/A	4.82	94
NM43	5;9	6;10	5;10	N/A	N/A	N/A
Mean	4;7	4;7	N/A	N/A	N/A	N/A

SUBGROUP 2

	C.Age	BPVS a.e.	Renfr a.e	TROG a.e	MLU(M)	past tns %
SF02	8;0	6;8	6;0	6;0	2.15	13
SM12	6;2	3;10	4;1	5;6	3.32	13
SM23	6;3	5;3	5;0	5;11	4.67	45
SM25	7;6	6;0	6;6	7;1	3.28	36
SM33	5;1	5;11	3;7	5;1	2.73	66
Mean	6;7	5;7	5;5	5;11	3.23	34.6
BPVS matches						
NF11	4;11	6;7	7;11	N/A	4.89	100
NM16	3;11	3;9	3;9	N/A	5.26	97
NM42	5;7	5;6	7;1	N/A	5.19	98
NM02	4;7	6;0	6;11	N/A	4.01	100
NM19	4;9	5;11	6;2	N/A	3.45	96
Mean	4;9	5;7	6;4	N/A	4.56	98.2