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Relative clause constructions in children with Specific Language Impairment

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Abstract

Background: It is well documented that children with specific language impairment (SLI) experience significant grammatical deficits. While much of the focus in the past has been on morpho-syntactic difficulties, less is known about their acquisition of multi-clausal constructions such as those containing relative clauses.

Aims: To investigate relative clause constructions in English-speaking, school-aged children with SLI, using a sentence-recall task

Methods & Procedures: Children with SLI (*mean age* = 6;10, *n* = 32) and two control groups – a typically developing group matched for age (AM-TD, *mean age* = 6;11, *n* = 32) and a younger typically developing group (YTD, *mean age* = 4;9, *n* = 20), repeated sentences that contained relative clauses that represented a range of syntactic roles. The relative clauses were either attached to the predicate nominal of a copular clause or to the direct object of a transitive clause.

*Outcomes & Results***:** Children with SLI showed significantly greater difficulty than both the AM-TD group and the YTD group overall, but found some relative clause types easier than others, displaying a similar profile to typically developing children but at a lower level of performance

Conclusions & Implications: Children with SLI who are close to seven years of age have significantly greater difficulty with relative clauses than their age peers and typically developing children who are on average two years younger. Their performance is influenced by the matrix clause type, the role of the relativized element within the relative clause, and in object relative clauses, lexical choices within the matrix clause and the relative clause.

What this paper adds?

What is already known on this subject?

Previous studies have suggested that English-speaking adolescents with language impairment have more problems with object relatives than subject relatives, and that younger children – of primary school age – produce relative clauses sparingly in picture descriptions and resist being primed for these structures.

What this paper adds?

This study extends the range of relative clause constructions examined. By systematically varying types of matrix clause and the syntactic role of the relativized element, it demonstrates that a group of children with SLI who are on average close to seven years of age are restricted in their use of these constructions, compared to their age peers, and also to children two years younger. In identifying a profile of difficulty among the family of relative clause constructions, the outcomes suggest directions for intervention.

Introduction

Relative clauses are a family of structures that share a defining characteristic but come in varying forms. Their defining feature is that they all function to post-modify a nominal in a main (henceforth 'matrix') clause. The classic examples would be sentences like (1) and (2):

(1) The *boy* (that the dog chased) got away.

(2) The *dog* (that chased the boy) barked furiously.

In these examples:

(a) the full construction contains two propositions which we can represent as follows: for 1) DOG CHASE BOY and BOY GET AWAY. For 2) the first proposition is the same as that in 1) while the second is DOG BARK FURIOUSLY.

(b) The embedded clause (bracketed) in both examples post-modifies a nominal (*boy, dog*) which is in the subject position in the matrix clause;

(c) The noun, which is post-modified, via the relative pronoun *that*, plays two distinct syntactic roles in the relative clause. In (1) it is the object of the verb *chased*, while in (2) it functions as the subject of the same verb.

For clarity we will refer to sentences such as (1) and (2) which contain two clauses, one of which is post-modifying a nominal, as 'relative clause constructions' (RC constructions for short). We will reserve the term 'relative clause' for the post-modifying clause itself. As we shall see, RC constructions of the form of (1) and (2) do not exhaust the range of these forms that children have to master. RC constructions vary in terms of (a) whether they contain one proposition or two, (b) whereabouts in the matrix clause the relative clause is embedded, and (c) the syntactic role that the matrix clause noun, which is post-modified, fulfills in the relative clause, via the relative pronoun. (There is a further dimension of variation – the omission or otherwise of the linking relative pronoun *that* or *who*. In (1), where the relative pronoun is the

object of the verb *chased*, it can be omitted, whereas in (2) where it is the subject of the verb, it is obligatory. We do not deal further with this issue in this report – for discussion in relation to children with SLI see Schuele and Tolbert (2001) and Hesketh (2006).

In part because of their significance in linguistic theory (e.g. Hauser *et al*. 2002), there is an extensive literature on the development of relative clauses in typically developing children, in English (see selected details below) and in other languages (see Kidd 2011). The literature on children with SLI learning English is however limited, especially in relation to the broader range of RC constructions that need to be addressed if we are to have a comprehensive profile of how these children handle such structures. However from one recent study, Hesketh (2006), we can identify three significant issues which relate to variation in RC constructions. Hesketh's study used picture-supported elicitation and story re-tell to amass production data from 6-11 year old children with language impairment who were in language units in the UK. The first point of interest for us is that there was evidence of the children using single proposition RC constructions, as in 3):

(3) This is the treasure (you were looking for).

Here the matrix clause contains a copular verb, *is*, and the role of the matrix clause is to introduce the noun, *treasure*, which is post-modified. The single proposition could be represented as YOU LOOK FOR TREASURE. Such structures will be referred to as *presentational* RC constructions, after Diessel and Tomasello (2000), who underscored the importance of these structures, in a study which involved four typically developing English-speaking children between 1;9 and 5;2 years. They found that over 90% of children's early RC constructions (based on the first 10 relative constructions produced in their corpus data), and 70% of *all* relatives conveyed only a single proposition.

The second point emerging from Hesketh (2006) concerns the position of the relative clause within the matrix clause. In her narrative task the children provided almost exclusively what she refers to as 'sentence-final' relative clauses, which we take to mean clauses modifying matrix clause object nominals, as in (4), where the relative clause in brackets post-modifies *scarf*:

(4) The monkey found the scarf (that was hanging on the washing branch).

A strong preference for relative clauses post-modifying matrix clause objects is also evidenced in data from typically developing children (Diessel and Tomasello, 2000; Diessel, 2004).

The third point of relevance from Hesketh (2006) concerns the syntactic role of the post-modified nominal. With one exception, the examples of RC constructions that she quotes in her study reflect relative clauses in which the relativized item realizes the subject role, as in (4) or object role, as in (1). Example (3) however represents another possibility. Here the post-modified noun, *treasure*, functions as the object of a preposition, *for*. This syntactic role is referred to as 'Oblique'. Diessel and Tomasello (2005), with typically developing children aged 4;7 years on average, explored RC constructions where the relativised element realized subject, object and oblique roles, but in addition the following possibilities:

- Indirect object. (5) The relativized element ('who') is the indirect object of the relative clause:

  (5) *I saw the guy <u>who</u> she gave the book <u>to</u>.*

- Genitive (Gen) relative. Here the relativizer 'whose' + noun sequence can function as either the subject, as in (6) or object, as in in (7) of the relative clause.

  (6) *I met the woman <u>whose daughter</u> lives next door.*

  (7) *I know the woman <u>whose horse</u> Peter heard on the farm.*

Using a sentence recall task, Diessel and Tomasello (2005) explored this wider range of syntactic roles with four-year old typically developing children. They performed best on subject relatives, followed by object relatives, indirect object relatives, oblique relatives (their performance was almost equal on indirect object and oblique relatives) and, finally, genitive relatives. Diessel and Tomasello propose this as a relative clause progression for typically developing children.

With these considerations of matrix clause type, the position of the relative clause within the RC construction, and a broader perspective on the possible syntactic roles of the relativized element within the relative clause, we can begin to discern the structure of a comprehensive approach to the performance of children with SLI on relative clause constructions. It should enable us to examine both single proposition and dual proposition RC constructions. For ecological validity, given what seem to be the preferences in both typically developing children's speech and that of their interlocutors, the protocol should concentrate on RC constructions where the relative clause modifies either the predicate nominal of a copular matrix clause or the object of a transitive matrix clause. And we should explore a more extensive range of syntactic roles that the relativized element can realize in relative clauses, than have previously been considered.

Two questions then arise. What procedure is likely to be most efficient for the exploration of these constructions? And what expectations do we have for the outcomes of the exploration?

Relative clauses are relatively rare in the spontaneous speech of pre-school children (Givon 2008). Hesketh (2006), even with a picture-supported elicitation procedure and a retelling of a narrative, found that in either mode, fewer than half the 66 children with language impairment produced a single appropriate relative clause construction. And Marinellie (2006) found it difficult to prime RC constructions in 7-8 year old children with SLI. In recent studies of relative clause constructions in typically developing children, a sentence recall procedure has proved to be a reliable method of exploring children's knowledge of these forms (Diessel and Tomasello, 2005: Kidd *et al.*, 2007). It has also been used with adolescents with SLI (Riches *et al.* 2010). Sentence-recall is considered a sensitive measure of children's syntactic knowledge (Lust *et al*. 1996). Research converges on the view that sentence-recall is not merely a task of language production – it is supported by lexical, conceptual and syntactic representations in long-term memory (Potter and Lombardi 1990, 1998, Brown and Hulme 1995, Schweickert 1993) as well as by phonological short-term memory processes (Alloway and Gathercole 2005). Although children can arguably use their phonological short-term memory to 'parrot' short sentences without understanding them, sentences that exceed a child's short-term memory span must be understood in order to be produced successfully. If the child does not understand the sentence then the syntactic and semantic representations are likely to differ from the original stimulus (Vinther 2002). The use of this method allows us to explore the full range of relative clause constructions we are interested in, in a time-efficient way.

In terms of expectations for outcomes, the literature on typically developing children, and what we know about processing difficulties in children with language impairment (e.g., Miller *et al.* 2001, Montgomery 2000), would lead us to anticipate superior performance on single proposition relative constructions to that on dual proposition relatives. Predictions about performance on RC constructions, which realize different syntactic roles in the relative clause, are less straightforward. First, there are studies that show that for both TD children of 4;7 years on average (e.g. Diessel and Tomasello 2005), and for children with SLI who were on average just over 15 years of age (Riches et al. 2010), sentences like (8), where the relative pronoun is the subject of the verb in the relative clause (henceforth subject relative constructions), are dealt with more successfully than examples like (9) (to be referred to as object relative constructions):

(8). She knew the student that met the teacher.

(9) She knew the student that the teacher met.

In (8) the relative pronoun serves as the subject of the relative clause and the canonical order of constituents (SVO) is maintained. In (9), in order to successfully parse the sentence, the child has to understand that in order to find the object of *met* he has to refer back to the relative pronoun. It is claimed that the specific grammatical configuration of (9), with its non-canonical – OSV -- constituent order, is more problematic for processing than the structure of (8), for both typically developing children and adolescents with SLI. The latter finding in particular suggests that this would also be the case for younger children with SLI. A similar account can be extended to oblique and indirect object relatives.

However, in typically developing children, the processing cost for object relative clauses, at least, can apparently be mitigated (Kidd et al., 2007). It seems that specific realisations of the object relative construction can facilitate processing by typically developing children to the extent that the asymmetry of their performance on object and subject types disappears. Children show greater facility with object relative constructions that reflect those that they are more likely to hear. In a study of the longitudinal development of noun post-modification in children, Givon (2008) provide examples such as (10):

(10) Naomi: I can't find the cover.

Mother: What cover?

Naomi: The cover that I'm looking for.

As Givon notes, in these mother-child conversations, referents will generally be non-displaced – that is visually available to the conversational participants in the immediate context. Many of them will be inaninmate (toys, books, dolls etc.) and the role of post-modification generally, and relative clauses in particular, will be to ensure that the participants are attending to or talking about the same referent. So there will be a tendency for the relativized noun to be inanimate and for the subject of the relative clause to be a personal pronoun, usually first or second person. Fox and Thompson (1990) argue that similar discourse considerations are also relevant for the preponderance of object RC constructions with the same lexical choices that are found in adult speech.

Kidd et al. (2007) analysed mother-child conversations to derive quantitative data on the lexical choices in RC constructions with object relative clauses. Of the 134 identified, 75% of the head (relativized) nouns were inanimate, and first and second person pronouns accounted for 86.6% of the noun phrases within the subject slot of the relative clause. Generally, then, object relative constructions tend to be realised by sentences such as the second example from Naomi in (10). Based on their distributional findings, Kidd et al. (2007) conducted an experiment using a sentence repetition task. They asked 3 and 4 year old typically developing children to repeat subject and object relatives that were manipulated for animacy of the head referent and the type of subject noun phrase within the relative clause (personal pronoun or lexical noun). They found that both age groups performed significantly better on RC constructions in which, as in (11), an inanimate noun in the matrix clause is post-modified by an object relative clause whose subject is a personal pronoun:

(11). Here's the *teddy* that *you* were looking for.

We can summarise this structure in the schema in (12)

(12) X - N*inanimate* – relpron – *perspron* - Y

Kidd *et al.* (2007: 887) conclude that when RC constructions containing object relative clauses conform to the schema in (12), three and four year old TD children perform as well on these structures as they do on RC constructions which contain subject relatives.

The findings of these studies on young typically developing children are interpreted as indicating their sensitivity to the distributional features of the input. Discourse-sanctioned relative clause configurations that are frequently heard by the children will entrench their representation of these syntagmatic sequences. The question arises as to whether children with language impairment have a similar sensitivity to these distributional facts in input, albeit attenuated by their language processing limitations. If this is so, we would expect this to show up in their performance. In order to evaluate the relative effects of frequency and grammatical processing, we should then include in our protocol, sentences which meet the schematic structure in (12).

To summarise then, a comprehensive approach to the performance of children with SLI on RC constructions will concentrate on those with relative clauses that post-modify the predicate nominal of a copular matrix clause or the object of a transitive matrix clause. It will allow scrutiny of both single and dual proposition RC constructions. And it will explore a number of possible syntactic roles that the relativized nominal can play in the relative clause. For object relative constructions two different types will be investigated, one that follows the most frequent lexico-syntactic configuration to be found in speech to and from children, and one that does not. The specific questions addressed are:

- Do children with SLI differ from their age-matched counterparts and from younger typically developing children in their performance on relative clause constructions overall?
- Is the performance of the children with SLI better on single proposition than dual proposition relative clause constructions?
- Does the difficulty level of relative clauses revealed by the performance of the group of children with SLI reflect the profile of difficulty seen in the relative clause performance of English-speaking typically developing children?

Methodology

Participants

Thirty-two children with SLI completed the study. As controls there were thirty-two typically developing age matched children (AM-TD) and twenty younger typically developing children (YTD). The target recruitment age was between 6;0 and 7;11 years, for the children with SLI and the AM-TD group. They had mean ages of 6;10 (SD = 7.12) (SLI) and 6;11 years (SD = 6.52) (AM-TD), and each consisted of twenty-two boys and ten girls. The younger typically developing children (YTD) ranged in age from 4;7 to 4;11 years, (M = 4;9 years, SD = 1.49) and included twelve boys and eight girls. The YTD group was not language matched to the children with SLI. Language matching has inherent validity problems (Plante et al. 1993) particularly when children with SLI are no longer in the preschool period. The children's language system increases in length and complexity and their environment changes as they are exposed to schooling. Here we relate the abilities of children with SLI to the trajectory of development revealed by two groups of typically developing children two years apart in age, on

average. All of the children were native English speakers living in Ireland. Written consent was given by the parents / guardian of each child in the study.

The children with SLI were identified by their performance on the Clinical Evaluation of Language Fundamentals (CELF-4) (Semel et al. 2006). Children were included in the SLI sample if they scored below -1.25 standard deviations (SD) on the composite score derived from the receptive language subtests of the CELF- 4. Standard scores ranged between 46 and 81 (M = 68.41, SD = 8.52). Children in this sample also met all usual exclusionary criteria for SLI, i.e. they lacked a diagnosis of Attention Deficit Hyperactivity Disorder, Autistic Spectrum disorder, major physical disabilities, intellectual disability or hearing impairment. Children with verbal articulatory dyspraxia or any significant phonological problems were also excluded. The Raven's test of Progressive Matrices (Raven, 2008) was administered to children to ensure adequate cognitive ability. Children were required to achieve a standard score of 85 or greater on this test to be included in the study – scores ranged between 85 and 115 (M = 97.19, SD = 7.61). The children with SLI attended a language unit, attended for therapy in the health service, or were wait-listed for therapy. The children in both control groups had no reported history of speech, language or hearing problems or any type of exceptional needs. They scored within 1 standard deviation of the mean for their age on the receptive and expressive language measures of the CELF- 4 (AM-TD group) (Semel et al. 2006) and CELF-Preschool-2 (YTD group) (Wiig et al. 2006). The AM-TD group receptive language standard scores ranged between 92 and 125 (M = 107.8, SD = 8.87) and Raven's Matrices scores ranged from 90 to 130 (M = 104.69, SD =10.16). Receptive standard scores for the YTD group ranged between 96 and 120 (M = 108.5, SD = 6.22), and Raven's Matrices scores ranged from 95 to 130 (M = 110.75, SD = 7.83). Ethical approval for the study was obtained from the Cork Teaching Hospitals Clinical Research Ethics Committee.

Materials

A sentence-recall task was devised, including 52 relative clause constructions, along with 17 filler sentences. The filler sentences were simple sentences, included to limit perseveration. They were randomly inserted in the sentence list and matched for length with the RC constructions. The stimuli were all between 10 and 13 syllables in length. Children were asked to repeat RC constructions containing one of six types of relative clause, attached to either a presentational matrix clause (PN - single proposition) or to the direct object of a transitive matrix

clause (DP- dual proposition). All relative clauses were introduced by one of the relative markers, *who*, *that* or *whose*. In each condition, two of the four sentences included a copular matrix clause (PN) and the other two sentences included a transitive matrix clause (DP). For O- (object) relatives, half of the sentences followed the schema in (12). Table 1 gives an example sentence for each of the conditions.

Table 1 - *Example test sentence for each condition*

	Presentational (PN)	Dual propositional (DP)
Subject (intransitive)	This is the bird that slept in the box all night.	The girl cleaned up the milk that spilt in the fridge
Subject (transitive)	There is the sheep that drank the water this morning.	Eddie met the girl who broke the window last week.
Object (Oa)	There is the boy that Emma helped in the kitchen.	The boy rode the horse that Anne put in the field.
Object (Oi)	There is the picture that you drew on the wall last week.	The girl ate the sweets that you brought to the party.
Indirect object (Io)	There is the dog that the man his football to.	Anne fed the baby who Emma kicked sang a song to.
Oblique (Obl)	There is the tree that the car crashed into last night.	Anne painted the picture that the girl looked at today.
Genitive subject (GenS)	There is the girl whose juice spilt in the kitchen.	Anne saw the farmer whose cow fell in the shed.

Genitive object (GenO)	There is the girl whose toy Anne broke in the garden.	Emma met the girl whose bag Anne took to school.

The procedure to elicit the children's productions was an adaptation of that used by Diessel and Tomasello (2005). Children were assessed individually in a quiet area. Each child was introduced to the task as a puppet game, in which s/he had to repeat sentences 'like a parrot'. The sentence-recall task was divided into three batteries and administered in one session. The sequence of sentences was randomized so that there were two orders of presentation for each battery. Positive feedback was given after each response regardless of the child's performance. If a child did not respond to a sentence, the researcher continued with the following eight sentences, and then repeated the sentence again. Each session was recorded using a Zoom H4 audio recorder. The responses were stored on a Mac Air for transcription and analysis. All transcriptions were orthographic, and included mazes and hesitations. An independent analyst re-transcribed 5% of the transcripts from each group. Agreement, assessed via word-level accuracy, was 97%.

A comprehensive scoring system was devised to allow for a detailed description of both correct and incorrect responses. Children's responses were assigned a score ranging from ten to zero, with a higher score representing a more accurate performance. The summation of these scores resulted in a total sentence-recall (SR) score on which the groups could be compared. An additional score was computed by recording the total number of sentences that accurately reproduced the target relative clause construction – that is, both maintained the structure of matrix sentence and relative clause, even though the wording of the sentence might not be accurate in all respects. Sentences that were repeated with complete accuracy received a score of 10. If the repeated sentence maintained the syntactic structure of the target but had a lexical substitution, it was given a score of 9. An inflectional error or a combination of a lexical and inflectional error resulted in a score of 8, depending on the nature of the error. (See Table 2 for details). The summation of these scores resulted in a total syntactic accuracy (SA) score, on which the groups could also be compared.

Table 2 – *Examples of syntactically accurate RC constructions with and without minor errors*

Score	Error type	Target Sentence	Sentence Produced
10	No errors	This is the toy that broke in the box last week.	This is the toy that broke in the box last week.
9	Lexical error	Joe rubbed the cat that the goat stood on last week.	Joe rubbed the cat that the goat *stepped* on last week.
8	Grammatical error (change in tense)	The girl ate the sweets that you brought to the party.	The girl ate the sweets that you *bring* to the party.

This detailed scoring system also facilitates an analysis of repetition errors, which did not maintain the structure of the stimulus RC construction, but we will not pursue detailed analysis of the error categories here. Inter-rater reliability measures were obtained for the scoring scheme for the sentence-recall data, with 5% of all responses randomly selected for re-analysis. For all scored responses, the agreement rate between the original scoring and an independent rater was 92.7%. For syntactic accuracy scores, the agreement rate was 97%.

Results

Overall production of relative clauses

The total sentence-recall (SR) score was the dependent variable used in the first analysis. A one-way analysis of variance (ANOVA) indicated that groups differed significantly (F (2, 81) = 114.8, $p < .001$, $\eta 2 = .739$). Post hoc tests (Tukey-B) showed that the differences between all three groups were significant. The children with SLI (M = 216 - out of a possible score of 520 –

SD = 72.4) showed significantly greater difficulty than the YTD group (*M* = 355, *SD* = 69.8), and the AM-TD group (*M* = 441, *SD* = 33.5). The syntactic accuracy (SA) score was the second dependent variable analysed. A similar picture emerges. There was a significant difference in performance between the three groups ($p < .001$) (Kruskal-Wallis Test). Post hoc tests (Mann Whitney for post hoc differences) were used to investigate the pairwise differences. The children with SLI showed the greatest difficulty (*Mdn* = 9, out of a possible score of 52, range 0 - 28) followed by the YTD group, (*Mdn* = 30.5, range 5 - 41) and the AM-TD group (*Mdn* = 41, range 27 - 50). If we consider the number of perfect responses scored, (those meeting the criteria for a score of 10) these account for just over half of the AM-TD responses (53%), 21% of the YTD responses and 3% of the responses of the children with SLI.

Presentational (PN) compared to Dual Proposition (DP) Sentences

Each group achieved a higher mean score on PN than on DP relatives, suggesting that the type of matrix clause is an important determinant of the difficulty of RC constructions. The mean for each group on both matrix clause types is shown in Table 3.

Table 3 - *Descriptive Statistics for each Group on PN and DP Sentences, overall SA scores*

	PN Mean (SD)	DP Mean (SD)
SLI	126 (41.7)	89.4 (32.8)
AM-TD	226 (14.4)	214.7 (20.9)
YTD	188.6 (31.6)	166.2 (40.1)

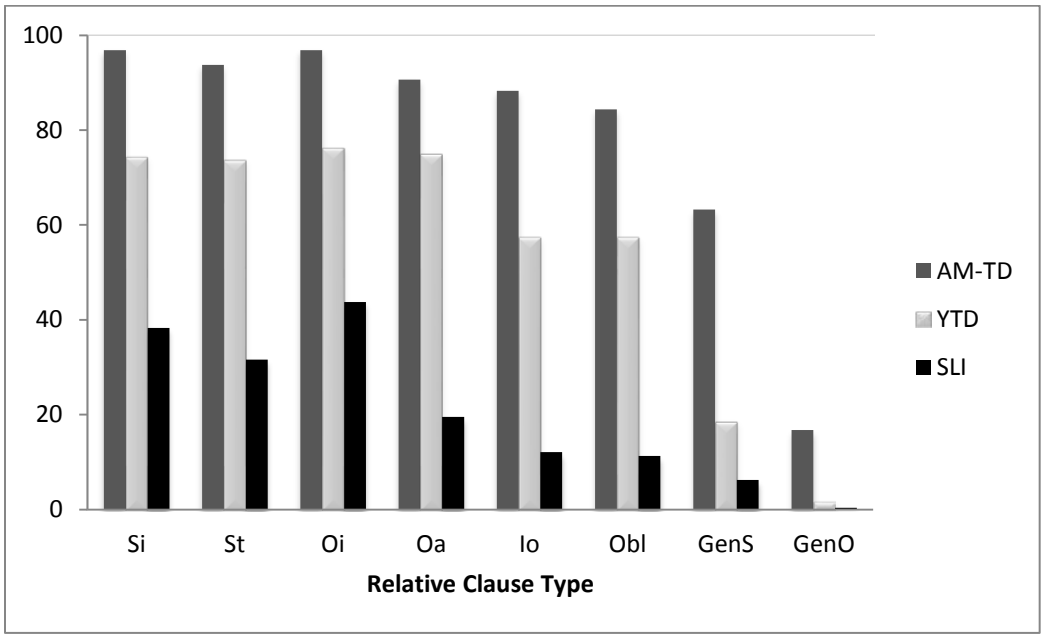
Paired sample t-tests were used to compare the mean PN and DP scores within each group. Although there was a significant difference between the two types of construction within each group, the magnitude of difference was by far the greatest for the group of children with SLI. For the children with SLI the SR score on PN sentences was on average 36.8 points higher than the

DP score. This was significant with a very large effect size (t (31) = 10.6, $p < .001$, $\eta 2 = .79$). For the AM-TD group the average difference between PN and DP scores was 11.3. This was also significant (t (31) = 5.0, $p < .001$, $\eta 2 = .45$) and for the YTD group, the average PN score was 22.5 points higher than the DP score, again significant (t (19) = 5.3, $p < .001$, $\eta 2 = .60$).

Comparison of performance on different types of relative clause

This set of results addresses the question of whether the profile of difficulty reported in the relative clause acquisition of TD children is reflected in the performance of children with SLI, and relies on SA scores. We compared the mean percentage of SA (syntactic accuracy) scores in each group's responses to the various types of relative clause constructions, defined by the syntactic role of the relativized element (Si-, St-, Oa-, Oi, Io-, Obl-, GenS- and GenO-relatives). Friedman's Anova revealed a significant effect of the relativized syntactic role ($p <$ .001) for all three groups. Pairwise comparisons were made on all pairs of relatives for each group using the Wilcoxon Signed Rank Test. In order to adjust for multiple comparisons (there were 21 comparisons in all) a Bonferroni correction was made. (Figure 1 compares the performance of the three groups on all RC construction types).

Figure 1: Percentage SA (Syntactic Accuracy) Score for Relative Clause Types



Broadly speaking the children with SLI showed the same performance difficulty, in terms of relativized role, as the two TD groups, although at a reduced level of performance. For the children with SLI there were significant differences between subject relatives and indirect object relatives ($p < .001$), subject relatives and GenS-relatives, ($p < .001$) and subject relatives and GenO-relatives, ($p < .001$). There was no significant difference between subject relatives and object relatives when object relatives were considered overall.

Children with SLI performed significantly better on intransitive subject relatives than on O-relatives overall ($p = .016$). This is in keeping with the asymmetry between subject and object relatives reported in the literature – where children with SLI are reported to have greater difficulty processing object relatives than subject relatives. However, when intransitive subject relatives were compared to Oi-relatives there was no significant difference between the two – i.e. when children with SLI were tested using object relatives with an inanimate head noun and a pronominal relative clause subject, they performed as well on these object relatives as they did on intransitive subject relatives. There was no significant difference between transitive subject relatives and O-relatives overall. Finally, when transitive subject relatives were compared to Oi-relatives not only was there a significant difference between the children's performance on both relative types but the difference was significant in favour of the Oi-relatives ($p = .048$) – i.e. children performed better on object relatives that followed the discourse constraints reported in the literature than they did on subject relatives with a transitive verb.

There were no significant differences between indirect object and oblique relatives ($p = 1.00$), indirect object and GenS-relatives, ($p = 1.00$) oblique and GenS-relatives ($p = .82$) and GenS and GenO-relatives ($p = .48$). All of these relative clause constructions caused considerable difficulty for the children with SLI and generally showed a low level of performance.

Discussion

Performance on relative clauses by children with SLI

The first research question addressed whether these 6-7 year old children with SLI differ from their age-matched counterparts and from younger TD children in their performance on RC constructions. The answer is clear, whether we consider total SR scores or SA scores. Total

sentence-recall scores showed a considerable difference between the AM-TD group, (who performed close to ceiling except on Gen relatives) and children with SLI. The discrepancy in performance was also apparent when we compared these two groups on the number of syntactically accurate RC constructions. The AM-TD group had a success rate of around 80% on this measure, whereas the children with SLI were only able to preserve the overall structure of the sentence they heard in about one in five cases. Differences between children with SLI and age peers are to be expected, but the limitations in children with SLI were also starkly revealed in the comparison with the performance of the YTD group. This group of children, who were on average two years younger than the children with SLI, had a superior overall sentence-recall score, and were successful in maintaining the correct syntactic structure of RC constructions in just over half of their responses. Both SR scores and SA scores identify a delay in the production of RC constructions in children with SLI. On the developmental trajectory of relative clause ability revealed by the two control groups in this study, children with SLI who are on average 6;10 years were not only well behind the performance level of their age peers, but they undershot by some margin the ability level of children who are not yet five years old. However the pattern of their responses to different types of RC constructions does mirror that of TD children.

The effect of the matrix clause (PN RC constructions and DP RC constructions)

Our second research question asked whether single proposition RC constructions would cause fewer difficulties for children with SLI than dual proposition RC constructions. This clearly was the case. While PN constructions favoured all groups, the greatest effect of matrix clause type was for the children with SLI, followed by the YTD group. The superior performance of typically developing children on PN structures (reported in Diessel 2004 and Diessel and Tomasello 2005) is replicated with AM-TD and YTD children here, and reflected in the performance of children with SLI on these sentences. In their discussion of the acquisition of relative clauses with young TD children, Diessel and Tomasello (2000, 2005) suggest a number of influences that might explain why the earliest relative clauses are embedded in copular constructions. If we assume that children with SLI are following a similar path, these arguments could equally be applied to children with SLI. Firstly, these constructions are semantically simple - although they consist of two clauses they reflect only a single proposition and can be paraphrased by a simple sentence. The matrix / copular clause has a formulaic construction which functions as an ‘attention getter' and is combined with a second component, for example a

verb phrase or full relative clause. Diessel and Tomasello argue therefore that relative clauses are built on item-specific constructions that are deeply entrenched when children begin to use them. Secondly, they are frequent in the ambient language, (Diessel, 2004) and are pragmatically useful for parent-child speech. The function of the presentational matrix clause is to focus the listener's attention on a referent, about which further information is given in the relative clause. Typically, the referent will be available/visible in the child's environment, and the demonstrative (*That's..)* or adverbial (*Here's…)* that introduces it will be linked to the context.

The effect of the relativized syntactic role

The third research question addressed the difficulty level of the various syntactic roles of the relative clause, in children with SLI, and its comparability with the profile of difficulty found in TD children. Broadly speaking, this performance profile is in keeping with that reported by Diessel and Tomasello (2005). The children with SLI performed best on subject relatives (with intransitive subject relatives better than transitive subject relatives), followed by object relatives, considered overall. Their performance on oblique and indirect object relatives is at too low a level to draw firm conclusions aside from the obvious ones that these forms are highly problematic for them. However perhaps the most significant feature of the performance of the children with SLI on different types of relative clause is that the advantage for subject relatives disappears when we compare them to RC constructions with object relatives that follow the scheme in (12) above – those that have an inanimate noun relativized, and a personal pronoun as the subject of the relative clause. Note that the advantage for subject relatives still holds when they are compared to object relatives that do not meet these constraints. But given the opportunity, it seems that children with SLI can demonstrate the same advantage for a frequently heard sub-type of object relative as did the TD children in Kidd *et al.*(2007).

General conclusions

Our findings would suggest that both the processing of grammatical structure and the frequency of specific structural types are relevant in accounting for the pattern of development that we see in children with SLI. In what is a stringent test of their grammatical performance – a sentence repetition task in which stimuli are up to 13 syllables in length - as a group they do not respond randomly. Rather they reflect in their responses a pattern of the difficulty afforded by different RC constructions, which parallels that of typically developing children – particularly younger children. This suggests that, subject to the limitations of processing and memory that are

inhibiting their linguistic development, these children are sensitive to the factors that influence the performance of their peers, in gaining traction on the various RC constructions.

The influencing factors are in the first instance structural. A clear indication of this comes from the superior performance by the children with SLI and the YTD children on single proposition RC constructions. These forms, where the nominal to be relativised is the predicate of a copular verb, are uniformly easier to deal with than their dual proposition counterparts. Less clear is the relevance of structural configurations to the resolution of relative clauses embodying distinct syntactic roles. There are clear differences between subject and object relatives, on the one hand, and oblique, indirect object and genitive on the other. This could implicate parsing problems associated with non-canonical structural sequences. However, the situation is less clear when we look at the subject and object relatives, particularly the latter. Both Oa relatives and Oi relatives have exactly the same structural configuration – that of (9) above – but the specific lexical choice of an inanimate head, and a personal pronoun as the subject of the relative clause makes Oi relatives easier to deal with. The results of Kidd et al. (2007) for TD children, and our data for children with SLI clearly demonstrate that Oi relatives – as is the case for adults (e.g. Mak et al., 2002) -- are easier to deal with than Oa relatives, ruling out a purely configurational account. It seems that for Oi relatives, the familiarity brought about by their frequency – which would seem to be tied to their discourse relevance – overrides any processing difficulty arising from their structure.

So far we have discussed our findings entirely in terms of group performance. It is obvious if we look at descriptive statistics for the children with SLI that standard deviations tend to be higher in this group, indicating a wide range of ability in this cohort. And this is a comparatively large and carefully selected sample, which covers a narrow age range. Resolving the heterogeneity of the group will require detailed consideration of individual profiles. For the time being we would point that variation in the YTD group as indicated by standard deviations (e.g. of overall SR scores) is similar to that of the children with SLI (and much higher than that of the AM-TD children). So given the identified delay in the group with SLI, we may simply be faced with the kind of individual variation generally seen in incomplete grammatical development.

Summary

Children with SLI are significantly delayed in their development of all types of relative clause constructions represented in this study, but they find some types easier to deal with than others. Children with SLI have significantly less of a problem with presentational relative clauses, which express a single proposition, than with fully fledged bi-clausal relatives that occur later in TD child speech. The impact of the type of matrix clause (single or dual proposition) on their ability to produce a relative clause is greater for the children with SLI than for AM-TD children or for YTD children who are on average two years younger. When it comes to the comparative difficulty of different types of relative clause, the profile that the children with SLI present is parallel to that TD children, but at a much lower performance level. In common with TD children, the performance of the children with SLI reflects the significance for them of structural configurations and frequency.

Clinical Implications and Future Research

The findings of the current study have implications for those responsible for the intervention needs of children with SLI. Those working with these individuals need to be cognisant first of all of the significant delay these children experience in their development of relative clauses. Secondly, the comparative ease for children with SLI of single proposition relatives, as opposed to the dual propositional type, and the facility with which examples of these structures can be made functionally relevant in a clinical context, suggest that these constructions should serve as the spearhead of any intervention approach for relative clauses. The superior performance of children with SLI across the range of relativized roles when these are embedded in presentational relatives only serves to reinforce this view. And finally the difficulty index that exists across relativized roles affords a clear guide to the types of relative clauses that could be initially attempted.

Measures of finite verb morphology (e.g. the tense composite of Rice, Wexler and Hershberger, 1998) have proved their discriminative value when comparing children with SLI to their typically developing age peers and to younger TD children. However, as we have become more aware of the persistence of language impairment into the school years, a focus on complex syntax may prove timely. The results of this study suggest that RC constructions may distinguish between older children with SLI and YTD children (who are on average two years younger -

further research with younger TD children would determine if the children with SLI are delayed or displaying a deficit). It can thus be added to other reports on relative clause limitations in English-speaking children with SLI (Schuele and Tolbert 2001, Hesketh 2006, Marinellie, 2006, Riches *et al.* 2010) and to the study of complement clauses, another complex syntax type, by Owen and Leonard (2006). A formal test of the diagnostic accuracy of complex syntax would be of future benefit.

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