

Two times three little pigs: dysfluency, cognitive complexity & autism

Lesley Stirling, Graham Barrington & Susan Douglas

Lesley Stirling
School of Languages and Linguistics
The University of Melbourne
Victoria 3010
lesleyfs@unimelb.edu.au

Graham Barrington
The Royal Children's Hospital, Melbourne
gbarring@bigpond.net.au

Susan Douglas
The University of Melbourne and La Trobe University, Melbourne
sdouglas@unimelb.edu.au

Abstract

This paper presents an analysis of dysfluencies in two oral retellings of a familiar children's story by a young boy with autism. Thurber & Tager-Flusberg (1993) postulate a lower degree of cognitive and communicative investment to explain a lower frequency of non-grammatical pauses observed in elicited narratives of children with autism in comparison to typically developing and intellectually disabled controls. We also found a very low frequency of non-grammatical pauses in our data, but indications of high engagement and cognitive and communicative investment. We point to a wider range of dysfluencies as indicators of cognitive load, and show that the kind and location of dysfluencies produced may reveal which aspects of the narrative task are creating the greatest cognitive demand: here, mental state ascription, perspectivization, and adherence to story schema. This paper thus generates analytical options and hypotheses that can be explored further in a larger population of children with autism and typically developing controls.

Keywords

autism, narrative, discourse analysis, cognitive science, dysfluency, repairs

1. Introduction¹

This paper stems from a research agenda based in linguistics and cognitive science which hopes to better delineate language disorder phenotypes observable in narrative. This requires the establishing of accepted metrics of narrative performance that adequately capture the ways developmental and pathological variations correlate with relevant cognitive deficits and

¹ This research was supported under the Australian Research Council's Discovery Projects funding scheme (project number DP0662936). We are very grateful to Lincoln and his family for their generosity in allowing us to collect and study Lincoln's narratives and for the useful supplementary discussions we have had with them. Thank you also to Erica Schmidt for her assistance in transcribing the data, and to Debbie Loakes for her advice and help in determining the finer-grained phonetic characteristics of the data where needed. We are indebted to Ilana Mushin, Rod Gardner and an anonymous reviewer for helpful comments on an earlier draft. We also thank audience members from ALS 2006 and from a closely related presentation at the Autism Victoria Research Forum 2006 for their comments and discussion.

abilities. As a contribution to this avenue of enquiry, we propose to perform detailed discourse analyses of the language production of individual neuro-atypical children who are able to produce rich narrative, with the guiding hypothesis that focusing on rich naturalistic data from these individuals may better identify key linguistic phenomena of phenotypic interest.

A previous study (Stirling & Barrington, in press) investigated *written* narratives spontaneously produced by a child with an established diagnosis of autism, Lincoln, who demonstrated a marked contrast between narrative proficiency and conversational deficit. These stories included retellings of the popular children's stories 'The Three Little Pigs' and 'The Three Billy Goats Gruff' spontaneously written by Lincoln on his home computer. Stirling & Barrington (in press) show that these stories exhibit sophisticated episodic macrostructure and the ability to use a range of devices for managing perspective. Nevertheless, his narratives are recognizably profoundly unusual in ways that go beyond morpho-syntactic and lexical irregularities, and which, it is suggested, could be explained in terms of the planning and the mentalising aspects of the narrative task, specifically in difficulties in the management of the relative knowledge states of characters, narrator, and audience.

The study reported here extends the data used in the earlier study in the addition of two *oral* retellings of 'The three little pigs' as told by Lincoln on subsequent separate occasions. In this paper we focus on a particularly interesting aspect of these oral narratives: dysfluency. One major difference between oral and written story retellings is that the written version tends to be an edited final product whereas the spoken version may index the process of narrative construction in a more revealing way: for instance in self-repairs, hesitations, blind alleys and restructuring.

2. This study

This paper thus presents a case study of dysfluency in two oral retellings of the same story by a young boy with autism. Autism is classified as a pervasive developmental disorder which has three main diagnostic areas. These are: (1) qualitative impairment in social interaction; (2) qualitative impairments in communication; and, (3) restricted repetitive and stereotyped patterns of behaviour, interests and activities. Within the area of qualitative impairments in communication, there are a sub-set of features, one or more of which must be included for a diagnosis of autism. These features include: delay in, or absence of, spoken language; for verbal individuals, a marked impairment in the ability to engage in conversation; stereotyped and repetitive use of language or idiosyncratic language; and a lack of pretend play (Diagnostic & Statistical Manual of Mental Disorders, Fourth Edition, Text Revision – American Psychiatric Association 2000). Autism has a developmental dimension, in that onset must be prior to three years of age, and it is a heterogenous disorder.

Lincoln has been formally diagnosed with autism and has significant language impairment, most readily apparent in a conversational setting, as well as the social deficits and behavioural routines typically associated with the disorder, but is otherwise in the 'higher-functioning category'. He attends a mainstream school with the support of a full-time aide and was 8 years old at the time of the first of the two data collection sessions described here.

Lincoln was originally diagnosed with 'severe language disorder' at age 2 and was not diagnosed with autism until age 7 (mid 2003). The diagnosis ('pervasive development disorder – autism') was made by a paediatrician in collaboration with a multidisciplinary team consisting of a clinical psychologist, speech therapist & occupational therapist. On the standardised Childhood Autism Rating Scale (CARS) assessing the presence of autistic features in current behaviour his disability was categorised as severe. The speech pathology

assessment, referring to results of the Clinical Evaluation of Language Fundamentals (CELF) and the Test of Language Development – Primary, also identified severe difficulties in receptive and expressive language (2 or more Standard Deviations below the mean). On non-verbal IQ tests he scored above average or superior.

Lincoln's spontaneous written retelling of 'The Three Little Pigs' was produced in around May 2003. On the basis of information from his carers we have ascertained that the major source of his knowledge about this story was books and accompanying 'reader theatre' plays which he used at school (Smith 1997). Note, incidentally, that there was apparently up to a year between his exposure to these and his reconstruction of the stories.

We subsequently sought to elicit oral versions of these stories. The elicitation sessions were 3 months apart and held in Lincoln's home in the presence of one of the researchers, his mother, and on the first occasion, his speech therapist – all people who were well known to Lincoln. The first retelling of 'The three little pigs' was one we asked Lincoln to tell at the first elicitation session on the 29th May 2004, and the second he volunteered without prompting at the beginning of the second session on the 1st August 2004. The first oral recording session took place approximately one year after Lincoln had written the stories analyzed in our previous study.

On both occasions, Lincoln was invited to sit at a table with the adults present in order to tell his stories. He was keen for his stories to be recorded and very comfortable speaking into the microphone, as he had previously participated in similar activities with therapists. The sessions were audio-taped on a SONY Professional Walkman and videotaped using an analog video recorder which was placed unobtrusively on a tripod at one side of the room. The audio and video tapes were subsequently digitized.

A relatively broad transcription of the stories was done using the Du Bois et al system (Du Bois, Schuetze-Coburn, Cumming & Paolino 1993); relevant transcription conventions are provided at the end of this paper.

Overall, Lincoln's oral retellings of the 'Three Little Pigs' are extremely expressive and highly dramatized, including appropriate character voices for the pigs and the wolf. However, there are distinct variations between the first and second versions. One of the striking characteristics is that they incorporate different propositional content. The key elements of the story are present in each, as are, to some extent, the formulaic expressions one would expect for any retelling of this story. Nevertheless, there are some noteworthy differences. In particular, the second story contains much more additional information which is a reflection of the different storytelling strategy employed by Lincoln: in this version, there is a much more clearly defined role for the narrator in the inclusion of scene transitions, more detailed scene and mood setting, and a stronger focus on character interactions. This is clear evidence that Lincoln's retellings are not merely products of rote learning. Lincoln is clearly operating with a story schema upon which he elaborates in different ways each time he tells the story.

In sum, Lincoln attempts a more ambitious storytelling task in the second version. This is concordant with our impression at the time that he was keen for the opportunity to present what he felt was an improved version of the story. The second story was also subjectively more dysfluent, in ways we will investigate below.

The following examples illustrate how the content of the second version of the story is enlarged from the basic story schema. Most often it was the setting which was elaborated, however in some cases, interactions between the characters were expanded. (1a) is the more descriptive version from the second retelling and (1b) shows the comparable section from the first retelling.

(1) a. [1/8 45-64]

45 L: (0.7) So he ^built this house,
46 ^out of bricks.
(H Hx H)
(Hx) (total elapsed time between words 3.2)
47 While ^mother pi-
48 .. while ^mother pig doing the ^kitchen,
49 (0.3) the big bad ^wolf,
50 was ^out of the forest the ^next day.
51 (0.3) (H) It was a ^ho=rrible ^night.
52 (0.5) (H) That was a ^fog of the worst seen XXXX.
53 (0.9) He ^looked for the three little ^pigs,
54 until the ^moon went ^up. ((drawn out))
55 (1.4) ^That night,
56 (0.6) the ^wolf,
57 ^came to the house of,
58 (0.5) sti- straw.
59 (1.2) (H) <VOX (rough voice) “He^llo= little pig,
60 can I come ^in” VOX>?
61 (1.4) said the wolf.
62 (0.5) <VOX (higher pitch) “No ^thank you,
63 (0.5) (H) I need to do my ^breakfast” VOX>.
64 (0.3) said the p- first little pig.

(1) b. [29/5 35-57]

35 L: (1.2) Then the f-
36 .. and the ^first pig,
37 .. built a house with ^bricks.
38 (0.7) “^This should make a good ^house”,
39 .. he said,
40 (0.9) so he ^shoveled,
41 .. and he ^sawed,
42 (H) (0.5) and he ^put it on the ^house.
(3.4) (clears throat)
(1.1) (H) (1.4) (clears throat)
(2.0) ([ʔə])
43 (1.0) but ts- ch-
44 but ^suddenly,
45 (0.7) (H) the ^big .. ^bad .. ^wolf –
46 M: (0.3) <VOX (whispered) No no no no no no VOX>. ((child doing something
with mic))
47 L: .. (Hx)
48 (1.5) ^<X stand/stared X> at the house with ^sticks.
49 M: (0) <VOX (whispered) no XX VOX>
50 L: (0.5) <VOX (very loud and gruff) “Little ^pig,
51 (0.4) little ^pig,
52 .. let me come ^in” VOX>,
53 (0.4) he ^said,
54 .. “No no ^no not the fair --”
(H)
55 (1.9) “Oh= not by a hair of the ^chinny chin chin,
56 I will ^not <X let you X> in!”
57 (1.0) s=aid the ^first pig,

Example (1b) contains minimal elaboration beyond the basic story schema. There is additional information in the description of the first little pig building his house (lines 35-42), however the scene settings and transitions are sparse, and the exchange between the first little pig and the wolf contains the formulaic expressions traditionally associated with this story. In contrast, the excerpt from the second retelling (1a) contains descriptive scene transitions (lines 47-50 and 55-58), detailed scene setting (lines 51-54), and the exchange between the first little pig and the wolf is quite a departure from the formulaic dialogue in (1b).

3. Analysis of pauses and cognitive complexity

3.1 Background literature

As indicated above, our focus in this paper is the dysfluencies present in the stories. Impressionistically, there are many long pauses and many repairs (such as in examples 1a and b), while at the same time Lincoln produces very rich and, in many ways, sophisticated narratives. As outlined in the previous section, this is particularly the case in the second retelling.

There has been only a small amount of previous work on dysfluency and repair in the speech of children with autism (Baltaxe 1977; Epstein 2005; Geller 1998; Volden 2004). Moreover, only the study by Thurber and Tager-Flusberg (1993) has considered dysfluency in narrative production. Thurber & Tager-Flusberg investigated the distribution of various pause types and repairs in oral narratives produced by children with autism and control groups of children with intellectual disabilities and typically developing children. A total of thirty children (ten in each group) were asked to tell the story depicted in the wordless picture story book *Frog, Where Are You?* by Mercer Mayer (1969). The mean age of the children with autism was 12 years, and they were described as ‘relatively high functioning’ (p. 313).

Previous research indicates that pausing behaviour in speech tasks is related to the level of cognitive demand required.² That is, the more cognitively demanding the task, the more pauses will be present in the discourse (Leeper & Woodard 1978; Levine, Silverman & Ford 1967). Moreover, a distinction can be made between what are called ‘grammatical’ pauses, which occur between sentences and at clause and phrase boundaries, and ‘non-grammatical’ pauses which occur within phrases: grammatical pauses are more likely a result of normal processing breaks or planned breath stops, while non-grammatical pauses are proposed as indicative of high cognitive loading, such as the search for a particular lexical item, and are connected with the difficulty of the discourse topic (Martin 1967; Rudor & Jensen 1972). Thurber and Tager-Flusberg hypothesised that the narratives of children with autism would contain fewer non-grammatical pauses than either typically developing children or children with intellectual disabilities. They investigated the frequency of pauses, false starts and repetitions in the narratives of each group.

Their results indicate that while there were no significant differences between the groups in the number of repetitions and false starts in the narratives, or in the number of grammatical pauses, there was a significant difference in the number of non-grammatical pauses. The children with autism had a lower non-grammatical pause frequency than either of the two control groups. Moreover, the children with autism produced shorter and less complex narratives, and the frequency of non-grammatical pauses was significantly correlated with narrative complexity as measured by the number of different words and total number of words produced. Thurber and Tager-Flusberg concluded that these children’s stories ‘were

² There is of course a substantial body of work in conversational analysis which shows that interactional factors such as recipient design can also be important in determining pausing behaviour (e.g. Goodwin 1981).

produced with less cognitive and communicative investment' (1993: 318) than the typically developing children and children with intellectual disabilities.

3.2 Coding protocol

In this study we applied the methodology of Thurber and Tager-Flusberg to our data. In our transcription we measured the duration of pauses in Transcriber in tenths of seconds, and coded them accordingly. Where very short pauses were difficult to measure, they were coded using the ‘..’ convention of the Du Bois style transcription system. Dysfluencies in the two retellings of ‘The three little pigs’ were coded by two independent raters for the following categories, as per Thurber and Tager-Flusberg’s coding scheme: grammatical pauses (GR), non-grammatical pauses (NGR), false starts (FS) and repetitions (R). False starts were taken to include cases where a recast occurred some way into the clause or turn, not just at the beginning. However, as in the original study, pauses associated with false starts were not counted: by definition false starts involve a structural change, hence it is impossible to ascertain the grammaticality of the intervening pause. Following Thurber and Tager-Flusberg, we also calculated the pause rate per 100 words to allow comparison of the pause frequency between the two retellings.

The following exemplify the pauses coded. In example (2), the encircled pauses are grammatical. The third pause occurs after a false start (bold text) and therefore was not included in the analysis. In example (3), the first two pauses are grammatical while the final pause (as encircled) was a non-grammatical pause. Here the pause is non-grammatical because it interrupts a Prepositional Phrase. Consistent with previous studies, the pause indicates high cognitive loading as it is clear that Lincoln is momentarily unsure whether it is the house of straw or the house of sticks the wolf approaches at this point in the story. Pauses accompanying repetitions occur between an incomplete utterance and the repeated lexical or phrasal element (see example 4b.).

(2) Grammatical pauses and a false start:

[29/5 3-5]
 3 (0.4) Once upon a ^time,
 4 **there was –**
 5 .. a ^mother pig had ^three little pigs.

(3) Non-grammatical pause:

[1/8 55-58]
 55 (1.4) ^That night,
 56 (0.6) the ^wolf,
 57 ^came to the house of,
 58 (0.5) sti- straw.

There were some issues with Thurber and Tager-Flusberg’s methodology which needed to be addressed in applying it to our data. The issues arise in deciding precisely when a pause occurs within a phrase, and is therefore to be coded as a non-grammatical pause. For instance, on the basis of the examples they give, it appears that Thurber & Tager-Flusberg don’t treat Verb Phrases as a unit for purposes of identifying non-grammatical pauses:

(4) a.	(The fresh fruit)	(from the farm)		(that had fired us)
	<i>noun phrase</i>	<i>prep. Phrase</i>		<i>subordinate phrase</i>
	(was shipped)	(to Maine)	(and)	(to the South).
	<i>verb phrase</i>	<i>prep. Phrase</i>	<i>coordinator</i>	<i>prep. Phrase</i>

b. The milk was // was in the fridge.

(Thurber & Tager-Flusberg 1993: 315)

As a result, pauses between a verb and its complement (such as in example 4b) are coded as grammatical. They also allow for grammatical pauses between a head noun and modifying Prepositional Phrase or Relative Clause (see example 4a). They thus treat as complete phrase units those which more conventionally might be regarded as syntactically incomplete, although the boundaries they recognize occur at potential phrase boundaries from a processing point of view. Nonetheless, we have followed what we take to be their approach in our study.

3.3 Results

It is important to note that our narrative data is rather different from Thurber & Tager-Flusberg's: their participants had not been exposed to the story, *Frog, Where Are You?*, prior to the data collection session, whereas Lincoln had encountered the story of 'The Three Little Pigs' through the 'reader theatre' activities outlined above. Furthermore, their participants received no verbal stimulus, but were invited to examine the pictures while an experimenter turned the pages; Lincoln was familiar with various verbalizations of the story and performed his own narratives without interruption. These procedural differences have implications for the nature of the data we would expect to find in Lincoln's stories. That is, we might predict that Lincoln would be quite fluent in his production of at least some sequences within the story, given his previous exposure to it and the formulaic nature of the story itself. Nevertheless, it seems reasonable to investigate the distribution of the two different kinds of pauses, given the association of non-grammatical pauses with cognitive complexity, and our impression that the second retelling is simultaneously more elaborate and more dysfluent.

Table 1 shows the overall length of the two versions in number of words and in minutes. The second version has more verbal content, yet is spoken at a much faster pace.

	1st version	2nd version
Total number of words	563	616
Length (minutes)	5:39	4:54

Table 1 General features of the two retellings

Table 2 details the frequencies per 100 words and the token counts of pauses, false starts and repetitions from the two retellings. Interrater agreement on the occurrence and location of pauses, false starts and repetitions was 94% for the first retelling and 92% for the second retelling. Areas of disagreement were resolved by discussion.

	1st version		2nd version	
	Frequencies per 100 words	Tokens	Frequencies per 100 words	Tokens
False starts	1.9	11	1.1	7
Grammatical pauses	18.5	106	15.1	93
Non-gramm. pauses	0.4	3	0.6	6
Repetitions (total)	0.5	3	0.5	3
Grammatical	0.3	2	0.2	1
Non-grammatical	0.2	1	0.3	2

Table 2 Frequency of pauses, false starts and repetitions

As indicated in Table 2, Lincoln's stories contained very few non-grammatical pauses. Comparison with the results of Thurber and Tager-Flusberg's study reveals that these figures are less than the mean frequency of non-grammatical pauses in the stories told by their children with autism (2.7) who produced fewer non-grammatical pauses than the typically developing children and children with intellectual disabilities. The small frequencies of non-grammatical pauses are even more surprising in light of the fact that there are higher frequencies of grammatical pauses. The children with autism in Thurber and Tager-Flusberg's study produced a mean frequency of 13.1 grammatical pauses per 100 words, compared to Lincoln's 18.5 for the first story and 15.1 for the second. These higher frequencies in Lincoln's stories correspond to the overall length of his stories (563 and 616 words) which were over twice as long as the mean length of the stories produced by the children with autism in their study. However, as discussed above, the nature of the storytelling task is somewhat different between our study and the Thurber and Tager-Flusberg study.

There are some interesting differences between Lincoln's two retellings of The Three Little Pigs. The second story contains fewer false starts and fewer grammatical pauses which seems to correspond to the fact that, as indicated in Table 1, it was produced at a faster pace than the first story. There are slightly more non-grammatical pauses in the second version which could be said to support the idea that this version was a more cognitively demanding task.

4. Discussion: other indicators of cognitive load

On the basis of Thurber and Tager-Flusberg's findings, the low frequencies of non-grammatical pauses in Lincoln's two story retellings might indicate that, as for the children with autism in their study, Lincoln's two retellings are produced with diminished cognitive and communicative investment. We wish to challenge this conclusion, however. As we have seen the stories are longer than those in the earlier study, and there are a number of indications that they are in fact produced with a high level of cognitive engagement and investment: they are presented as a performance, with high dramatization and multiple voices, and there is an evident concern on Lincoln's part to get the story right. A global consideration of dysfluency in these narratives supports these impressions, suggesting that further investigation of dysfluency beyond pause frequencies is required to properly capture cognitive load and investment. Some examples of other kinds of dysfluency which it is fruitful to consider will be examined in the remainder of this section.

4.1 Perseverative repair sequences

Example (5) illustrates what we are calling 'perseverative repair sequences'.

- (5) [29/5 91-101]
 91 (0.7) <VOX (high tone yell) "He=lp!" VOX>
 92 .. cried the ^first little f- --
 93 .. cried the ^two litt- --
 94 .. cried the s- ^first and the ^second,
 95 (0.7) two ^times,
 96 .. ^off to the bro-
 97 to--³
 98 .. ^off --
 99 two times,
 100 .. ^off to their bro-
 101 .. brother's house.

³ This could also be 'two--'.

There is only one non-grammatical pause in this sequence (the non-grammatical repeat in the final line), so measurement of non-grammatical pauses doesn't capture what is going on. Instead we find many false starts and partial repetitions.

Schegloff (1979) points out that more than one or two 'tries' at repairing a trouble spot is highly unusual. He says (p. 277):

...repair aims for success and is overwhelmingly successful at achieving it quickly. For the most part, a single repair effort deals with a trouble-source. [...] Sometimes, however, a single repair effort does not achieve a stable, successful solution, and almost immediately another repair is initiated on the same repairable. Although not common, two successive repairs [...] yielding three tries at that bit of talk – are not rare. Cases with more than two repairs [...] are the harder to find the more repair segments are involved.

Here Lincoln perseveres beyond what one would normally find at least in adult speech: little comparable work on children's speech has been done, but the work which exists on self-initiated repair in children's speech does not report unusually perseverative repair (Evans 1985; Caplan et al 1996). In this example, there are at least two interlocked repair sequences with at least 4 tries at each, and 7 or 8 attempted repairs altogether depending on how you count, as shown in Table 3. Here, following work on repair from within the conversational analysis tradition (Sacks, Schegloff & Jefferson 1974; Schegloff 1979), a 'repairable' is a trouble source for which there is a subsequent attempt at repair.

Line	Repair sequence I	Repair sequence II	Repairable (if applic.)	Repair status
1	.. cried the ^first little f- --		Ia	
2	.. cried the ^two litt- --		Ib	Attempted repair of Ia
3	.. cried the s- ^first and the ^second,		Ic Id	Attempted repair Repair
4	(0.7) two ^times,			Further clarification
5		.. ^off to the bro-	IIa	
6		to-	IIb	Attempted repair of IIa
7		.. ^off --	IIc	Attempted repair
8	two times,			Repetition of 4
9		.. ^off to their bro-	IIId	Attempted repair
10		.. brother's house.		Repair

Table 3 An example of perseverative repair sequences

Perseveration as a feature of executive control dysfunction is well known in psychological research, particularly in reference to performance tasks. Shallice (1988) proposes an information-processing model for perseveration in which executive control dysfunction leads to a failed modulation of a lower level response selection system under a requirement for novel response generation. Perseveration has been found to be a feature of the performance of children with high functioning autism in studies of executive function (e.g. Liss et al 2001). Stereotyped and repetitive use of language has long been recognized as a clinical feature of autism. These characteristics have however been less discussed in the discourse analytic literature.

We observe in this example repairs that appear to be associated with the management of number and the attribution of reported speech to two agents simultaneously. At issue here is a mentalisation task over number which appears to cause some difficulty. There could also be some interference between higher and lower level narrative structure, with intrusion of the entrenched ‘3 part one by one’ schema of the three little pigs story. Of note is that in the first repair sequence in the example discussed, Lincoln does not persevere on selection of a lexical item, but rather on the solution of a higher-level repair task.

This is not an isolated incident: there are a number of such clusters of dysfluencies in the stories. A point of interest is where these clusters occur, and one place is around reported speech. Given that taking the perspective of others is held to be a problem for people with autism (Hobson 1993; Tager-Flusberg 1993, 1994), this is a potentially interesting observation.

In example (6) for instance, Lincoln perseverates on finding a preferred reported speech introducer, and again here none of the pauses are non-grammatical ones. This is particularly interesting given that in Thurber & Tager-Flusberg (1993), non-grammatical pauses are associated with searching for lexical items among other things, and it is lexical search of a particular kind which is going on here: rather than pausing while casting around for the desired word, in this case the speaker is trying one word after another before settling on a formulation.

(6) [29/5 82-87]

82	<VOX (rough and soft) (0.6) “Then I’ll ^huff,	GR
83	(0.6) and I’ll puff,	GR
84	(0.7) (H) and I’ll ^blow your house ^i=n”, VOX>	GR
85	.. cried the wolf	GR
86	.. said the –	GR
87	(0.8) yelled the wolf,	FS

In selecting amongst the three lexical options considered here, there is an emotional state attribution encoded as part of the meaning of the reported speech introducing verb. This is interesting in the context of postulated deficits in emotion recognition and attribution in autism. If repairs and pauses are an indication of cognitive load, then this example may point to both ability and deficit in the attribution of propositional attitude.

In the second version of the story, there is still some dysfluency over reported speech, but somewhat less: in example (7) lines 164-165 illustrate hesitation over the reported speech verb, with a non-grammatical repetition (NGR(R)) in line 165, but note that Lincoln has found a strategy for dealing with the number problem, by spelling out the distributed nature of the reported speech explicitly – and this time with few dysfluencies. There is just one non-grammatical pause in this segment, in line 168.

(7) [1/8 163-168]

163	“let’s build a ^fire!”,	
164	said the –	
165	.. said the pi-	NGR(R)
166	third little pig,	
167	to the second little pig,	
168	and the fir=st .. little pig,	NGR

A final example in this section shows that we do get similar clusters outside reported speech contexts – here it is probably noteworthy that this is one of the places where Lincoln is adding

new context not in the original schema. Note that ‘H’ indicates an in-breath in the Du Bois transcription system and is treated here as an unfilled pause.

(8) [1/8 111-117]

	(H) (swallows) (Hx through nose)	
	(total elapsed time between words 6.2)	
111	In the ^middle of the ni- (H)	GR
112	(0.7) and on the ^midnights –	FS
113	(H) and –	FS
114	(0.3) and ^on the nmoo-	NGR(R)
115	(0.2) ^midnight Sunday,	FS
116	(H) with no par^ticular warning,	GR
117	(H) the two pigs ^ra=n to the house of bricks,	GR

Another point to note here is that the whole cluster is preceded by a very long gap between speech segments: 6.2 seconds altogether. We will return to the importance of pause length in section 4.3.

4.2 Schema-level repair

As well as these cases of perseverative repair, we find examples of what we call ‘schema-level’ repair, where the repair involves a restructuring on a more global scale. We will consider two examples here.

The first example is from version 2 of the story.

(9) [1/8 16-28]

16	The ^three little pigs,	
17	^set off across town,	
18	and ^left ^mum ^home.	
	(1.1) (clears throat) (0.7) (H) (Hx) (H) (Hx) ha. (H Hx H) (total elapsed time between words 6.8)	
19	<VOX (panting voice) “He ^built,	
20	.. ^a=,	
21	.. ^straw!” VOX>,	
22	(1.1) said the first little ^pig. ((microphone rustling))	
23	(1.3) The ^first little ^pig says ^no,	
24	he ^found some straw.	
25	(0.2) He just ^built some –	
26	(H) a ^house of straw,	
27	(H) made,	
28	(H) out of ^straw.	

This sequence is marked by notable dysfluency. There is a long break between story episodes, after line 18. In the period immediately prior to line 19 begins a breathing pattern that seems to indicate a character hard at work, which leads into and continues throughout the hard to interpret direct speech of the first little pig of lines 19-21. Line 22 shows a clear and distinct return to the narrator’s voice. In lines 23-28 Lincoln frames the speech in lines 19-22 as problematic: that a correction is being made is clear from line 23 ‘The first little pig says ^no’, with emphasis on the ‘no’, and by the contrastive stress on ‘found’ and ‘built’ in the following two lines.

We postulate that there are two issues being wrestled with by Lincoln here: adherence to the traditional story schema which would require that the finding of the materials to build the

house is described before its building, and the management of the presentation of information as distributed between the different communicative roles available in narration: voices of the narrator, the characters and the author.

Thus, it is not appropriate for the first little pig to say ‘he built’ in direct speech in line 19 – Lincoln confuses the narrator and character. The narrator’s voice is reestablished in line 22. The repair sequence in lines 23-28 indicates further difficulty in the mental state attribution process between character, narrator and author. Although Lincoln presents the material in lines 23-28 as said by the little pig, the content is a meta-correction to the story schema which in fact should be the domain of the author – Lincoln confuses the character and the author. This could be viewed as an example of difficulty with attentional flexibility and set shifting in shifting between roles within the narration, in line with deficits in executive function that are hypothesized to occur in autism.

The second example to be discussed in this section also involves the tripartite schema of the house of straw / sticks / bricks. In the first retelling of the story, Lincoln begins with the house of sticks (the relevant extract is in (10)a.). Then when he comes to tell of the house built by the second little pig, he starts to say ‘bricks’ as following on from ‘sticks’, but apparently realizes he is not up to that part of the story yet, and resolves the difficulty by creating the idea of a second house with ‘nicks’. Again note the kinds of pauses which occur in these examples. There is a non-grammatical repeat in example a., and the grammatical pause which occurs in the third line of this example is in fact a pause between the verb and direct object (see below). In example b., while there is no non-grammatical pause, there is dysfluency with a repeat followed by false starts.

(10) [29/5 15-18]

a.

15	(0.6) The ^first pig,	GR
16	(0.6) built,	GR
17	(0.9) a ^house wiss-	GR (between V & DO)
18	(1.0) a house with ^sticks.	NGR(R)

[29/5 25-28]

b.

25	(2.0) The second built,	GR
26	.. built a house with ^br-	GR(R) (between V & DO)
27	(0.5) built a house with ^nee,	FS
28	(0.5) ^nicks,	FS

4.3 Pauses and cognitive complexity: methodological issues

We also wish both to make some cautionary points about the use of pauses as a measure of cognitive complexity, and to suggest that a more detailed look at pauses may be illuminating. We need to investigate not just the occurrence of pauses and their type but also the length of pauses and where they occur with respect to the story structure and perspectival shifts.

In our data we frequently found long pauses, all of which were coded as ‘grammatical’ and therefore not indicative of cognitive complexity on this model. We need to look carefully at where these occur. Long pauses before or in the vicinity of a cluster of other types of dysfluencies seem consistent with the proposal that there is a schema which is in the process of being filled in, so that cognitive work may be being done. Example (11) (a partial repeat of example 1b.) is a case in point, as are examples (8) and (9) above (in the latter there is a very long pause between story episodes as we saw).

(11) [29/5 38-48]
 38 L: (0.7) “^This should make a good ^house”,
 39 .. he said,
 40 (0.9) so he ^shoveled,
 41 .. and he ^sawed,
 42 (H) (0.5) and he ^put it on the ^house.
 (3.4) (clears throat)
 (1.1) (H) (1.4) (clears throat)
 (2.0) ([ʔə])
 43 (1.0) but ts- ch-
 44 but ^suddenly,
 45 (0.7) (H) the ^big .. ^bad .. ^wolf –
 46 M: (0.3) <VOX (whispered) No no no no no no VOX>. ((child doing something with
 mic))
 47 L: .. (Hx)
 48 (1.5) ^<X stand/stared X> at the house with ^sticks.

Some instances of grammatical pauses thus seem to be more problematic than others. As well as these extra long grammatical pauses, we also find pauses between verb and direct object which seem potentially more dysfluent and indicative of cognitive load than, for instance, those occurring at clause boundaries. This was the case in example (10); another instance can be seen in example (12) below.

(12) [1/8 33-35]
 33 (3.4) (H) So he ^built,
 34 (0.2) the ^house,
 35 out of ^sticks.

Finally, pauses as timed silence may poorly reflect ‘pausing’ in a more discourse functional sense: for this reason some discourse analysts measure pausing subjectively relative to the pace of surrounding speech rather than by timing pauses. Consider the following example for instance:

(13) [1/8 176]
 176 (H) and no one has seen him (H) any * m=ore.

In this example there is 400 ms of silence between *any* and *more*, which would be coded as a non-grammatical pause on a consistent, mechanical application of the coding criteria we have adopted from the earlier study. However this pause occurs in the context of elongation of the entire intonation unit, as the story draws to a close. It is completely appropriate and expected in this context.

5. Conclusion

Dysfluencies in the language of children with autism have been comparatively little studied, however Thurber and Tager-Flusberg have investigated the distribution of pauses in narratives of children with autism, children with intellectual disabilities, and typically developing children. Substantial earlier work had established a correlation between non-grammatical pause frequency and cognitive load, particularly in regard to lexical choice. Thurber and Tager-Flusberg found a significant difference in the frequency of non-grammatical pauses in the autism group in comparison to the other two groups, and for the children with autism the frequency of non-grammatical pauses significantly correlated with the length and complexity of their narratives. Thurber and Tager-Flusberg interpret these

results as indicating that the stories of the children with autism 'were produced with less cognitive and communicative investment' (p. 318).

We have been interested to apply this method of analysis to two narratives produced by the same child in the form of oral retellings of a well-known children's story, one representing a more complex task than the other. Our data showed a very low frequency of non-grammatical pauses in comparison to Thurber and Tager-Flusberg's data, but relatively high grammatical pause rate. There was little difference between the two stories in frequency of pauses with an overall decrease in the frequency of grammatical pauses and increase in the frequency of non-grammatical pauses in the second retelling, along with an increase in the complexity of the story and the speed of narration.

On the basis of this exercise we make two main points. First, for this child undertaking this task, we argue that non-grammatical pauses are not the place to look for an indication of cognitive load, and that the notable dysfluencies that we do see in fact suggest that Lincoln is engaged with a demanding cognitive task. Second, we propose that the kind and location of dysfluencies produced can profitably be examined in detail to explore the aspects of the narrative task which are creating the greatest cognitive demand.

Thus, we identified a class of perseverative repairs, which while in themselves plausibly result from executive control dysfunction which has been associated with autism, are interesting in where they occur: primarily at points of complex mentalising and perspectivization. We also saw examples of repair associated with story schema departures, which indicate that the child is concerned to get this right, and long sequences of pausing and dysfluency between narrative episodes. All these indicate considerable effort in planning if we are looking for areas of cognitive engagement.

Although both the story telling task used by Thurber and Tager-Flusberg and the task undertaken by Lincoln involved production of a narrative, only the latter involved reproduction of an internalized story schema. This may highlight the cognitive load associated with adherence to (and perhaps embellishment of) a story schema, but would be expected to lower the non-grammatical pause rate, if prior exposure aids lexical choice, reducing associated dysfluencies.

We wish then to shift the focus of attention to looking at examples which may indicate cognitive load operating at levels beyond simple lexical choice and syntactic construction, and which may be identified in part via the presence of grammatical rather than ungrammatical pauses (although clearly issues of mental state ascription for instance may have an effect on lexical selection as well).

This paper is an exercise in generating interesting analytical options and hypotheses that can be explored further in a larger population of children with autism and typically developing controls. Two avenues of enquiry of interest are: one, dysfluencies associated with perseveration, with the potential to reveal something about language and cognitive processing (in particular the novel response generation and selection process that escapes modulation), and secondly, the identification and distribution of dysfluencies associated with higher order aspects of the narrative task, such as mental state ascription, perspectivization, and adherence to story schema.

References

- American Psychiatric Association 2000 *Diagnostic and Statistical Manual of Mental Disorders, DSM-IV-TR Fourth Edition (Text Revision)* Washington, DC: American Psychiatric Publishing.
- Baltaxe C 1977 'Pragmatic deficits in the language of autistic children' *Journal of Pediatric Psychology* 2: 176-180.
- Blythe J 2006 'Referential repair and co-construction in Murriny Patha conversational narratives' Paper presented at the Australian Linguistic Society conference, Brisbane, 7-9 July.
- Caplan R, Guthrie D & S Komo 1996 'Conversational repair in schizophrenic and normal children' *Journal of the American Academy of Child & Adolescent Psychiatry* 35.7: 950-958.
- Du Bois J, Schuetze-Coburn S, Cumming S & D Paolino 1993 'Outline of Discourse Transcription' in J Edwards & M Lampert (eds) *Talking data: transcription and coding in discourse research*: Hillsdale, NJ: Erlbaum. Pp. 45-89.
- Epstein S 2005 *Formulation Deficits in Spontaneous Speech of Verbal Children with High Functioning Autism* PhD Thesis, Columbia University.
- Evans MA 1985 'Self-initiated repairs: A reflection of communicative monitoring in young children' *Developmental Psychology* 21.2: 365-371.
- Geller E 1998 'An investigation of communication breakdowns and repairs in verbal autistic children' *British Journal of Developmental Disabilities* 44: 71-85.
- Goodwin C 1981 *Conversational Organization: Interaction between Speakers and Hearers* NY: Academic Press.
- Hobson R 1993 'Understanding persons: The role of affect' in S Baron-Cohen, H Tager-Flusberg & D Cohen (eds) *Understanding other minds: perspectives from autism*: Oxford University Press. Pp. 204-227.
- Leeper HA & RE Woodard 1978 'Temporal characteristics of topic- and picture-elicited speech of children' *Perceptual and Motor Skills* 47: 496-498.
- Levine H, Silverman I, & BL Ford 1967 'Hesitations in children's speech during explanation and description' *Journal of Verbal Learning and Verbal Behavior* 6: 560-564.
- Liss M, Fein D, Allen D, Dunn M, Feinstein C, Morris R, Waterhouse L & I Rapin 2001 'Executive-functioning in high-functioning children with autism' *Journal of Child Psychology & Psychiatry & Allied Disciplines* 42.2: 261-270.
- Martin JG 1967 'Hesitations in the speaker's production and the listener's reproduction of utterances' *Journal of Verbal Learning and Verbal Behavior* 6: 903-909.
- Mayer M 1969 *Frog, Where Are You?* New York: Dial.

- Rudor KF & PJ Jensen 1972 'Fluent and hesitation pauses as a function of syntactic complexity' *Journal of Speech and Hearing Research* 15: 49-60.
- Sacks H, Schegloff E & G Jefferson 1974 'A Simplest Systematics for the Organization of Turn-Taking for Conversation' *Language* 50: 696-735.
- Schegloff E 1979 'The relevance of repair to syntax-for-conversation' *Syntax and Semantics* 12: 261-286. NY: Academic Press.
- Shallice T 1988 *From neuropsychology to mental structure* Cambridge: Cambridge University Press.
- Smith A 1997 *The Three Little Pigs* (Retold by Annette Smith, Illustrated by Isabel Lowe) Petone, NZ: Nelson Price Milburn.
- Stirling L & G Barrington In press "'Then I'll huff and I'll puff or I'll go on the roff' thinks the wolf: Spontaneous narratives written by a child with autism' in AC Schalley & D Khlentzos (eds) *Mental states: Language and cognitive structure*: John Benjamins.
- Tager-Flusberg H 1993 'What language reveals about the understanding of minds in children with autism' in S Baron-Cohen, H Tager-Flusberg & D Cohen (eds) *Understanding other minds: perspectives from autism*: Oxford University Press. Pp. 138-157.
- Tager-Flusberg H 1994 'Dissociations in Form and Function in the Acquisition of Language by Autistic Children' in H Tager-Flusberg (ed) *Constraints on language acquisition: Studies of atypical children*: Erlbaum. Pp. 175-194.
- Thurber C & H Tager-Flusberg 1993 'Pauses in the Narratives Produced by Autistic, Mentally Retarded, and Normal Children as an Index of Cognitive Demand' *Journal of Autism and Developmental Disorders* 23: 309-322.
- Volden J 2004 'Conversational repair in speakers with autism spectrum disorder' *International Journal of Language and Communication Disorders* 39: 171-189.

Appendix: Transcription conventions used

Transcription conventions are based on Du Bois et al (1993).

Units:

Intonation Units (IU) begin on a new line
truncated / abandoned Intonation Unit --
truncated word -

Transitional Continuity:

final intonation contour . (usually indicates low falling pitch)
continuing contour , (level pitch or slight rise)
appeal contour ? (marked rise in pitch)

Pauses:

short .. (roughly less than 0.8 secs)
length specified in seconds (1.2)

Transcriber's perspective:

indecipherable syllable X
uncertain hearing <X X> around hypothesised words
researcher's comments (())

Vocal noises:

laughter (single pulse) @
other vocal noises (
in-breath (H)
exhale (Hx)
speech has unique voice quality <VOX VOX>

Accent:

primary accent ^ (before the relevant word)

Prosodic lengthening:

=