

Narrating the Cinderella story in adults with primary progressive aphasia

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Abstract:

The language of adults with non-Alzheimer's dementias is still relatively unexplored. This is problematic given that, in the absence of definitive biomarkers, linguistic features have an important role to play in the diagnosis of these dementias. In this article, the performance of adults with primary progressive aphasia during narration of the Cinderella story is examined. The adults were all participants in an investigation of primary progressive aphasia conducted by researchers in the School of Medicine at Johns Hopkins University. Narration of the Cinderella story is a high-level language task which permits a detailed examination of cognitive-linguistic skills to be undertaken. This examination reveals that the narrative impairments of adults with primary progressive aphasia cannot be entirely explained by the structural language deficits of these adults. The sensitivity of the Cinderella story to cognitive-linguistic impairments in primary progressive aphasia warrants the use of this narrative task in the diagnostic evaluation of adults with this form of dementia.

Key words: Cinderella story; dementia; diagnosis; language assessment; narrative discourse; neurodegenerative disease; pragmatics; primary progressive aphasia

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1. Introduction

Speech-language pathologists have long recognised the valuable role that narrative production tasks can play in a clinical language evaluation. That role is typically characterised as providing a more ecologically valid assessment of the language skills that are most often evaluated using formal language tests. After all, story-telling is a key component of conversation, the most naturalistic of all forms of communication – one of the main reasons we engage in conversation is in order to exchange stories with each other. Also, the single-word and sentence testing formats of formal language assessments serve to eliminate contextual influences on language. These influences can be faithfully replicated in narrative production tasks. There can be little doubt that narrative production tasks are a more ecologically valid method of assessment than formal language tests in exactly these respects. But, as I will argue in this paper, narrative production tasks have certain other attributes which make them particularly well suited to assessing cognitive-linguistic skills of the type that are disrupted in neurodegenerative disorders such as the dementias. In fact, so important are narrative production tasks to an assessment of language in the dementias that, it will be argued, they should be prioritised in a clinical language evaluation of clients with suspected dementia. The context for these remarks will be the use of the Cinderella story in an investigation by Argye Hillis and collaborators of 36 clients with primary progressive aphasia which was conducted at Johns Hopkins University. The data from this study, some of which will be examined below, are available through DementiaBank, part of the TalkBank System (MacWhinney *et al.*, 2011).

The discussion will unfold as follows. In section 2, we examine the features of the Cinderella story that make it such a revealing assessment of the cognitive-linguistic skills that are disrupted by neurodegenerative disease. The disruption of these skills gives rise to linguistic impairments such as grammatical errors and lexical-semantic deficits, but also to discourse-level impairments which affect the structural and thematic integrity of the narrative. In section 3, the Cinderella narratives of six adults with primary progressive aphasia will be examined. These narratives are part of the Hopkins corpus described above. They include the Cinderella stories of adults with the semantic, agrammatic and logopenic variants of primary progressive aphasia. It will be demonstrated that linguistic deficits can have a disruptive effect on narrative production through their impact on pragmatic-discourse processes such as

information management and referential cohesion. However, it will also be shown that for many adults with primary progressive aphasia, narrative impairments are not so clearly related to linguistic deficits. The presence of these impairments suggests that cognitive processes essential to narrative production may also be disrupted in primary progressive aphasia. In section 4, a working model of the narrative impairments in adults with primary progressive aphasia is developed. This model seeks to integrate language and cognitive factors which contribute to the narrative impairments of these adults. Finally, in section 5, the case is presented for placing narrative production tasks like the Cinderella story at the centre of a clinical language evaluation of clients with neurodegenerative disorders like the dementias.

2. Exploring the Cinderella story

For most readers, their first encounter with the Cinderella story will have been as a child. The story is a classic fairy tale in which the life of the main character, a young girl called Cinderella, is transformed from a state of abject misery to one of great fortune and happiness. Before this story can be examined, it must first be narrated for readers who are not familiar with it, and for readers who need some rehearsal of its content.

Once upon a time, there was a young girl called Cinderella. She was kind and gentle and was deeply loved by her mother. Tragically, Cinderella's mother passed away. Her father decided to re-marry, but to a woman who had two children of her own. Cinderella's new stepmother was a cruel, unpleasant woman who privileged her own daughters over Cinderella. While her own daughters experienced every possible luxury, Cinderella was made to cook and clean the house and attended to the needs of her stepsisters. Even though Cinderella was forced to wear rags while her stepsisters had the finest dresses and jewellery, she had natural beauty and considerable kindness which they did not possess.

One day, it was announced that the King's son, a handsome prince, was to host a ball to which all the young women in the town were invited. Cinderella's ugly stepsisters immediately started preparing for the ball. The stepsisters wanted the finest dresses, hairstyles, and jewels which Cinderella had to arrange

alongside her normal duties. Cinderella also wanted to attend the ball, but she knew that this would not be possible. Instead, she broke down and cried after she saw her stepsisters leaving for the ball.

Then suddenly, a fairy godmother appeared before Cinderella. She told Cinderella that she would also attend the ball, but first she must bring her a pumpkin and seven mice from the garden. When Cinderella returned, the fairy godmother waved her magic wand and the pumpkin and mice were transformed into a golden coach, six white horses, and a coachman. The rags that Cinderella was wearing were also transformed by the fairy godmother into a splendid dress and jewellery. Just before Cinderella left for the ball, the fairy godmother told her that she must leave the ball and return home before midnight or else the spell would be broken. Her fine dress would be rags once again.

When Cinderella arrived at the ball, all the other guests were amazed at her beauty and elegance. The prince was transfixed on Cinderella and spent the entire evening dancing with her. Then the clock began to strike midnight. Cinderella knew she must leave quickly, and fled down the steps of the palace and into the darkness of the night. In her haste, she lost one of her slippers on the steps. The prince saw it and picked it up. The next day, he ordered his courtiers to visit all the women in the town and make them try the slipper on their feet. When Cinderella's home was visited, her stepsisters did their utmost to squeeze their feet into the delicate slipper. But their feet were too large. The slipper was then tried on Cinderella, and it was a perfect fit. The prince then knew that he had found the woman whom he had danced with at the ball. He asked Cinderella to marry him, and they lived happily ever after.

To understand how this story can be used to assess cognitive-linguistic skills in clients with neurodegenerative disorders like primary progressive aphasia, it is first necessary to examine the linguistic and conceptual knowledge that is integral to the Cinderella story. For ease of exposition, this examination will proceed by means of a number of points, starting with the linguistic skills that are essential to the narration:

Structural language skills – The Cinderella story is a naturalistic context in which to assess grammatical and lexical-semantic skills. In terms of grammar, there are multiple occasions during the telling of the story in which to examine the use of word classes, phrases, and clauses. Some of the word classes in the narrative include common and proper nouns (*girl* vs. *Cinderella*), compound nouns (*fairy godmother*, *magic wand*), superlative adjectives (*the stepsisters wore the finest dresses*), prepositions (*into the darkness of the night*), modal auxiliary verbs (*you must leave the ball before midnight*), and intransitive verbs (*Cinderella cried*). A skilled narrator will use a range of phrases to capture people and events in the story, including noun phrases (*ugly stepsisters*), verb phrases (*fled down the steps*), adjective phrases (*their feet were too large*), adverb phrases (*Cinderella left quickly*), and prepositional phrases (*before midnight*). An equally wide range of clauses can be employed during the narration, such as the following examples:

Cinderella had natural beauty which they did not possess (Relative clause)

Cinderella also wanted to attend the ball (Infinitive clause)

The prince knew that he had found the woman (Subordinate clause)

In some neurodegenerative disorders, the grammatical structure of language can be relatively intact while lexical-semantic skills are degraded. Semantic memory is organized at a number of levels, each of which can be assessed by means of the Cinderella story. The story permits the expression of abstract and concrete lexemes (*kindness* vs. *slipper*), and animate and inanimate lexemes (*mice* vs. *pumpkin*). There are opportunities to use high-frequency words (*woman*, *horse*) and low-frequency words (*courtiers*, *haste*). The story also contains a range of specific lexemes (e.g. *stepmother*, *slipper*) which have semantically related, general counterparts (e.g. *woman*, *shoe*) in semantic memory. Neurodegenerative diseases like primary progressive aphasia can disrupt each of these aspects of semantic memory. Different patterns of lexical-semantic impairment can be clearly revealed in a story that contains as much lexical diversity as the Cinderella story.

Cohesion – The Cinderella story is also a rich context in which to examine the cohesive devices that permit a narrator to link one sentence to other sentences in a narrative. These cohesive devices confer local coherence on the events in a narrative. It is through them that a hearer

can follow what a narrator is saying and establish a coherent mental representation of the people and events in a narrative. Several forms of cohesion can be examined by means of the Cinderella story, the most common of which are illustrated below:

Cinderella heard the clock strike midnight. She fled down the steps. (Anaphoric reference)

Her untidy appearance made Cinderella an object of ridicule. (Cataphoric reference)

Cinderella found seven mice. One was turned into a coachman. (Lexical substitution)

The fairy godmother asked Cinderella if she wanted to go to the ball. Cinderella replied that she did [want to go to the ball]. (Ellipsis)

Some forms of cohesion can weave their way through successive utterances. This is evident in the following use of anaphoric reference:

Cinderella was responsible for all the cooking and cleaning in the house. She did not have the fine clothes and food that her sisters enjoyed. Her life was miserable and dull.

The skilled use of cohesion demands cognitive and linguistic skills. A narrator must be able to hold the antecedent noun phrase (Cinderella, in the above example) in memory for long enough to make subsequent reference to it. In terms of linguistic skills, the narrator must know the grammatical forms that can be used to refer to the antecedent. In the example above, this is the personal pronoun *she* and the possessive determiner *her*. On account of their cognitive-linguistic impairments, adults with neurodegenerative disorders can display a range of errors of cohesion. For example, they may omit an antecedent noun phrase in anaphoric reference or they may use an incorrect pronominal form to refer to the antecedent. In section 3, we will examine some errors of cohesion in the narratives of adults with primary progressive aphasia.

Mental state language – A skilled narrator is someone who can go beyond the actions and events in a story and relate these to the motivations, beliefs, and interests of its characters. It is more informative to tell hearers that a character took a particular course of action because he *believed* something to be the case or because he *wanted* to achieve a particular outcome. It is mental states like belief and desire that make a story interesting to hearers and

worth relating to others. The ability to attribute mental states to the minds of the characters in a story is known as mental state attribution or theory of mind (Cummings, 2013, 2014, 2015, 2017). A complex array of cognitive and affective mental states can be expressed during the narration of the Cinderella story. The following examples are cases in point:

The ugly stepsisters knew Cinderella would not complain. (Cognitive mental state)

The handsome prince decided to hold a ball. (Cognitive mental state)

Cinderella was very unhappy with her life. (Affective mental state)

The stepmother was angry when the slipper fitted Cinderella's foot. (Affective mental state)

Mental state language is particularly complex when it involves beliefs about another person's thoughts rather than about events in the world. In the following example, the narrator has attributed to the mind of the stepmother a mental state (knowledge) about a mental state (desire) of Cinderella:

The stepmother knew that Cinderella wanted to go to the ball with them.

Theory of mind is a complex cognitive skill which is often compromised in adults with neurodegenerative disorders such as the dementias (Bora *et al.*, 2016; Heitz *et al.*, 2016; Torralva *et al.*, 2015). Reduced or limited use of mental state language is a key indicator of impaired theory of mind skills. Sometimes, this language may be used inappropriately such as when a narrator uses an affective adjective like *sad* when a character is actually angry. In section 3, we will see that speakers with primary progressive aphasia make minimal use of mental state language. This imposes a further expressive limitation on their narratives beyond those which are already created by structural language problems.

Inferences – All mental state attribution involves the drawing of inferences based on perceptual, linguistic, and other information. How can a narrator of the Cinderella story tell that Cinderella is *unhappy*? It is by looking at a picture in which she is crying. Beyond the drawing of inferences about the mental states of characters, the Cinderella story is fertile ground for the generation of a wide range of other inferences. For example, the narrator can infer that fine food and wine were served at the ball, the guests received personal invitations,

and that Cinderella's stepsisters arrived on time for the ball. Each of these inferences makes explicit information which is contained implicitly in the story. These inferences are drawn subconsciously by narrators and hearers based on real-world knowledge and expectations. In the absence of these inferences, the story would lack coherence, with many of the actions and events appearing inexplicable. We could not make sense of the presence of guests at the ball, for example, if we could not *infer* that they had received and accepted invitations to attend this event. The ability to generate inferences of this type is compromised in adults with neurodegenerative disorders (e.g. Chenery *et al.*, 2002). In section 3, we will see that adults with primary progressive aphasia contribute little in the way of information that is not explicitly depicted in the Cinderella story.

Information – First and foremost, a narrative must be informative. An under-informative narrative does not convey the information that a listener needs in order to make sense of the story. An over-informative narrative loses a hearer in unnecessary detail that contributes little to the plot of a story. Decisions about the quantity or amount of information presented during narration require subtle judgements about the hearer's current state of knowledge, and the type of information that would best increase that knowledge. These judgements involve theory of mind skills. As such, they might be expected to be compromised by the same neurodegenerative disorders which have a negative impact on theory of mind. But the management of information during narration goes beyond the quantity of information that a narrator includes in a story. It also involves the order in which information is presented. A hearer cannot follow the events in a narrative if the order in which they are related violates the temporal sequence in which they occurred. For example, a narrator can provide an informative account of the ball in the Cinderella story – the guests who were present, the food and drinks that were served, and so on. But if this event is narrated prior to events that occurred before the ball took place – for example, that the prince issued invitations to young women and that Cinderella's stepsisters ordered expensive dresses – then hearers will struggle to make sense of these different actions and events.

As well as reflecting the temporal order of events, information in a narrative should also be presented in a manner which reflects causal relations between events. The Cinderella story is an excellent context in which to examine these relations. There are numerous occasions in

the story where one action or event caused another action or event. For example, the prince found one of Cinderella's slippers on the steps of the palace. This discovery caused him to order his courtiers to find the owner of the slipper. Also, the receipt of the prince's invitation to the ball caused the stepsisters to begin exhaustive preparations to attend the event. If a narrator reports the stepsisters' preparations before relating that they received an invitation from the prince, then the natural causal order between these actions is reversed, and the coherence of the narrative is compromised in consequence. In section 3, it will be seen if adults with primary progressive aphasia are able to reproduce faithfully the temporal and causal order of events in their presentation of information in the Cinderella story.

Story grammar – Narratives have internal structure without which they appear incomplete, disorganized and incoherent. This internal structure is referred to as story grammar (e.g. Stein and Glenn, 1979). Every narrative contains several episodes. In the Cinderella story there are at least five episodes: Cinderella's daily life and conditions after her father remarried; the receipt of the prince's invitation to the ball and the preparations that ensued; Cinderella's encounter with the fairy godmother; Cinderella's attendance at the ball; the discovery of the owner of the slipper. Each of these episodes can be further characterized in terms of setting, characters, problem, action, and resolution. If we take the episode in which Cinderella attended the ball, the *setting* is the palace that belongs to the prince and his father, the King. The *characters* are the prince, Cinderella, the stepsisters, and the other guests at the ball. The *problem* is that the spell will be broken if Cinderella does not leave the ball by midnight. The *action* is that Cinderella flees down the steps of the palace as soon as the clock begins to strike midnight. The *resolution* is that Cinderella succeeds in fulfilling her dream of attending the ball without her true identity being revealed. The overall *theme* of a narrative is often characterised in broad, moral terms. In the case of the Cinderella story, the theme might be stated as *Oppressed young woman finds her prince charming*. In section 3, we will see that adults with primary progressive aphasia can omit episodes in a narrative and narrate others incompletely.

Narrative discourse markers – Skilled narrators use certain linguistic features and discourse markers to indicate to their hearers that they are telling a story. As soon as a narrator begins to tell the Cinderella story, the use of the adverbial expression *once upon a time* indicates that

a fictional narrative is about to be related to the hearer. Through the use of this expression, the narrator is activating a particular mental schema in the hearer which will facilitate the processing of the contents of the story. The clause at the end of the narrative – *they live happily ever after* – is a conventional way of concluding a fictional narrative, and is also a feature of the mental schema that is activated by the story. There are other features of the Cinderella story which serve to engage the reader or hearer in the unfolding narrative. The spoken words of some of the characters in the story, for example the fairy godmother, may be presented as direct reported speech (Cummings, 2016). New episodes in the story are introduced by means of adverbial markers such as *one day* and *then suddenly*. To the extent that young children are typically among the intended audience of most fairy tales, there are explicit evaluations of the physical and moral attributes of the characters. So the stepsisters and the prince are described as the *ugly stepsisters* and the *handsome prince*, while the woman that Cinderella's father married is described as her *cruel stepmother*. The use of these various linguistic features and markers requires considerable narrative competence. It remains to be seen in section 3 if adults with primary progressive aphasia succeed in using these various devices.

3. Narrating the Cinderella story

In this section, the Cinderella narratives of six adults with primary progressive aphasia will be examined. These narratives will be analysed for what they can reveal about cognitive-linguistic impairments in this neurodegenerative disorder. Given the core linguistic impairments in primary progressive aphasia, it is expected that structural language skills will be disrupted. Additionally, however, it will be demonstrated that there are marked deficits in the other skills discussed in section 2. Several of these skills involve cognitive abilities which are generally assumed to be intact in primary progressive aphasia, at least initially. We begin with a brief overview of the clinical features of primary progressive aphasia. Cinderella narratives from adults in the dementia study at Johns Hopkins University will then be analysed. This study examined adults with different variants of primary progressive aphasia. The narratives of adults with each variant will be analysed in this section. A range of cognitive-linguistic impairments will emerge from these analyses. In section 4, a model of these impairments will be considered.

Primary progressive aphasia is a clinical dementia syndrome in which there is progressive deterioration of language functions alongside relative preservation of other aspects of cognition. Perception, memory, and personality are intact initially (usually 2 years or more). The onset of primary progressive aphasia is insidious and typically occurs before the age of 65 years (Mesulam and Weintraub, 2008). Patterns of language impairment differ between the three clinical variants of the disorder (Mesulam and Weintraub, 2008). In clients with the *agrammatic or non-fluent variant*, there are impairments of syntax and fluency but preserved word comprehension. In the *semantic variant* of primary progressive aphasia, clients display poor word comprehension but preserved syntax and fluency. In clients with the *logopenic variant*, there is variable fluency, frequent word-finding pauses and/or anomia but relatively intact syntax and word comprehension. Different pathological processes are associated with primary progressive aphasia. A clinical diagnosis of the disorder is most often associated with frontotemporal lobar degeneration. Around 19% of cases are caused by Alzheimer's disease pathology (Spinelli *et al.*, 2017). The epidemiology (e.g. incidence, prevalence) and risk factors for primary progressive aphasia are still largely unknown. There is a predominance of males with primary progressive aphasia after the age of 80 years (Magnin *et al.*, 2016).

3.1 Agrammatic/non-fluent variant primary progressive aphasia

The first narrative to be analysed is produced by a 68 year-old man who has a diagnosis of agrammatic or non-fluent primary progressive aphasia. His utterances are indicated by PAR in the transcription below. The investigator's turns are marked as INV. (.) indicates a micro-pause. The recording was made in June 2014. The client's narrative is non-fluent and effortful:

- 1 INV: Alright.
- 2 INV: So what I'd like you to do is um recor describe the Cinderella story.
- 3 PAR: Uh this is Cinderella.
- 4 PAR: Those are her two stepsisters and the wicked stepmother.
- 5 PAR: (*inhales*) and um (..) she's washing the floor.
- 6 PAR: Uh because uh (..) the wicked stepsisters and stepmother um (..) tell her what to do.
- 7 PAR: And um (...) let's see.
- 8 PAR: Uh uh (..) she's visited by um someone or other who tells her that she will um (..) go to the uh dance.

- 9 PAR: And she's um (.) whisked away with uh some horses.
- 10 PAR: And um (.) oh that's the fairy godmother uh who um (...) uses magic on her.
- 11 PAR: And um she goes to the ball and meets a handsome prince.
- 12 PAR: And uh at midnight she is has to leave.
- 13 PAR: Uh (..) and he f eh the uh prince finds the um (.) her shoe that's left behind.
- 14 PAR: And um (.) he tries it ah the servant tries it on the wicked stepsister.
- 15 PAR: But um it doesn't fit.
- 16 PAR: And uh she recognizes Cinderella recognizes it.
- 17 PAR: And um it's a perfect fit.
- 18 PAR: And they live happily ever after.
- 19 PAR: Because the prince recognizes her.
- 20 INV: Good.

This client's non-fluency is indicated by the presence of multiple micro-pauses and filled pauses such as *uh* and *um*. Filled and unfilled pauses give the speaker additional time in which to encode the grammatical structure of his utterances. Pauses may also give the speaker additional time for lexical retrieval. In line 8, the speaker uses *someone or other* to refer to the fairy godmother, suggesting some difficulty with lexical retrieval. Only in line 10 is the speaker able to use *fairy godmother*. These structural language problems are relatively mild in comparison to other impairments in this narrative. This speaker exhibits marked difficulties with referential cohesion. For a hearer who is listening to the narrative without viewing the pictures, there are two possible referents of the pronoun *she* in line 5 (Cinderella and the stepmother). A hearer needs the additional information in line 6 to establish that *she* refers to Cinderella. In line 14, a hearer will understand the prince to be the referent of the pronoun *he*. However, this pronoun actually refers to the servant. On this occasion, the speaker identifies the referential ambiguity and corrects it. A similar self-correction occurs in line 16 where it is initially unclear who is the intended referent of the pronoun *she*. These referential difficulties compromise the comprehensibility of the narrative even when the speaker succeeds in identifying and correcting them.

Another prominent difficulty in this narrative lies in the quantity and order of information. Between lines 6 and 8, considerable information is omitted. There is no mention of the prince

and his decision to host a ball, or the fact that the stepsisters receive an invitation and undertake extensive preparations to attend the event. The speaker jumps from a description of the chores imposed on Cinderella by her stepmother and stepsisters to the promise by the fairy godmother that Cinderella will attend the ball. Further information is omitted between lines 17 and 18. The speaker describes how the slipper is a perfect fit and then rapidly closes the narrative by saying they live happily ever after. The speaker does not describe how the prince recognises the young woman he danced with at the ball (although he later introduces this information in line 19), or that the prince asks Cinderella to marry him. In addition to being under-informative, this narrative presents information in the wrong temporal order. In line 10, the fairy godmother is described as using magic on Cinderella. But this occurs after we are told in line 9 that Cinderella is whisked away to the ball by horses. There is only one example of mental state language (the verb *recognises* in line 16) and one narrative discourse marker (the use of *they live happily ever after* in line 18). In summary, referential cohesion and information management are more problematic areas in the narrative of this speaker than his structural language skills.

The second narrative is produced by a 76 year-old woman with a diagnosis of agrammatic or non-fluent primary progressive aphasia. It was recorded in March 2014. It is a longer narrative than the first narrative:

- 1 PAR: This is Cinderella with her two ugly seps stepsisters and her stepmother.
- 2 PAR: Looks like uh uh the girl in the ten uh A Thousand and One Dalmatians.
- 3 INV: Oh dalmatians, yeah.
- 4 PAR: This is the uh stepmother with her two ugly stepsisters.
- 5 PAR: Cinderella is uh wiping the floor.
- 6 PAR: And an invitation came uh from the prince to the ball.
- 7 INV: Mhm.
- 8 PAR: Uh the stepmother was surprised.
- 9 PAR: And uh the stepmother and two ugly seps stepsisters went to the ball.
- 10 INV: Yeah.
- 11 PAR: Cinderella was in the window.
- 12 PAR: And she saw her fairy godmother in the park.

- 13 INV: Mhm.
- 14 PAR: And she (i)s now (.) shook her magic wand turned a pumpkin into a um...
- 15 PAR: Oh shoot.
- 16 PAR: Um (..) turned the pumpkins into a uh ...
- 17 PAR: (*laughing*)
- 18 PAR: Horses to mice into horses.
- 19 INV: Uhhuh.
- 20 PAR: And she turned Cinderella into a um very beautiful, with a very beautiful dress.
- 21 INV: Mhm.
- 22 PAR: And she warned her she had to go uh leave by twelve o'clock midnight.
- 23 PAR: (Be)cause she would turn down ...
- 24 INV: Keep going (*unintelligible*) for you.
- 25 PAR: She met the prince.
- 26 PAR: She danced with the prince.
- 27 PAR: And when the uh kwa clock turned twelve.
- 28 PAR: She ran down the uh stairs and left her uh slipper, glass slipper.
- 29 INV: Mm.
- 30 PAR: And the thing, um it was here.
- 31 PAR: So the uh prince's (..) person went through house to house to fit uh the slipper
glass slipper on every girl in the neighbourhood.
- 32 PAR: And she found Cinderella and it fit her.
- 33 PAR: So she married the prince.
- 34 PAR: (*laughs*) dear God that was so hard.
- 35 INV: Alright.

Structural language deficits are more common in the narrative of this speaker than in the first speaker's narrative. These deficits include phonological errors (*stepsisters* in lines 1 and 9), incorrect prepositions in line 11 (*in the window* instead of *at*) and line 31 (*through house to house* instead of *from*), an incorrect pronoun in line 32 (*she* instead of *he*), omission of the coordinating conjunction *and* in line 14, omission of a grammatical subject in line 2 ([...] *looks like the girl in...*), and an abandoned clause in line 23 (*Because she would turn down...*). This

speaker exhibits a number of lexical-semantic problems. There are numerous filled pauses before content words like nouns and verbs (e.g. *She ran down the uh stairs and left her uh slipper*). These pauses indicate a word-finding difficulty on the part of the speaker. The speaker explicitly indicates that she is having difficulty retrieving words between lines 14 and 17 when she says *Oh shoot*. A semantic error occurs in line 4 when the speaker uses *stepsisters* for *stepdaughters*. Another semantic error occurs in line 2 when the movie is incorrectly called *A Thousand and One Dalmations* instead of *A Hundred and One Dalmations*. A neologism is used for *clock* in line 27. The final lexical-semantic disturbance occurs in lines 30 and 31. In these lines, there are two instances of non-specific vocabulary: the use of *thing* and *prince's person* for *servant*.

In terms of cohesion, two shifts occur in the referent of the pronoun *she*, leading to referential ambiguity. The first shift occurs in line 14 where *she*, which previously referred to Cinderella, now refers to the fairy godmother. A similar shift occurs in line 25. This time, the pronoun *she* is used to refer to Cinderella where previously it had been used to refer to the fairy godmother. In line 30, the deictic expression *here* also lacks a referent in the preceding discourse, although the speaker may be pointing to the picture at this point. The only other problem with cohesion occurs in lines 25 and 26, where the use of pronominal reference to the prince could have avoided unnecessary repetition: *she met the prince and danced with him* instead of *she met the prince and she danced with the prince*.

By far the most significant impairment in the narrative of this speaker is the omission of information. In fact, so much information is omitted that in the absence of prior familiarity with the Cinderella narrative, it is difficult to see how any hearer would understand the story based on the information that the speaker actually conveys. The main actions and events are presented as discrete phenomena with no temporal or causal connection between them. There is almost no use of mental state language (the one exception is the description of the stepmother as *surprised* in line 8). In the absence of this language, the actions of characters do not appear to be motivated by beliefs, desires, or any other mental state. In terms of story grammar, the five episodes identified in section 2 are either omitted altogether or are inadequately captured. With the exception of line 5 (*Cinderella is wiping the floor*), the episode which should capture Cinderella's daily life and conditions after her father remarried

is all but omitted. The speaker describes the receipt of the prince's invitation to the ball but there is no information about the preparations that ensued. Cinderella's encounter with the fairy godmother is the most detailed episode in the narrative. But even this omits any mention of a coachman. The episode that describes Cinderella's attendance at the ball omits mention of the other guests and their reaction to Cinderella's presence. The episode about the discovery of the owner of the slipper states little more than that the slipper fit Cinderella and she married the prince. The informational inadequacy of this narrative is its chief limitation by far.

In summary, the Cinderella narratives of both these adults with non-fluent primary progressive aphasia contain structural language problems. These problems are relatively mild in the case of the first speaker and are somewhat more pronounced in the case of the second speaker. But for neither speaker do structural language deficits explain difficulties with referential cohesion and information in the narratives. These difficulties are particularly marked in both speakers and limit the effectiveness of their narratives. These findings suggest that the focus to date on structural language skills in primary progressive aphasia may not be entirely warranted. Other cognitive-linguistic processes may also be impaired or even more impaired than structural language skills. It remains to be seen if the narratives of adults with other variants of primary progressive aphasia display a similar pattern.

3.2 Semantic variant primary progressive aphasia

The first narrative to be analysed in this section was produced by a 77-year-old man with a diagnosis of semantic variant primary progressive aphasia. The recording was made in November 2012. The speaker indicates before the recording that he does not fully remember the Cinderella story. The exchange begins with the investigator telling him to use the pictures in the story book to aid his memory:

- 1 INV: That's fine.
- 2 INV: You could go by by the pictures and kind of tell me what you do remember.
- 3 PAR: This is Cinderella (.) and the sisters and her mother.
- 4 PAR: Uh the ban [bad] orn [or] the bad person.
- 5 PAR: And um Cinderella is doing all the work.

- 6 PAR: And they're playing their instruments.
- 7 PAR: And uh (...) (*laughs*) there's the the witch.
- 8 PAR: I don't know, no.
- 9 PAR: And (.) they're prancing around.
- 10 PAR: And Cinderella's looking.
- 11 PAR: And Cinderella and her fairy godmother and her fairy godmother and the pumpkin
- 12 PAR: And she's making uh a chariot or an uh hm ...
- 13 PAR: And the mice she makes the horses.
- 14 PAR: Eh and the fairy godmother makes Cinderella into a princess.
- 15 PAR: The fairy godmother (.) talks to to Cinderella as the princess.
- 16 PAR: And there's Cinderella at the (.) the ball.
- 17 PAR: And she may meets prince charming.
- 18 PAR: And prince charming is (.) is dancing with Cinderella.
- 19 PAR: And they look and it's twelve o'clock.
- 20 PAR: And she's running away.
- 21 PAR: And her (..) this guy has his the slipper.
- 22 PAR: And she's he's trying to fit this slipper on the girl.
- 23 PAR: And she losses Cinderella when she's leaving she losses his slipper.
- 24 PAR: And they're looking for her slipper, for who fits the slipper.
- 25 PAR: And they're and she marries eh and Cinderella fits this slipper.
- 26 PAR: And she marries prince charming.
- 27 INV: Good.

There are several structural language problems in this speaker's narrative. Two phonological errors occur in line 4, and an incomplete verb phrase occurs in line 10: Cinderella has to look *at something*. As one would expect, lexical-semantic deficits are more common than either phonological or grammatical errors. Non-specific vocabulary occurs in line 3 in the use of *sisters* and *mother* for *stepsisters* and *stepmother*, respectively. There is more non-specific vocabulary in lines 21 and 22, when *guy* is used in place of *prince* or *servant* (it is unclear which applies) and *girl* is used to refer to either Cinderella or her ugly stepsisters. A semantic error occurs in line 23 in the use of *his slipper* instead of *her slipper*. In line 12, the coach is described as a *chariot*. The final lexical-semantic problem is in line 15, when the fairy

godmother is described as *talking* to Cinderella when she is in fact *warning* her to return from the ball by midnight.

These structural language problems are relatively mild and do not appear to explain the marked difficulties of this speaker in the use of referential cohesion and management of information. In terms of referential cohesion, there is no identifiable referent of the pronoun *they* in lines 6, 9, and 24. A hearer is left asking exactly who is playing the instruments (line 6), who is prancing around (line 9), and who is looking for her slipper (line 24). A similar problem with referential cohesion occurs in lines 12 and 13. This time, there is no identifiable referent of the pronoun *she*. In these lines, *she* may refer to either Cinderella or the fairy godmother. The speaker's difficulty in using pronominal reference cannot be explained in terms of his lexical-semantic deficits, as in all these cases there are antecedent noun phrases in the prior discourse context. It is simply that the speaker fails to signal which of these noun phrases is the intended referent of a particular pronoun.

The informational content of this narrative is problematic in two respects: the quantity and order of information. In terms of quantity, there is omission of important actions and events. The speaker does not mention that Cinderella must leave the ball by midnight or else the spell will be broken, or that the stepsisters receive an invitation from the prince to attend the ball. An even more significant problem for this speaker is the order in which information is presented. Between lines 21 and 26, there is considerable confusion about the temporal order in which events occur. The information about the loss of the slipper in line 23 should be conveyed in line 21, that is, before the hearer is told that the prince or servant (we don't know which) has the slipper and is trying it on 'the girl'. The hearer is first told about the search for the owner of the slipper in line 24. This information should precede line 22 where it is reported that the slipper is being tried on 'the girl'. Finally, in line 25, the hearer is told that Cinderella marries the prince before it is reported that the slipper fitted her. On this occasion, the speaker appears to recognise his own failure to report events in the correct temporal order. He abandons his statement about Cinderella marrying the prince, states that Cinderella fitted the slipper, and then re-states in line 26 that Cinderella marries the prince. Like referential cohesion, these anomalies in the quantity and order of information cannot be readily explained by structural language deficits on the part of this speaker.

The second narrative is produced by a 74-year-old man with semantic variant primary progressive aphasia. The recording was made in January 2012. The lexical-semantic deficits of this speaker are more severe than those of the first speaker. The impact of these deficits on a number of narrative features will be addressed subsequently:

- 1 INV: Okay.
- 2 PAR: Well the, I don't know.
- 3 PAR: These things aren't that interesting.
- 4 PAR: So I don't know.
- 5 PAR: But (.) but well but here it looks like they're doing something.
- 6 PAR: And three people here changing the things.
- 7 PAR: Here sh she's doing something putting something down.
- 8 PAR: And then this little thing here.
- 9 PAR: Uh I don't know what these things are but ...
- 10 PAR: That's uh three people there.
- 11 PAR: And she no she's looking outside the window there.
- 12 PAR: And uh ...
- 13 PAR: That's interesting stuff.
- 14 PAR: Oh the yeah well this this this here looks like it's a ...
- 15 PAR: Oh what do you call it a ..?
- 16 PAR: Yeah this was k k kind of looks like a ...
- 17 PAR: What do you call this thing?
- 18 INV: The coach?
- 19 PAR: The coach.
- 20 INV: Yep.
- 21 PAR: Yeah.
- 22 INV: Pumpkin turned into a coach?
- 23 PAR: Yeah the coach.
- 24 PAR: Well this is pretty interesting here too.
- 25 PAR: Pretty nice, all these things are nice.
- 26 INV: Mhm.

- 27 PAR: Now sounds like there he ...
- 28 PAR: There but here they're they're changing some things.
- 29 PAR: Here's a here's a big thing that (.) two things on the side.
- 30 PAR: Yuck.
- 31 PAR: Oh that's pretty nice there plus they are coming down.
- 32 INV: Good, and you can stop there.

The marked lexical-semantic deficits of this speaker are manifested in three ways. First, the narrative is littered with non-specific vocabulary. Words like *thing*, *people* and *stuff* take the place of more specific lexemes. Instances of non-specific vocabulary use occur at the following locations:

- Line 3: *these things aren't that interesting*
- Line 5: *it looks like they're doing something*
- Line 6: *three people here changing the things*
- Line 7: *she's doing something putting something down*
- Line 8: *this little thing here*
- Line 9: *I don't know what these things are*
- Line 10: *that's three people there*
- Line 13: *that's interesting stuff*
- Line 25: *all these things are nice*
- Line 28: *they're changing some things*
- Line 29: *here's a big thing that (.) two things on the side*

Second, the speaker exhibits word-finding difficulties throughout the narrative. In line 9, the speaker states *I don't know what these things are*. Then in lines 15 and 17, he explicitly asks: *What do you call this thing?* In order to progress the narrative, the investigator makes a rare contribution when she says *the coach* in line 18. Third, to compensate for his lexical retrieval problems the speaker makes extensive use of pointing during narration. Pointing is achieved through the use of deictic expressions such as *here*, *there*, *this* and *that*. These terms occur frequently throughout the narrative. The following examples illustrate how the speaker is using adverbs and demonstrative pronouns to point to pictures during his narration:

Line 14: *this here looks like it's a ...*

Line 24: *Well this is pretty interesting here too*

Line 31: *that's pretty nice there plus they are coming down*

As well as lexical-semantic deficits, this speaker exhibits problems with referential cohesion. There is no antecedent noun phrase for the pronouns *they* in lines 5, 28 and 31, or the pronoun *she* in lines 7 and 11. The most likely explanation for the omission of these noun phrases is the speaker's severe lexical-semantic deficits and his over-reliance on pointing in consequence. But by far the most significant impairment is that the narrative is particularly under-informative. This, too, is a direct consequence of lexical-semantic impairments. Lexemes like *thing*, *people* and *stuff* convey little information to a hearer. There is not a single use of any of the following words, all of which refer to the main characters in the story: *Cinderella*, *stepmother*, *stepsisters*, *prince* and *fairy godmother*. The only inanimate object mentioned is *coach*, and this only occurs because the investigator introduces it into the narrative. Words like *slipper*, *magic wand* and *pumpkin* are not used, even when the latter term is mentioned by the investigator. Adjectives like *nice* and *interesting* convey little in the way of specific content. The same is true of verbs like *doing*, *putting* and *coming*. When combined, these various lexical-semantic features result in a narrative which has very limited informational content.

In summary, the narratives of the two speakers with semantic variant primary progressive aphasia contain structural language problems, principally lexical-semantic deficits. But it is only the severe lexical-semantic impairments of the second speaker which appear to be responsible for this speaker's problems with referential cohesion and information management. The first speaker's significant problems with referential cohesion and information management cannot be so readily explained by structural language deficits. This is the same pattern that was observed in section 3.1 in relation to the non-fluent speakers – there are cognitive-linguistic impairments in primary progressive aphasia which cannot be related to the structural language problems of these clients. It remains to be seen if this pattern also occurs in speakers with the logopenic variant of primary progressive aphasia.

3.3 Logopenic variant primary progressive aphasia

One of the longest narratives that will be examined in this paper is produced by a 72-year-old woman who has a diagnosis of logopenic variant primary progressive aphasia. Her narrative was recorded in January 2014 as part of the dementia study conducted at Johns Hopkins University. The impairments in this narrative will be discussed at length below:

- 1 INV: Alright, so just kind of describe what you see in the pictures.
- 2 PAR: Okay.
- 3 PAR: I see Cinderella and the two ornery sisters and the mother.
- 4 INV: Mhm.
- 5 INV: Good.
- 6 PAR: And um here are the uh mother and the two children.
- 7 PAR: Uh having a wonderful time at the uh piano.
- 8 INV: Mhm.
- 9 PAR: And Cinderella is washing up the floors.
- 10 PAR: And then comes comes they are now at the door.
- 11 PAR: And there is the terrible mother.
- 12 PAR: And and we have the ugly mother and sisters.
- 13 PAR: And uh then there's Cinderella [Cinderella] looking out.
- 14 PAR: And um then comes the little (..) (*sighs*) uh what do I call her?
- 15 PAR: An angel of sorts.
- 16 INV: Mokay.
- 17 PAR: And um she comes to relieve her.
- 18 PAR: And then um all of the sudden uh there's (..) a beautiful little (*sighs*) ...
- 19 PAR: I don't know where it is, right?
- 20 PAR: And um she sees uh (..) beautiful things.
- 21 INV: Mhm.
- 22 PAR: There's a little carriage.
- 23 PAR: Uh here's the sweet, sweet little um mice.
- 24 PAR: And this we have the, these beautiful horses.
- 25 PAR: And here the um (..) the uh wonderful angel, I recall her, uh turned her into a beautiful Cinderella.

- 26 INV: Mhm.
- 27 INV: And some more just some more pictures.
- 28 PAR: Okay and here they're having a nice time.
- 29 INV: Um ...
- 30 INV: Good.
- 31 PAR: And then here she meets a man.
- 32 INV: Uhhuh.
- 33 PAR: And uh when it strikes twelve ...
- 34 PAR: And um evidently he is coming to her.
- 35 PAR: And (..) um the they're looking for the shoe.
- 36 PAR: Who was the person who left the shoe?
- 37 PAR: And uh the gentleman was trying to go to the sisters to see if they fit their feet.
- 38 PAR: And (...) when he tried it onto her it was her.
- 39 INV: Mhm.
- 40 INV: Good.
- 41 PAR: And then here they are (..) getting married.
- 42 INV: Alrigh(t).

Several structural language impairments are evident in this narrative. There are phonemic paraphasias in line 3 ('ornery' possibly for *ugly*) and in line 13 ('Cindererella' for *Cinderella*). A grammatical subject is omitted in line 10 (*And then [...] comes*), and there is an incomplete noun phrase in line 18 (*there's a beautiful little [...]*). In line 37, an incorrect pronoun is used (*they* when the pronoun should be *it*, as the speaker is talking about the slipper). But by far the most significant structural language impairment is lexical-semantic deficits. These deficits are manifested in four ways. First, there are numerous filled pauses, often before content words like nouns and in the middle of phrases (e.g. *here's the sweet, sweet little um mice*). The speaker uses these pauses to retain her turn as she searches for a target lexeme. Second, in line 14 the speaker explicitly signals that she is having difficulty recalling the target word *fairy godmother* when she says *what do I call her?* Third, in line 15 the speaker uses circumlocution when she says *an angel of sorts* as she struggles to retrieve the word *fairy godmother*. Fourth, the speaker uses several non-specific lexemes. For example, in line 3

sisters and *mother* are used in place of *stepsisters* and *stepmother*, respectively. The speaker uses *children* in place of *daughters* in line 6. In line 20, we are told that Cinderella sees beautiful *things*. In line 31, the word *man* is used to refer to the prince. Finally, in line 37, *gentleman* is used in place of *servant* or *courtier*.

Structural language deficits aside, this speaker's most significant narrative impairments involve referential cohesion and the management of information. Moreover, neither of these narrative difficulties appears to be related to this speaker's structural language deficits. In terms of referential cohesion, even when this speaker is able to name characters and objects, subsequent pronominal reference to these lexemes is inadequate. For example, in line 10 the speaker says they are now at the door. However, it is unclear which of the four characters already introduced into the narrative by line 10 – Cinderella, the stepmother, and the two stepsisters – are included in the referent of the pronoun *they*. In line 17, the speaker says *she* comes to relieve *her*. The referents of the pronouns, *she* and *her*, could be any of the following, all of which are present in the prior discourse context: Cinderella, the stepmother, and the fairy godmother. Further referential anomalies occur at the following points in the narrative. In each case, there is no clear referent of the underlined pronoun:

Line 19: *I don't know where it is*

Line 20: she sees beautiful things

Line 28: they're having a nice time

Line 31: she meets a man

Line 33: it strikes twelve

Line 34: he is coming to her

Line 35: they're looking for the shoe

Line 38: *when he tried it onto her* (the referents of *he* and *it* are *gentleman* and *shoe*)

Line 41: they are getting married

Of course, a hearer could establish the referent of many of these pronouns based on their knowledge of the Cinderella story and the speaker's pointing to the characters in the pictures. But the point is that in the absence of these contextual supports, the speaker's narrative fails in terms of referential cohesion. A further referential anomaly occurs in lines 35 and 37. In

both locations, a definite noun phrase is used: *the shoe* (line 35) and *the gentleman* (line 37). The use of a definite noun phrase assumes that there is a prior referent of these terms, when in fact this is not the case. One can imagine a hearer thinking what shoe and what gentleman on hearing these noun phrases.

The speaker's use of referential cohesion is not particularly successful. But the narrative is also problematic in terms of its informational content. Parts of the narrative are repetitive. For example, between lines 3 and 12, the speaker states four times that there is the mother (stepmother) and two sisters (stepsisters). This repetition contributes no new information to the narrative. The narrative also omits key information. This is in part related to the failure of the speaker to relate actions and states in causal terms. For example, in line 15 *an angel of sorts* (circumlocution for *fairy godmother*) is mentioned. Then later, in line 22, the speaker says that *there's a little carriage*. However, in none of the intervening lines is there any attempt by the speaker to relate these two pieces of information by saying that the fairy godmother waves her magic wand and a pumpkin turns into a carriage. Omission of causal processes is again evident in lines 23 and 24. There is no account given of how the sweet little mice in line 23 become the beautiful horses of line 24. Once again, the fairy godmother's intervention is completely omitted. Other significant omissions occur in line 35 where the speaker says *they're looking for the shoe* without first stating that the shoe was lost. In line 33, the speaker says that the clock strikes twelve. But this event lacks any significance for a hearer who has not first been told that the fairy godmother warned Cinderella to leave the ball by midnight. The combined effect of the repetition and omission of information is to reduce the informational content of the speaker's narrative.

Finally, the speaker does, at least, succeed in using two linguistic devices that are associated with narrative discourse. In line 18, the speaker introduces dramatic tension through the use of *all of a sudden*. Then in line 36, the speaker uses direct reported speech. One can imagine the prince asking: *Who was the person who left the shoe?* Narrative devices which heighten tension and engage the hearer or reader were rarely used by speakers with primary progressive aphasia in the Johns Hopkins dementia study.

In summary, we can say that this speaker with the logopenic variant of primary progressive aphasia has structural language deficits. But like most of the speakers we have examined so far, these deficits do not appear to explain the very marked difficulties with referential cohesion and information management seen in this speaker. The speaker certainly has sufficient lexical-semantic resources to introduce certain lexemes into the narrative and make subsequent pronominal reference to the individuals denoted by these lexemes. Also, the speaker's expressive language skills would permit a more detailed account of the events in the Cinderella story than is evident in the above narrative. Once again, we are drawn to the conclusion that adults with primary progressive aphasia have cognitive-linguistic impairments that extend well beyond their structural language deficits. We will see if this pattern is confirmed by examining the narrative skills of a second speaker with the logopenic variant of primary progressive aphasia.

The second narrative is produced by a 58-year-old man with logopenic variant primary progressive aphasia. This speaker is the youngest by some years of all six speakers who have been examined. His narrative was recorded in April 2012:

- 1 INV: Okay.
- 2 PAR: That's Cinderella.
- 3 INV: Uhhuh.
- 4 PAR: And those are two sisters.
- 5 PAR: They're like uh they're like them.
- 6 PAR: And they uh the uh woman who is the uh (..) not the mother but the uh ...
- 7 INV: Okay.
- 8 PAR: I'm not sure who she was with them.
- 9 INV: Yeah, stepmother?
- 10 PAR: Stepmother.
- 11 PAR: And it looks like they're having a great laugh with the two sisters.
- 12 INV: Mhm.
- 13 PAR: Great way in that.
- 14 PAR: And uh the other girl has to do all the crap there.
- 15 PAR: And um (..) I don't know who this was.

16 PAR: That's too far I think.

17 PAR: And she has a letter with something.

18 INV: Mhm.

19 PAR: And they're going with her.

20 PAR: And she was going with all her things with her.

21 PAR: But she doesn't get to go in there.

22 PAR: And all of a sudden she's.

23 PAR: See uh that's too long for this thing.

24 PAR: I don't know who these gir (*laughs*) ...

25 INV: (*laughs*)

26 PAR: Is that like a uh.

27 INV: The fairy godmother.

28 PAR: Oh it's a fairy.

29 INV: Yeah.

30 PAR: Okay, so she's like crying with her.

31 PAR: And she's going through something with her.

32 INV: Mhm.

33 PAR: And she has a pʌŋkɪn [pumpkin], makes it into a uh, uh carriage.

34 PAR: And I don't know what what.

35 PAR: These other mice turn into the uh (.) to the horses.

36 PAR: And she's pointing at her and give her new, great uh dress there.

37 INV: Mhm.

38 PAR: And I'm not sure what she's saying there.

39 PAR: And now she's in some big uh place here uh party there.

40 PAR: And there's the handsome guy.

41 PAR: And he (.) he gets in with them.

42 PAR: But at uh twelve he had to get out of there.

43 PAR: And she is uh has the shoe still there.

44 PAR: I'm actually seeing some of the stuff.

45 PAR: And they found the shoe.

46 PAR: And uh (.) they're trying to find who it was.

47 PAR: And of course it's sisters who would not get the shoes.

48 PAR: But she's just sitting there (.) not doing anything.

49 PAR: But then they put the shoe on for her.

50 PAR: And then the prince knew who it was.

51 INV: Good, and you can stop there.

This speaker also displays structural language problems. He produces a phonemic paraphasia in line 33 when he says [pʌŋkɪn] for *pumpkin*. Non-specific vocabulary predominates in the narrative, suggesting significant lexical-semantic deficits on the part of the speaker. In line 4, the speaker uses *sisters* in place of *stepsisters*. In line 14, *the other girl* is used for *Cinderella*. In line 39, the speaker uses *place* for *palace*. In line 40, *guy* is used in place of *prince*. Other instances of the use of non-specific vocabulary occur at the following locations in the narrative:

Line 17: *she has a letter with something*

Line 20: *she was going with all her things with her*

Line 23: *that's too long for this thing*

Line 31: *she's going through something with her*

Line 44: *I'm actually seeing some of the stuff*

There is further evidence of this speaker's lexical-semantic deficits in the large number of filled pauses in the narrative. These pauses facilitate the retrieval of content words like nouns, often in the middle of grammatical phrases (e.g. *And now she's in some big uh place here uh party there*). Also, on two occasions in the narrative, the speaker displays overt word-finding difficulties. The investigator suggests target lexemes to the speaker as a means of facilitating the progress of the narrative. This occurs in lines 9 and 27, where the investigator volunteers the words *stepmother* and *fairy godmother*, respectively. A further indication that this speaker has lexical-semantic deficits is his reliance on pointing to the pictures in the story. There are many uses of deictic expressions such as *these*, *those*, and *there* during the narrative:

Line 4: *And those are two sisters*

Line 21: *But she doesn't get to go in there*

Line 35: *These other mice turn into the uh (.) to the horses*

Referential cohesion is a significant source of difficulty for this speaker. Throughout the narrative, the speaker uses pronouns which lack a clear referent. In line 5, the stepsisters are the referent of the pronoun *they*, but there is no prior referent of the pronoun *them* in the same utterance. Between lines 30 and 33, the pronoun *she* is used on three occasions. In line 30, the referent of this pronoun is Cinderella – Cinderella is, after all, the only person crying in the scene. It is unclear from both the discourse context and the content of the utterance in line 31 if Cinderella or the fairy godmother is the referent of *she* in this line. In line 33, the most likely referent of *she* is the fairy godmother, as it is the fairy godmother who turns the pumpkin into a carriage. The shifting referent of this pronoun makes the narrative very difficult for any hearer to follow. Further referential anomalies occur in line 45 where there is no referent of the pronoun in *they found the shoe*. In line 49, the referent of *they* in the utterance *they put the shoe on her* must be the stepsisters, the salient antecedent noun phrase. However, we know that it was not the stepsisters but the prince's servants who tried the shoe on Cinderella.

The issue which concerns us is the extent, if any, to which this speaker's lexical-semantic difficulties contribute to his problems with referential cohesion. There can be little doubt that this speaker has difficulty using specific lexemes in his narrative. But this does not appear to explain the speaker's problems with referential cohesion. The proof of this is that on the two occasions where the investigator introduces lexemes into the discourse for the speaker, there is an immediate failure on the part of the speaker to make pronominal reference to these lexemes. The investigator volunteers the word *stepmother* in line 9. However, in line 17, the referent of the pronoun *she* is ambiguous between the stepmother and the other girl (Cinderella). The speaker appeared not to recognise that there were two potential referents of this pronoun in the prior discourse context, and failed to signal clearly which of these referents was the intended referent of *she*. A similar pattern occurs in line 27 when the investigator volunteers the lexeme *fairy godmother*. The first use of *she* after the use of this lexeme occurs in line 30 and should have the fairy godmother as its referent. However, the referent is clearly Cinderella and not the fairy godmother. It is the failure of the speaker to

use pronominal reference successfully, even after the investigator has introduced certain lexemes into the narrative, which suggests that this speaker's problems with referential cohesion cannot be explained by his lexical-semantic difficulties.

This speaker's narrative is also markedly under-informative. In all five episodes in the story, actions, events and characters are omitted. The question is then one of the extent to which this lack of informational content can be explained by the speaker's poor lexical-semantic skills. Clearly, the use of non-specific vocabulary limits the amount of information that the speaker can convey. However, this is not the whole story. For there are numerous instances where the speaker does use specific vocabulary and intact grammar, and yet the resulting utterances are still not particularly informative. For example, between lines 33 and 36 the following specific lexemes are used: *pumpkin*, *carriage*, *mice*, *horses* and *dress*. The speaker even has the expressive language skills to convey to the hearer that the dress is *great* and *new*, and that only some of the mice became horses (*the other mice*). The grammatical structure of these utterances is also quite sophisticated. The speaker is able to use noun phrases (*the horses*) and prepositional phrases (*into a carriage*), as well as main verbs (*these other mice turn into ...*), auxiliary verbs (*she's pointing*), and di-transitive verbs (*give her [a] new, great dress*). The reason the reader is still left with the impression that the narrative conveys little information is that none of the utterances used between lines 33 and 36 succeeds in conveying that these different actions and events were part of a magical spell which was made by the fairy godmother with the intent of fulfilling Cinderella's dream to go to the ball. In other words, these events are not presented as part of a wider network of causal and intentional relations. The speaker appears to be unaware that it is these relations that are of significance to a hearer, and that convey most informational content in a narrative.

In summary, this speaker with logopenic variant primary progressive aphasia also displays marked impairments of referential cohesion and information management which cannot be explained by structural language deficits alone. It emerges that the impairments of adults with primary progressive aphasia extend well beyond areas like grammar and lexical semantics to include a range of other cognitive-linguistic deficits. These deficits come into focus most clearly during narrative production tasks like the Cinderella story. Next, we consider a model which can be used to explain the patterns of impairment which have been

examined in this section. Contrary to the standard view of this dementia syndrome, this model does not prioritise the structural language skills of adults with primary progressive aphasia.

4. Model of cognitive-linguistic impairments in primary progressive aphasia

The analysis in section 3 revealed that the narratives of adults with primary progressive aphasia are significantly disrupted by this neurodegenerative disorder. These adults exhibited a range of structural language deficits including phonemic paraphasias, grammatical omissions and errors, and lexical-semantic deficits. However, the most significant finding to emerge from the analyses in section 3 is that many of these adults' cognitive-linguistic impairments during narration do not appear to be attributable to deficits in structural language. Among the six speakers examined, only one speaker – a 74-year-old man with semantic variant primary progressive aphasia – exhibited structural language deficits which could account for his problems with referential cohesion and information management. Although structural language deficits were present in the remaining five speakers, these deficits were either not sufficiently severe to account for these adults' marked difficulties with referential cohesion and information management, or they were of a kind that could not explain these narrative difficulties. For example, the repetition and incorrect sequencing of information are not explicable in terms of lexical-semantic deficits or any other structural language impairment. Rather, this type of narrative difficulty is most successfully explained in terms of cognitive deficits such as poor executive function. Although such deficits are acknowledged to exist in primary progressive aphasia (Gansler *et al.*, 2017; Macoir *et al.*, 2017), they are widely believed not to be an early feature of the disorder. The findings of this analysis suggest that this standard view of primary progressive aphasia may need some revision.

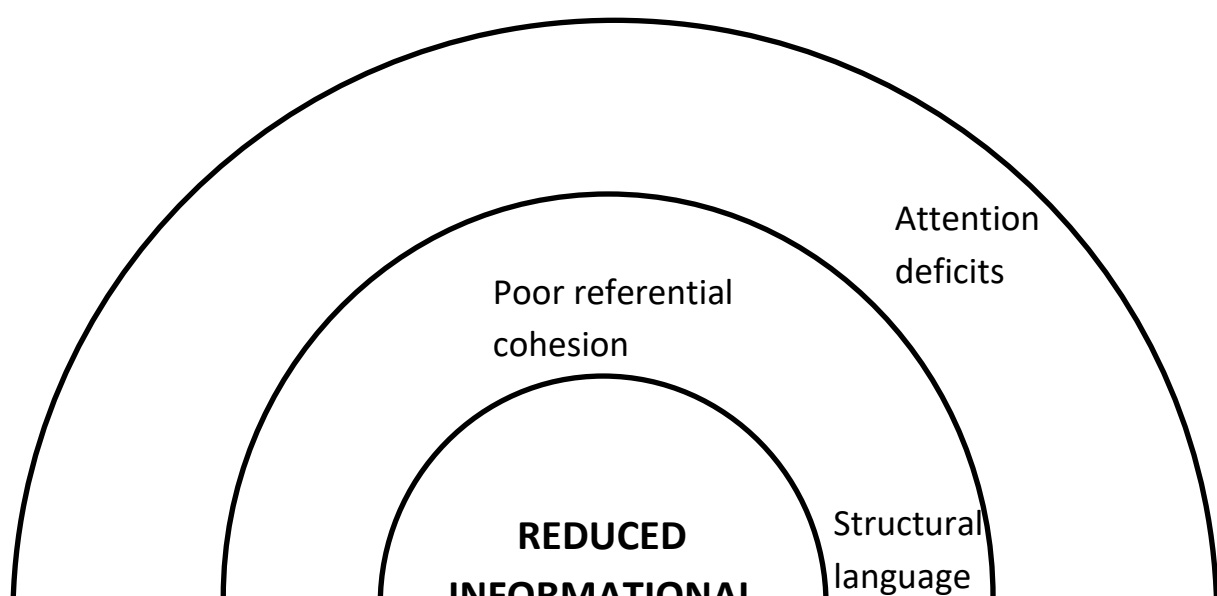
It was demonstrated in section 3 that adults with primary progressive aphasia experience marked impairments of referential cohesion and information management during narration. Contrary to expectation, however, these impairments could not be clearly related to the structural language deficits of these speakers. Difficulties with referential cohesion and information management in five of the six speakers examined appeared to be attributable to factors other than lexical-semantic deficits and grammatical errors. For example, even when

lexemes were introduced into the discourse by the investigator, a speaker with lexical-semantic deficits had difficulty in making pronominal reference to the characters denoted by these lexemes. A more plausible explanation of this type of referential failure is that the speaker had difficulty in establishing certain characters in his mental representation of the discourse and in using pronouns to make subsequent reference to those characters. Similarly, the repetition and incorrect sequencing of information could not be explained by structural language impairments when a speaker had sufficient expressive resources to convey information, but appeared to be incapable of judging how that information should be presented. An alternative explanation of these narrative difficulties, one which is not based on structural language deficits, needs to be found. That explanation lies, I believe, in aspects of cognition which are generally assumed to be intact in early-stage primary progressive aphasia. Further examination of this point is required.

The planning and execution of a narrative is a complex task which requires the integration of linguistic and cognitive skills. Clearly, a speaker must be able to use certain syntactic and semantic structures in order to produce any language at all. But much earlier in the planning of a narrative, a speaker must decide what a hearer needs to be told in order to follow the events in a narrative, and how that information should best be presented. A narrator must be able to establish what a hearer already knows (old information) and what information is new or novel to a hearer. Establishing this knowledge is an exercise in mental state attribution or theory of mind. Even when it has been decided that certain information must be conveyed to a hearer, a narrator must decide the order in which to relate this information. In order for a hearer to make sense of a story, temporal and causal relations between events must be reflected in the narrative. The executive planning that this requires is considerable. A speaker must be able to inhibit or withhold information when that information relates to events that occur at a late stage in the narrative. A speaker must also make decisions about the information that will prepare the hearer to comprehend these events, and know how to introduce that information at an early stage in the narrative. Meanwhile, the narrator must have an intact working memory which can accommodate all of these cognitive processes and judgements. In short, what appears to be a predominantly linguistic task (Cinderella narration) is, in fact, a complex exercise in executive planning and mental state attribution

(theory of mind). We must look to these aspects of cognition, I believe, for an explanation of the narrative difficulties that are experienced by adults with primary progressive aphasia.

The model that can best capture this pattern of impairment in primary progressive aphasia is represented by Figure 1. In this diagram, it is the reduced informational content of the discourse of speakers with primary progressive aphasia, not structural language deficits, which constitutes the central cognitive-linguistic impairment in this neurodegenerative disorder. Structural language deficits, particularly lexical-semantic impairments, certainly contribute to these speakers' difficulties with informational content. But they are only one of a number of factors which contribute to a reduction of the informational content that these speakers are able to convey during narration. Of equal or greater significance are these adults' problems with mental state attribution or theory of mind, executive planning, and referential cohesion. Poor referential cohesion reduces the information that a hearer can glean from a narrative. A narrator who is unable to relate one utterance to other utterances cannot provide a hearer with the information that is needed to construct a complete mental representation of the people and events in a narrative. The processes that contribute most directly to the management of information in a narrative are in turn dependent on a number of other cognitive operations. These operations include attention, memory and perception, all of which eventually become impaired in adults with primary progressive aphasia (Etcheverry *et al.*, 2012; Weintraub *et al.*, 2013; Stenclik *et al.*, 2015). By relocating structural language deficits, this model revises the standard view of primary progressive aphasia as a dementia syndrome with isolated decline in language function. Instead, these deficits are one of several factors that contribute to the reduced informational content of these speakers.



Executive
planning
deficits

Figure 1: Cognitive-linguistic impairments in the narrative discourse of adults with primary progressive aphasia

5. Conclusion

By way of conclusion, I want to return to the Cinderella story which has been central to this paper. In section 2, we characterized various cognitive-linguistic skills that can be examined by means of this narrative production task. It emerged that this task has a unique potential to reveal complex skills that are susceptible to disruption in neurodegenerative disorders such as primary progressive aphasia. To this extent, it can be argued that Cinderella narration has a key role to play in a clinical language evaluation of clients with neurodegenerative disorders. In this concluding section, the exact nature of that role will be considered. Typically, a clinical language evaluation is conducted by speech-language pathologists, although psychologists and educationalists may also be trained in how to conduct an evaluation of language and

communication skills (see Cummings (2018) for further discussion of clinical language assessment). It is the use of Cinderella narration by speech-language pathologists which will form the context for these remarks.

The versatility of the Cinderella narrative production task is beyond doubt. In clinical research, Cinderella narration has been used to investigate verbal fluency and grammar in adults with primary progressive aphasia (Catani *et al.*, 2013; Thompson *et al.*, 2012), gains in vocabulary production after naming therapy in aphasia (Conroy *et al.*, 2009), the relationship between thematic structure and phrase complexity in adults with agrammatic aphasia (Webster *et al.*, 2001), and intrusions in story recall in patients with Alzheimer's disease (De Anna *et al.*, 2008). In clinical practice, Cinderella narration is used by speech-language pathologists as a diagnostic tool to determine areas of language function that are compromised through injury, illness, or disease. These areas may then become targets of language intervention. The question which concerns us here is whether this task is employed to best effect in this context, or if current use of Cinderella narration should be modified to extract greater gains from this task for language assessment and treatment planning. Of course, it should be emphasized that Cinderella narration, like many other discourse production tasks, is not used during every, or even most, language evaluations. The amount of time it takes to record, transcribe, and analyse even small amounts of discourse is a widely acknowledged barrier to the routine use of discourse production tasks in a clinical setting (Coelho, 2007). It is hoped that the following comments will encourage all speech-language pathologists who work with clients who are suspected of having a neurodegenerative disorder to use a narrative production task as part of a language evaluation.

Cinderella narration is typically undertaken by speech-language pathologists in order to obtain an extended sample of a client's connected speech. This is usually justified on the following grounds. First, the performance of clients can vary with the context in which language is used. Language performance may be better or worse in the context of single sentences than it is in the context of extended discourse. Second, connected speech is closer to the use of language in everyday communication than are the linguistic responses – single words and sentences – that are elicited during formal language testing. If the argument of this paper demonstrates anything, it is that these should not be the only grounds for the use

of Cinderella narration. Indeed, to use the Cinderella narrative production task for just these reasons is to misunderstand its true diagnostic potential. Narration of the type, that the Cinderella story makes possible, exposes to analysis a range of complex cognitive-linguistic skills which remain untapped by other forms of assessment. Neuropsychological assessments of executive planning and formal language assessments of expressive syntax and semantics certainly do exist. But none of these assessments is able to capture the flexible deployment of cognitive-linguistic skills under real-time conditions. This is only possible using Cinderella narration and other narrative production tasks. These tasks are uniquely sensitive to the disintegration of skills across multiple aspects of cognition that is typical of neurodegenerative diseases such as the dementias.

So, the need for some form of narrative production task in a clinical language evaluation is confirmed. The only remaining issue, then, is how such a task should be included in an evaluation. Typically, speech-language pathologists conduct a narrative production task after formal language testing has taken place, and only then if sufficient clinical time is available. But if we take seriously the lesson of this paper, that narrative production tasks are uniquely sensitive to neurodegenerative processes across cognitive functions, then tasks of this type should be conducted at the start of a clinical language evaluation. Their results could then be used to guide clinicians towards those areas that require more detailed assessment. In the case of speakers with primary progressive aphasia, the Cinderella narrative task revealed that a test of single-word naming and comprehension was required, particularly for those speakers with lexical-semantic deficits. For speakers who were unable to narrate events in the temporal order in which they occurred, or who misrepresented cause and effect relations between events, a suspicion of executive planning impairment was raised. An assessment of this executive function deficit should then be implemented by a neuropsychologist. For speakers who could not represent the mental states of the characters in the Cinderella story, some further investigation of theory of mind skills is required. The diagnostic possibilities are as varied and numerous as the utterances are that speakers produce during Cinderella narration. But for these possibilities to be fully realized, speech-language pathologists must embrace a new narrative emphasis in their clinical language evaluations.

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