A construction-based approach to spoken language in aphasia

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This thesis is dedicated to the Fab Four:

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Abstract

Linguistic research into aphasia, like other areas of language research, has mainly been approached from the perspective of rule-based, generative theory (Chomsky, 1957 onwards). In turn, this has impacted on clinical practice, underpinning both aphasia assessment and therapy. However, this theory is now being widely questioned (e.g. Tomasello, 2003), and other approaches are emerging, such as the constructivist, usage-based perspective, influenced by cognitive and construction grammars (e.g. Langacker, 1987; Goldberg, 1995). This approach has yielded important results in, for example, child language (e.g. Ambridge, Noble, & Lieven, 2014), but it remains largely unapplied to language in aphasia. This thesis begins to address this by conducting an exploratory examination of spoken language in aphasia from a constructivist, usage-based perspective. Two central features of usage-based theory, the nature of constructions and the role of frequency, form the basis of the studies reported in the thesis. Reliable methods of transcription and speech segmentation appropriate for an analysis that employs this approach are developed and then applied to the examination of spoken narratives of the Cinderella story by twelve people with a range of aphasia types and severities.

Beginning at the single word level, the effects of general versus ‘context-specific’ frequencies on participants’ nouns are examined, demonstrating that most participants’ noun production appears to be more influenced by context-specific frequency, that is, the frequency of nouns in the context of the Cinderella story.

This is followed by an analysis of errors in marking these nouns for grammatical number. A main finding here was that error production seems to be affected by general frequency: the noun form used erroneously was always more frequent than that expected.

Finally, beyond the single word level, an in-depth analysis is provided of the participants' verbs and the strings these were produced in. This focuses on the number and productivity of constructions apparently available to the participants and shows that these speakers can be placed along a continuum largely corresponding to their expressive language capabilities. The productions of the more impaired speakers were mainly limited to a small number of high-frequency words and lexically-specific or item-based constructions. In contrast, those with greater expressive language capabilities used a larger number and variety of constructions, including more lengthy schematic patterns. They seemed much more able to use their constructions productively in creating novel utterances. In addition, an analysis of the errors in participants' verb strings was conducted. This revealed some differences in the types of errors produced across the participant group, with the more impaired speakers making more omission and inflection errors, whilst the participants with greater expressive language capabilities produced more blending errors. The analysis demonstrates how these seemingly different error types could all be explained within a constructivist, usage-based approach, by problems with retrieval.

In showing how the results of these studies can be accounted for by constructivist, usage-based theory, the thesis demonstrates how this view could help to elucidate language in aphasia and, equally, how aphasia offers new ground for testing this approach.

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1. Introduction

Linguistic research into aphasia, like other language areas, has been somewhat dominated by rule-based, generative theory (Chomsky, 1957 onwards). In turn, this has had a major impact on clinical practice, underpinning both aphasia assessment and therapy. However, rule-based theory is now being widely questioned in areas such as child language, and other approaches are emerging. One such approach that is gathering momentum in acquisition research is constructivist, usage-based theory, influenced by cognitive and construction grammars (see Ambridge & Lieven, 2011; 2015 for an overview). Indeed, a growing body of research is showing how this approach could offer a more plausible account of children's early utterances.

Observations regarding language from speakers with aphasia, too, pose problems for generative, rule-based models; yet research and clinical practice remains heavily influenced by this approach. If constructivist, usage-based theory was found to offer a more plausible alternative, this could contribute to the development of more effective aphasia assessment and therapy. Equally, data from aphasia could be of value in providing new ground for testing the constructivist, usage-based approach. This thesis addresses this issue by examining spoken language in aphasia from a constructivist, usage-based perspective.

In chapter 2, the literature review outlines the main differences between the generative and constructivist, usage-based approaches, before providing a more comprehensive overview of the latter and support for this theory from the acquisition literature. Relevant aphasia research is then reviewed, followed by a discussion of how constructivist, usage-based theory could provide new insight into aphasic language. This is followed in chapter 3 by the aims of the current project.

The main method of data collection is presented in chapter 4 before chapter 5 then provides language profiles for the participants with aphasia in this thesis. The next two chapters detail two methods developed for the project but which could also be used in other research of this kind: a protocol for the transcription of speech from people with aphasia (PWA) in exchanges with healthy speakers (chapter 6) and a procedure for extracting strings for analysis from healthy and aphasic speech (chapter 7).

Subsequently, the three main analytical chapters are presented. The first of these studies (chapter 8) investigates the nouns produced in narratives by PWA, comparing these with the nouns used for the same referents by healthy speakers narrating the same story. This particularly focuses on the effects of 'context-specific frequency' (the frequency of linguistic items in the context of the narrative in question), and the interplay between these and 'general frequency' effects (the frequency of items in UK spoken English).

The second study (chapter 9) examines speakers' errors in marking their nouns for grammatical number. It discusses how general frequency effects may influence this error production and also demonstrates how such errors can help to generate hypotheses about the constructions available to participants.

The third study (chapter 10) presents an examination of the verbs and 'verb strings' produced by the PWA. This particularly focuses on the participants' productivity levels with the verbs and strings produced, as well as analysing the errors made in these strings. In doing so, it details how the seemingly varied productions observed across the participants can all be accounted for by difficulties with retrieval, within a constructivist, usage-based model.

Lastly, the overall findings and implications of the project are brought together in the general discussion (chapter 11), before a final conclusion to the thesis is given (chapter 12).

2. Literature review

2.1. Chapter overview

Linguistic research into aphasia to date has been somewhat dominated by the rule-based, generative approach based on the proposals of Chomsky (1957 onwards) (although see, for example, the work of Gahl and colleagues, section 2.5.2). However, generative theory is now being questioned in areas such as child language, where studies are increasingly concluding that this approach struggles to account for linguistic data from real language learners (e.g. Tomasello, 2003). An alternative approach that has been applied with apparent success in acquisition research (e.g. Ambridge, Noble, & Lieven, 2014) but remains largely untested in aphasia is the constructivist, usage-based perspective. This chapter begins by outlining the key differences between these two approaches and some main challenges to the generative perspective, before providing a more comprehensive overview of the constructivist, usage-based approach applied in this project. This is followed by a review of the aphasia literature relevant to these theories, before discussing how constructivist, usage-based theory could provide new insight into aphasic language.

2.2. Main contrasts between the generative and constructivist, usage-based approaches

Before contrasting the two approaches, it should be acknowledged that the construction grammars at the heart of the constructivist, usage-based view do share some basic assumptions with the generative perspective. As Goldberg (2003) explains, both regard language as a cognitive system (being stored and processed in the mind) and recognise that humans must be able to combine linguistic units in some way to produce novel utterances. Also, both call for a "non-trivial theory of language learning" (Goldberg, 2003, p.219). However, apart from these commonalities, there are sharp contrasts between the two approaches.

In short, rule-based, generative theory proposes that humans are born with a specific grammar component distinct to their lexicon. It is theorised that this grammar module contains abstract rules - algorithms for syntactically combining the individual words or categories to create grammatical utterances. This abstract grammatical knowledge is assumed to be the same across speakers of all languages, thus being termed 'Universal Grammar' (UG) (e.g. Chomsky, 1986). In this view, speakers need to learn the vocabulary of their own particular language, which they store in their lexicon, linking their UG to this and setting a number of innate parameters to the particular language they are learning. To create connected speech, they apply their default UG rules to assemble utterances compositionally from individual words and categories (see Ambridge & Lieven, 2011, for a comprehensive overview of this approach).

Contrastingly, the constructivist, usage-based approach takes the view that all language (including 'grammar') is learned from the input in 'constructions' - form-meaning pairings of various sizes. As well as single words, constructions can be multiword sequences, or partially or fully abstract syntactic patterns (see section 2.4.1 for more details). There is therefore no distinction between syntax and lexicon: both grammar and lexis are simply learned in such 'whole-form' pairings. Furthermore, rather than needing to apply abstract rules, speakers can produce connected speech either by retrieving multiword items as 'fixed' wholes, or by combining constructions of various sizes and levels of specificity. A more detailed overview of this approach is provided in section 2.4.

2.3. Key challenges to generative theory

The main focus of this thesis is constructivist, usage-based theory, and, as such, most attention is given to this approach. However, because of the dominance of rule-based, generative theory in aphasia research, it is first useful to briefly summarise some of the key challenges to the generative approach. These will mainly centre on issues with the notion of UG and the proposed systems of language storage and generation.

The UG proposal is largely based on the argument that there are certain elements of grammar that are universal to all human languages but that cannot be learned because the exemplars that would allow speakers to do so are lacking in the input. This is the ‘poverty of the stimulus’ argument, which led to the proposal that since such features cannot be learned, they must instead be innate (e.g. Chomsky, 1986). However, there are several problems with this argument.

One such challenge is with the assertion that there are insufficient exemplars of certain structures in the input for speakers to acquire them simply through linguistic exposure. A classic example used by Chomsky (1980) to illustrate this point relates to English yes/no questions, which, according to rule-based theory, are formed via the movement of an auxiliary verb to the beginning of the sentence. For instance:

the boy who was arriving late [*has*] *already been checked in*

[*has*] *the boy who was arriving late already been checked in?*

It is proposed that in such utterances containing multiple auxiliaries, a child does not have enough evidence in the input to allow them to distinguish *which* auxiliary should be moved. For instance, they could infer a rule such as ‘move the left-most auxiliary to the start’, or ‘move the first auxiliary after the subject to the start’, but in fact, in multiple-auxiliary utterances, only the second of these would lead to the well-formed question. However, Chomsky asserts that there are so few of the relevant exemplars that would allow children to acquire this rule that a person may not even be exposed to sufficient evidence in their whole lifetime (Chomsky, 1980). However, as Dąbrowska (2004) explains, this claim is not supported by any frequency data for the relevant utterances in language usage. In fact, after investigating such frequency counts, Pullum and Scholz (2002, p.43) estimate that by three years old, children are likely to have heard at least 7,500 relevant instances that should indeed allow them to learn this distinction. Such data challenge the argument from the poverty of the stimulus and thus the need for an innate grammar (Pullum & Scholz, 2002; see also Dąbrowska, 2004).

Another way in which the UG proposal is challenged by actual language data is in its implications regarding children's early syntactic knowledge. The proposal implies that children are born with adult-like syntactic capabilities and that once they have learned the vocabulary of their particular language, they will be able to apply their innate grammar rules 'across the board' to combine these words and categories to create novel utterances. A major problem with this, however, is that analyses of children's early utterances strongly indicate that they do not have adult-like grammar. It is not the case that once a child has mastered a particular grammatical or morphological feature with, for example, one verb that they can then apply the same feature to any verb of the relevant kind (e.g. Lieven, 2008; Tomasello, 1992; 2003;). Instead, children's acquisition of such features occurs gradually in a more 'piecemeal' fashion, leading to 'unevenness' in their productivity levels across items (Ambridge & Lieven, 2015; see also 'mosaic acquisition', Dąbrowska, 2004). This is therefore a problem for the generative approach.

There is also evidence from adult language that speakers' grammatical knowledge is not universal. In fact, detailed typological analyses have concluded that very few, if any, grammatical structures can be confirmed as universal (see Evans & Levinson, 2009, for a comprehensive overview). For instance, Evans and Levinson (2009) cite extensive counterevidence to Pinker and Bloom's (1990) proposed universals, explaining, for example, that many languages (e.g. Kayardild, Bininj Gun-wok) have no auxiliaries and others (e.g. Lao, Enfield, cited in Evans & Levinson, 2009), lack an adjective class. Similarly, Croft (2005) argues that, amongst others, "there is no universal structural description of passive […] constructions that will hold empirically" (p.308). Instead, many of the principles that a speaker's UG is thought to be comprised of are 'theory-internal' (e.g. Tomasello, 1995; 2003). Thus Tomasello (1995) argues that such similarities might not be found if examinations adopted other theoretical perspectives that employ different structural definitions.

Furthermore, as Dąbrowska (2012) points out, even adult monolingual native speakers of the *same* language do not show 'universality' in their linguistic knowledge. Rather, there seem to be substantial differences in grammatical knowledge across individuals, and this may be affected by, for example, speakers' education levels. For instance, Street and Dąbrowska (2014) found that some participants who had comparatively 'low academic attainment' had difficulties with interpretation of passives, performing well below ceiling and sometimes at or below chance, whereas this was not the case for participants with 'high academic attainment'. As Street and Dąbrowska (2014) point out, these results raise challenges for the idea that speakers of a language all converge on the same grammar. Such findings, along with the other issues described above, therefore pose difficulties for the notion of a UG.

Apart from this, there are also limitations with the generative view of language storage and generation, in which only single words are stored in the lexicon. This is challenged by increasing evidence that speakers in fact also store larger items as wholes. For example, multiword frequency effects have been reported in studies of language production (e.g. Arnon & Clark, 2011; Bannard & Matthews, 2008) and comprehension (e.g. Arnon & Snider, 2010), and suggest that speakers store information about linguistic items beyond the single word level.

In addition, the generative combinatorial system adopts a fully compositional view of language, in which the meaning of a multiword utterance should be equal to the summed individual meanings of its component words. However, this is not the case for certain linguistic strings, the classic example being idioms. For instance, it is not possible to deduce from the component word meanings of *kick the bucket* that the conventional global meaning of this phrase is ‘to die’. The response to this issue from proponents of generative theory was to argue that the compositional approach could indeed account for the ‘core’ of language, and that ‘idiosyncratic’ exceptions to this, such as idioms, were ‘peripheral’ to this core (e.g. Chomsky, 1981). This, however, is not supported by empirical data. On the contrary, it can be argued that, far from being ‘peripheral’, such non-deducible items constitute a substantial proportion of language, in fact comprising items of various levels of schematicity, including abstract grammatical patterns that, too, have meaning (e.g. Fillmore, Kay & O’Connor, 1988). The meaning of such abstract patterns is illustrated by the following transitive caused motion utterance provided by Goldberg (1995, p.9):

He sneezed the napkin off the table

As Goldberg explains, the verb *sneeze* is not usually associated with caused motion meaning and, rather, it is the abstract pattern hosting the lexis in this utterance that gives the verb this meaning. Therefore, there is meaning associated with fully abstract grammatical patterns and these too can be treated as (schematic) whole forms.

In extending the analyses of idiomatic expressions to items of all degrees of compositionality in this way, the theory proposed to account for the ‘periphery’ can in fact be applied to all language if this is regarded as consisting of constructions (Fillmore et al., 1988). In this unified account, there would be no need to distinguish a core from a periphery. Rather, “it’s constructions all the way down” (Goldberg, 2003, p.223).

2.4. The constructivist, usage-based approach

2.4.1. The nature of constructions

The constructivist, usage-based view proposes that all language consists of constructions. Constructions are defined as conventional pairings of form and meaning/function (e.g. Goldberg, 1995; Goldberg & Casenhiser, 2006) thus constituting "symbolic units" (Croft & Cruse, 2004, p.257; see also Langacker, 2008). A proposed architecture of this pairing (Croft & Cruse, 2004, p.258) is shown in Figure 2.1, in which 'form' relates to the item's syntactic, morphological and phonological features, and 'meaning' comprises "all the conventionalized aspects of a construction's function", including semantic, pragmatic and/ or discourse-functional properties. Opinion varies on the exact criteria for a construction, but the current project adopts the more inclusive approach summarised by Goldberg and Casenhiser (2006, p.349) in which 'construction' extends to single morphemes and root words, as well as larger items such as "…idioms, partially lexically filled and fully general linguistic patterns". In this approach, the standard definition is that any linguistic pattern constitutes a construction if at least "…some aspect of its form or function is not strictly predictable from its component parts or from other constructions recognized to exist" (Goldberg & Casenhiser, 2006, p.349). However, this project will also adopt the assumption of other proponents of constructivist, usage-based theory (e.g. Tomasello, 2003) that even fully predictable patterns may be stored (and included under the term 'construction') if they are sufficiently frequent (see also Goldberg & Suttle, 2010).

Examples of constructions of various sizes and levels of specificity, provided by Goldberg (2013, p.436) are shown in Table 2.1. Since constructions range from fully schematic grammatical patterns to lexically-specific items, they can be placed along a 'syntax-lexicon continuum' (Croft, 2007, p.471). That is, the difference between grammar and lexis is one of degree rather than a categorical distinction of the kind proposed in generative theory.

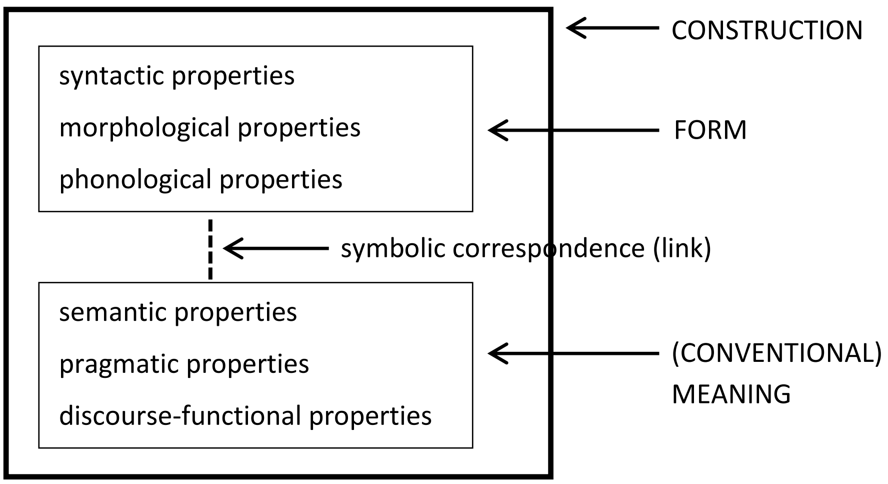

Figure 2.1: The symbolic structure of a construction

(Reproduced from Croft & Cruse, 2004, p. 258; also Croft, 2007, p.472).

Table 2.1. Goldberg’s (2013, p.436) examples of constructions of various sizes and degrees of abstraction

Type of construction	Example
Word	*Jacuzzi*
	tattoo
	behoove
Word (partially filled)	*anti-N, V-ing*
Idiom (filled)	*long story short*
	give the Devil his due
Idiom (partially filled)	*jog* <someone’s> *memory*
	<someone’s> *for the asking*
(minimally filled) Correlative construction: The Xer the Yer	*the longer you think about it, the less you understand*
(unfilled) Ditransitive construction: Subj, V, Obj1, Obj2	*he gave her a life-saver*
	he baked her a three-layer cake

2.4.2. Language acquisition

While the constructivist, usage-based view agrees that the *ability* to learn language is innate, it does not assume any innate linguistic knowledge, such as abstract syntactic categories or rules. Instead, all language is thought to be learned from the input in constructions of various sizes and degrees of specificity (e.g. Ambridge & Lieven, 2011; Tomasello, 2003). The child firstly learns single words and 'frozen' phrases, before making generalizations across these, to form more abstract constructions, thereby acquiring grammar (e.g. Ambridge & Lieven, 2011: Tomasello, 2003). For example, as Ambridge and Lieven (2011, p.134) explain, if the child encounters and stores the frozen phrases *I'm hitting it*, *I'm kicking it* and *I'm eating it*, she can then analyse them into their components and generalize across these utterances, recognising their common lexical content and meaning. Through doing so, the child can make an abstraction to acquire an item-based schema with a functional[1] slot, of the kind [*I'm* ACTION*ing it*], paired with a function of describing "the child performing some action on an object" (Ambridge & Lieven, 2011, p.134). It is by analogising across their stored lexically-specific and item-based constructions that the child then acquires fully schematic constructions of the kind proposed for adult speakers (Ambridge & Lieven, 2011).

Lieven (2008) emphasises the different roles of *type* versus *token* frequency, as distinguished by Bybee (1995), in the acquisition of constructions of different levels of abstraction. *Token* frequency leads to the entrenchment of lexically-specific items, that is, words, phrases and 'fixed' multiword strings that are learned as 'concrete' wholes without children having knowledge of the internal structure of such utterances. In contrast, *type* frequency, facilitates the process of abstraction "…by demonstrating to the learner that within the 'same' construction different concrete items may serve the same function (at the level of either the whole construction or some of its constituents)" (Lieven, 2008, p.64). Type frequency

[1] As Ambridge and Lieven (2011) explain, the slots are functional at this point, rather than formal (i.e. associated with more abstract grammatical categories such as VERB).

therefore promotes the acquisition of, for example, categories, slots associated with categories and fully schematic grammatical patterns.

2.4.3. Language storage: the adult 'end-state'

Constructivist, usage-based theory regards the adult 'end-state' of language not as a system of abstract rules, but as a 'structured inventory' of constructions, of the kind proposed by Langacker (1987), which constitutes a speaker's total linguistic knowledge (see also Ambridge & Lieven, 2011; Croft & Cruse, 2004). This inventory, or '*construct-i-con*'[2] (e.g. Goldberg, 2003, p.219), is usually regarded as a 'taxonomic network', in which each construction represents a separate node and taxonomic relations signify how constructions are linked in terms of "schematicity or generality" (Croft & Cruse, 2004, p.262). For example, lexically-specific constructions, such as *The bigger, the better*, can also be an instance of a schematic construction like *The X-er, the Y-er* (Croft & Cruse, 2004, pp.262-3; see also Fillmore et al., 1988) and this type of schematic relation between constructions is represented by a taxonomic link in the network. In fact, a number of levels of schematicity may be represented between the most lexically-specific and the most schematic of related constructions, as Croft and Cruse (2004, p.263) illustrate with the example of *kick the bucket* (Figure 2.2). Although this is an idiom with a form-function mapping of its own, its structure is also associated with a schematic verb phrase pattern. Moreover, the word sequence it consists of can also be fully compositional. For example, it could be used by a farmer telling his assistant in a milking shed "*don't kick the bucket*".

[2] This is also sometimes written as 'constructicon'.

[VERBPHRASE]

|

[VERB OBJ]

|

[*kick* OBJ]

|

[*kick* [*the bucket*]]

Figure 2.2. Constructions schematically linked to the idiom *kick the bucket* (Croft & Cruise, 2004, p.263).

The links between constructions in the network are commonly described in terms of these schematic relations. However, it is likely that constructions are also linked through shared properties of various kinds (Ambridge & Lieven, 2011), which could include any or all of the features thought to constitute a construction's form and meaning components (see again Figure 2.1). In this way, constructions are likely to be richly connected within the inventory and activation of one should spread to the various others connected to it. However, although constructions may be highly related to each other, as Croft and Cruse (2004) explain, slight differences in their form and meaning properties (see again Figure 2.1) can be enough to distinguish items as separate constructions.

In attempting to characterise the adult 'end-state' of language, it is again important to highlight the differences in linguistic knowledge across individual speakers (e.g. Dąbrowska, 2012; see again section 2.3). Different speakers will be exposed to different constructions to varying degrees, and it is also likely that they will attend more to different cues in the input. Therefore, speakers' linguistic knowledge - the constructions they have stored - should differ across individuals. In addition, what is stored may reflect speakers' individual processing preferences regarding the type of items they use to produce utterances. As Dąbrowska (2014, p.643) states, "some [speakers] may prefer larger, more concrete units (and produce fluent though stereotypical utterances) while others may rely on smaller chunks" (see 2.4.4 for a discussion of the process of utterance production).

2.4.4. Producing utterances

Rather than involving the retrieval and combination of single words and categories, the creation of utterances in the constructivist, usage-based view involves retrieval, and often combination of constructions of all sizes (e.g. Ambridge & Lieven, 2011). In this process, the speaker must find the appropriate constructions to convey their message, which may only involve lexically-specific items, such as single words (e.g. *hello*) or 'frozen' phrases (e.g. *I don't know*[3]). However, there are also times when speakers need to produce novel utterances that are unlikely to have been stored as fully lexically-specific strings. In these cases, it is assumed that they will need to assemble the utterance by combining several constructions in some way. This could involve the combination of relatively 'fixed' units, such as words, 'frozen' phrases and partially filled, item-based constructions. Alternatively, it might involve assembling the utterance 'from scratch' by inserting individual words or phrases into a fully-schematic 'host' construction.

A number of studies have suggested that children make considerable use of pre-fabricated chunks rather than assembling utterances from single words. Dąbrowska and Lieven (2005) and Lieven, Salomo and Tomasello (2009) used a 'traceback' method to compare children's spoken utterances in a test sample with utterances that the children had produced or encountered in a main corpus recorded across 28 days leading up to the recording of the test sample. They found that most utterances could be traced back to precedents in the main corpus. The majority of utterances were either identical repetitions of an utterance by the child or mother in the main corpus or required only a single operation (e.g. substitution of a

[3] It cannot be said with certainty that a speaker stores this sequence as a whole, and in fact it may be stored as a whole by some speakers and not by others. However, given its frequency, it is a likely candidate for whole-form storage (e.g. Bybee & Scheibmann, 1999).

component unit into a slot) to modify the respective precedent in the main corpus. That is, children's syntactic creativity appeared to rely heavily on lexically-specific chunks, although this became less so in later stages of development, which seemed to reflect children's acquisition of increasingly abstract constructions (e.g. Dąbrowska & Lieven, 2005; Lieven et al., 2009).

The ubiquity of such 'recycled' items does not appear to be limited to child language, however. By conducting a similar 'trace-back' analysis of adult speech, Dąbrowska (2014) showed that here, too, such 'recycled' chunks made up a substantial proportion of utterances: 42% were 'invariant units' (fixed phrases and single words) and phrasal items (fixed phrases or phrases with slots) constituted 71% (Dąbrowska, 2014, p.633). Therefore, adult as well as child language seems to involve considerable 'recycling' of utterance fragments (Dąbrowska, 2014, p.641).

The combination of such lexically-specific and item-based constructions can be effected through one of two 'usage-based operations': juxtaposition and superimposition (Dąbrowska, 2014; Dąbrowska & Lieven, 2005). In juxtaposition, two independent items are concatenated in a paratactic relationship, for instance:

where are you + *baby* = *where are you, baby?*

= *baby, where are you?*

(Dąbrowska, 2014, p.623)

Superimposition, contrastingly, "involves the combination of a frame with another chunk in such a way that the corresponding elements are "fused"…" at the semantic and phonological levels simultaneously (Dąbrowska, 2014, p.623). An example of this, involving the fusion of *keep them* AP and *keep NP happy*, can be seen in Figure 2.3.

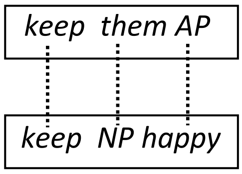

Figure 2.3. Superimposition of *keep them AP* and *keep NP happy* (based on an example from Dąbrowska, 2014, p.623).

A detailed account of the process of utterance creation, whether involving combination of lexically-specific chunks or assembly from scratch, is provided by Ambridge and Lieven (2011), using the example of a sentence-level string. As they explain, this process begins with the speaker's message, which in turn is comprised of a set of items representing different parts of the message and "an event semantics that specifies the relationship between them" (p.257) (see Table 2.2).

Table 2.2: Example of elements involved in utterance creation (Ambridge & Lieven, 2011, p.257)

Message	that a joke caused a man to laugh
Items	JOKE, MAN, LAUGH
Event semantics	the JOKE indirectly[4] caused the MAN to LAUGH

When creating an utterance, the speaker selects a suitable word or phrase to represent each of the items in the message, as well as an appropriate 'construction template' to host these words. This template is "an ordered pattern of slots which, as a whole, is associated with a particular event-semantics" (Ambridge & Lieven, 2011, p.257). The example provided by Ambridge and Lieven (2011) is the transitive

[4] Ambridge and Lieven (2011) point out that this causation is relatively indirect compared to that of a direct physical nature.

causative [AGENT] [ACTION] [PATIENT] construction, which is paired with the event-semantics of "the AGENT directly causing the PATIENT to perform the ACTION" (p.257).

During the process of utterance assembly, Ambridge and Lieven (2011) further explain, there is competition between all the constructions in a speaker's inventory to be selected for use in conveying the message, and the construction that receives the highest level of activation will 'win out'. Ambridge and Lieven (2011) identify four key factors thought to influence the level of activation that a construction receives. One of these is the 'relevance' of the construction to the message in terms of whether it has a suitable slot for each item and how well-matched its meaning (event-semantics) is to that of the message. Secondly, there should be an effect of the 'fit' between the properties of an item (e.g. semantic, pragmatic, phonological, etc.) and those of the slot it is to be inserted into. Thirdly, the construction's overall frequency in the input should influence its activation. Greater activation is predicted for constructions that are more frequent than those that are less frequent, although this should also be affected by whether the construction has been activated in the recent past: "…constructions that have recently been produced or encountered will be most available in memory" (p.260). Finally, the 'item-in-construction frequency', that is "the frequency with which each individual item has previously appeared in that construction", should also play a role. "Items in the message will activate constructions in which they have frequently appeared" and, conversely, construction templates can also activate individual items (Ambridge & Lieven, 2011, p.261). Activation of a construction should depend on the relative weightings of these four factors (Ambridge & Lieven, 2011).

Again, it is emphasised that utterances are likely to be created differently by different speakers, as the constructions available to them and also their processing preferences differ (Dąbrowska, 2014; see again section 2.4.3). Furthermore, the same speaker may produce a given utterance using different combinations of constructions at different times (Dąbrowska, 2014).

2.4.5. Summary of the constructivist, usage-based view

In summary, in the constructivist, usage-based view, language is learned, stored and processed in constructions of various sizes and degrees of schematicity, from morphemes and words to fully abstract grammatical patterns. All these processes are thought to be strongly influenced by the frequency of constructions in the input.

2.5. Research examining linguistic structures in aphasic language

2.5.1. Studies underpinned by generative theory

As stated, the main focus of this project is the constructivist, usage-based approach, and the scope of this literature review does not allow detailed coverage of aphasia research underpinned by generative theory. However, it is worth summarising some examples and limitations of such studies. The two main examples that will be discussed are the *Trace Deletion Hypothesis* [TDH] (e.g. Grodzinsdky, 1990; 2000) and the *Tree Pruning Hypothesis* [TPH] (e.g. Friedmann, 2002; Friedmann & Grodzinsky, 1997).

The *Trace Deletion Hypothesis* [TDH] (Grodzinsdky, 2000) was proposed to account for a reported selective comprehension deficit in Broca's agrammatic aphasia: difficulties in comprehending structures that, in the generative view, require 'transformations' (rule-based syntactic operations such as movement of elements from their canonical base position). In generative theory, moved elements leave a trace in their base position, and it is from this trace that information about the thematic role of the displaced unit is transmitted (e.g. Chomsky, 1981). Grodzinsky argues that such traces are deleted in people with Broca's aphasia, meaning that thematic roles cannot be assigned to the displaced elements. However, he explains that a "default linear strategy" that enables people to assign the role of agent to the "traceless clause-initial NPs" (Grodzinsky, 2000, p.6). Therefore, despite lacking traces, people with Broca's aphasia can guess the meaning of sentences in which the clause-initial NP happens to be the agent. According to Grodzinsky, this explains the finding that such speakers perform above chance on comprehension of these structures, whereas they perform at chance on structures in which the agent is not the first NP.

There are several criticisms of this research, though. Apart from, amongst others, inaccuracies in Grodzinsky's portrayal of Broca's aphasia (Cappa, Moro, Perani & Piattelli-Palmarini, 2000; Dick & Bates, 2000) and lacking reports of statistical testing of results (Bickerton, 2000), the findings are based on *grouped* results, showing that, *overall*, participants were better at comprehending structures that did not involve transformations. However, the issue at hand is rather the comprehension of such structures by the individual speaker. If individual cases do not show the predicted deficit, then this is a challenge for Grodzinsky's account. In fact, such individual cases have been reported. Both Druks and Marshall (1995) and Zimmerer, Dąbrowska, Romanowski, Blank and Varley (2010) present cases studies of speakers with aphasia who perform better on comprehension of passive sentences (which should involve transformations) than active sentences (which should not). These pose difficulties for the TDH.

In fact, the data presented by Grodzinsky (2000) in support of the proposed comprehension deficit do not provide evidence of any of the key theoretical concepts assumed, that is, movement, traces and trace deletion (Kay, 2000). Instead, as Kay (2000) argues, this data could be accounted for more economically "…with traditional grammatical concepts that are less theory-internal and more empirically based", that is, with reference only to the concepts of argument and logical subject (Kay, 2000, p.37). Kay explains that speakers can use information about their own language's predominant clause type to deduce which item in a sentence is the subject. For instance, since English favours a subject-verb-object (SVO) structure, English speakers with aphasia could employ a 'Logical Subject First' strategy: "A logical subject precedes its coarguments" (Kay, 2000, p.37). Indeed, an example of such a strategy is Bever's 'Strategy D': "Any Noun-Verb-Noun (NVN) sequence within a potential internal unit in the surface structure corresponds to “actor-action-object” (Bever, 1970, p.298). This has found support in, for example, studies of language acquisition, such as Slobin’s (1966) observation that children are quicker to verify pictures that correspond to active sentences (in which the subject is usually the first noun) rather than passive sentences (in which the subject occurs after the verb). As Kay points out, such a strategy could account for the data provided by Grodzinsky (2000) in support of the TDH.

Another theory proposed for impairments in agrammatism, but this time in production, is the *Tree Pruning Hypothesis* [TPH] (e.g. Friedmann, 2002; Friedmann & Grodzinsky, 1997). This again attempts to explain a proposed selective deficit for certain structures, for example, a reported impairment on particular question types, such as wh- questions in Hebrew, Palestinian Arabic and English, and a relative preservation of others, such as yes/no questions in Hebrew and Arabic. Friedmann (2002) argues that this can be best accounted for by the Tree Pruning Hypothesis, which asserts that “the high nodes of the syntactic tree are inaccessible for agrammatic speakers…Structures that rely on high nodes…are impaired in production, but lower structures are intact” (p.184). This, Friedmann (2002) asserts, can explain the selective impairment on, for example, tensed wh- questions, since these rely on higher nodes of the tree, whereas those that are reportedly preserved, such as yes/no questions in Hebrew and Arabic, do not.

There are, however, several issues with this research, not least relating to the methods employed. Amongst others, a particular issue is Friedmann’s (2002) coding of questions in spontaneous speech as grammatical versus ungrammatical. The full criteria for this procedure is not provided, but Friedmann states that “Questions counted as grammatical even when they included wrong inflection, preposition, determiner, and so on” (p.166). It is difficult to understand the rationale for this decision. In addition, items that Friedmann (2002) classed as ‘formulaic questions’, for example “*maztomeret = what d’ you mean?*”, “…were not included in the [results] table since they most probably are not syntactically derived and therefore do not indicate any syntactic ability” (p.166). However, again no criteria were stated for how this utterance type was defined and it is therefore unclear if this coding may have been based only on researcher intuition.

Apart from the described issues for each of these theories, there are also key limitations that are common to these and other aphasia research underpinned by generative theory, such as the substantial body of research on agrammatism by Bastiaanse and colleagues (e.g. Bastiaanse, Rispens & van Zonneveld, 2000). Firstly, the deficits reported do not constitute impairment of a given structure 'across the board'. For example, although participants in Friedmann's (2002) study produced fewer grammatical wh- questions than yes/no questions, they did indeed produce some grammatical wh- questions. This challenges the assumption of generative theory that the syntactic rules of UG are default and should apply 'across the board'. If a particular rule is impaired in a given speaker, that person should not be able to create structures requiring that rule *at all*[5], but this is not the case in Friedmann's (2002) data.

A second common limitation of all the above research is that it does not consider that multiword items of all degrees of compositionality may be stored as wholes, and in this way, it neglects the potential effects of whole-form frequencies. Little aphasia research has addressed frequency beyond the single-word level, but studies are beginning to demonstrate such effects at larger constructional levels on the language abilities of people with aphasia (see section 2.5.3.). These effects could influence participants' abilities to process different sentences and it is therefore important for aphasia studies to consider this factor.

[5] Speakers could, however, produce such utterances if they were rote-learned, which is presumably the reason for Friedmann (2002) excluding the 'formulaic questions' (see preceding paragraph). However, even with these excluded, the results show that some speakers did produce some grammatical wh-questions.

2.5.2. Studies examining whole-form utterances in aphasic language

Research has investigated multiword utterances that may constitute whole units in aphasic language, and in fact, such productions were noted in one of the earliest published accounts of aphasia, by Rommel in 1683 (as cited by Benton & Joynt, 1960, as cited by Wray, 2002, p.218). This described the ability of a lady with aphasia to recite, amongst others, the Lord's Prayer and certain Biblical verses, but seemingly only as 'fixed' sequences. As Rommel explained "…we tried to determine whether she could repeat very short sentences consisting of the same words found in her prayers. However, she was…unsuccessful in this" (cited in Benton & Joynt, 1960, as cited by Wray, 2002, p.218).

More modern studies of such productions generally fall under research into 'non-propositional' or 'formulaic' language, which is still relatively limited in the context of aphasia (see Wray, 2002, for an overview). These mostly either provide a general characterisation of the utterances and classify them into subtypes, often by pragmatic function (e.g. Blanken & Marini, 1997); or compare the features of such items with the criteria for 'nonpropositional' language (see below) [e.g. Code, 1989], often in attempts to make predictions about the roles of each cerebral hemisphere in language processing (supporting or challenging, for example, the 'dual source' hypothesis, Blanken & Marini, 1997; Van Lancker Sidtis & Postman, 2006; see also the overview by Van Lancker Sidtis, 2004]).

However, these studies are arguably hampered in several ways. Firstly, it is difficult to draw conclusions across such studies, because confusion over the terminology used to describe the utterances leads to uncertainty over the phenomenon reported (Wray, 2002; Code, 1989; 1994; Blanken & Marini, 1997). The array of terms used for items displaying some sort of 'fixed' unity in aphasic speech include, for instance, 'recurring' or 'recurrent utterance' (Hughlings-Jackson, 1874; 1879; Code, 1982; 1989; 1994; Blanken & Marini, 1997; Wallesch & Blanken, 2000);

‘(permanent) verbal stereotypy’ (Alajouanine, 1956); ‘speech automatism’ (Code, 1989; 1994; Blanken & Marini, 1997); ‘formulaic expression’ (Van Lancker Sidtis, 2004; Van Lancker Sidtis & Postman, 2006) and ‘nonpropositional speech’ (Van Lancker Sidtis, 2004). However, as Wray (2002) states, some terms are used interchangeably for the same thing and, conversely, the same label is given to phenomena that appear rather different. Thus, caution is necessary when comparing this research (Wray, 2002).

Secondly, even if the phenomenon in question is the same, the definitions used for this seem problematic. Most definitions in the more recent literature appear to be heavily influenced by the first extensive descriptions of ‘fixed’ utterances in aphasia, by Hughlings-Jackson (1874; 1879). Hughlings-Jackson (1874; 1879) noted the ability of patients with aphasia to produce longer, ‘fixed’ strings of language such as prayers and rhymes, despite seeming unable to create novel utterances. This led him to propose a dichotomy between ‘propositional’ and ‘non-propositional’ speech, whereby propositional speech conveys something meaningful whilst nonpropositional speech has no true language function. As Hughlings-Jackson (1879, p.206) illustrated, “...were a [healthy] person asked how many oranges he would buy, the reply “one” would be a proposition...But the speechless man’s recurring “one” comes out whenever anything comes out, and applies to nothing at all”. In the latter case, the speech could, he argued, be termed ‘nonpropositional’, and even when such utterances consisted of a multi-word string, and have “propositional structure”, they “...have in the mouths of speechless patients no propositional function. They are not speech, being never used as speech…they or their tones are at the best of interjectional value only” (p.209). However, such judgements appear to have been made impressionistically by Hughlings-Jackson and therefore the reliability of this distinction is questionable.

In spite of this, modern studies of formulaicity still seem to be influenced by this proposed dichotomy, regarding the utterances, again, as ‘non-propositional’ or ‘formulaic’, as opposed to ‘propositional’ or ‘non-formulaic’. While definitions of such utterances differ, most seem to centre, to varying degrees, on a core set of characteristics, namely that the utterances are 'automatic' or 'involuntary' (Code, 1982); 'stereotyped' in production (Blanken & Marini, 1997); based on emotion (Hughlings-Jackson, 1879; Blanken & Marini, 1997); lacking in relevance to the person or the context (Hughlings-Jackson, 1879); and of relatively high frequency in aphasic speech compared to in that of healthy speakers (Code, 1982; Blanken & Marini, 1997).

However, most of these criteria again seem to be based on impressionistic judgements that are likely to be highly subjective (see also Code, 1989). For example, no criteria are specified for the coding of an utterance as 'automatic' or of no relevance to the context. Even more problematic is the description of utterances as having no relevance to the speaker, as it is difficult to imagine how such a judgement would be made without in-depth knowledge of the speaker's life (including prior to their stroke). The criteria for deeming utterances to be based on emotion must also be questioned since the words that are emotionally significant to speakers are likely to vary according to the individual. Thus, it would again be difficult to know which items were emotionally-charged for the speaker in question.

Because of this lack of clear definitions and detection methods, the validity of such imposed dichotomies as 'propositional' versus 'non-propositional' or 'formulaic' versus 'non-formulaic' is arguably unsupported. It may transpire that some such utterances are indeed processed differently to others, but this cannot be assessed when examinations are limited to a subset of utterances selected because they are pre-assigned a special status distinct from other language. Rather, it is useful to consider all productions by a speaker together without imposing such dichotomies, and in this way, the constructivist, usage-based approach could offer a more inclusive framework for such an analysis. From this theoretical perspective, it would also be interesting to investigate the potential effects of frequency on preserved utterances in aphasia but little mention is made of this factor in the research above. Blanken and Marini (1997, p.28) do state that "Many of the automatisms consisted of words that were presumably of high familiarity to the speakers", but no method for predicting such familiarity was specified. In addition, no mention was made in the above research on formulaic/ nonpropositional utterances about the potential effects of multi-word (or 'n-gram'[6]) frequencies. Frequency has, however, been considered in other areas of aphasia research.

2.5.3. Frequency effects in aphasia

The effects of frequency on PWAs' language processing is widely recognised in the literature (e.g. Nozari, Kittredge, Dell & Schwartz, 2010) - but usually only at the single-word level. In turn, only word frequency seems to usually be considered in aphasia assessment and therapy. Even current literature on clinical practice, such as Whitworth, Webster and Howard's textbook on clinical assessment and intervention (2014), does not mention frequency effects beyond the single-word level. Instead, Whitworth et al. (2014) state that in examining frequency effects in aphasia, "…the usual method is to compare performance on a set of high-frequency words and a set of low-frequency words…" (p.12). This focus on single-word frequency can be seen in language assessments such as the Comprehensive Aphasia Test (Swinburn, Porter, & Howard, 2004). While this controls for word frequency, it does not control for larger frequency effects that could also influence a participant's performance and, consequently, their aphasia diagnosis. An example of a test within this battery where this issue could arise is subtest 9: *Comprehension of Spoken Sentences*. This assesses participants' comprehension of different sentence types, such as reversible or irreversible sentences, or active versus passive structures, and therefore aims to also highlight possible patterns of impairment on certain syntactic structures. For instance, sentences 4 and 13, shown in Table 2.3, are included in this subtest as 'irreversible active' and 'reversible embedded' structures, respectively. Poor performance on sentences such as test item 13 might therefore lead a clinician to diagnose a selective deficit for reversible or embedded

[6] An n-gram is a sequence of two or more linguistic items (here words) occurring contiguously in speech or writing (e.g. two words = bigram; three words = trigram, etc.) (e.g. Shaoul, Westbury & Baayen, 2013).

sentences. However, when multiword frequency is considered, it would be unsurprising if sentence 13 was more difficult to process than sentence 4, as several of the n-grams contained in 13, for instance the intial bigram and trigram, are less frequent[7] than those in 4 (see Table 2.4).[8]

Table 2.3. Example test items from the CAT Subtest 9: *Comprehension of spoken sentences* (Swinburn et al., 2004)

Test item	Sentence	Assigned structure	Assigned sentence type
4	*The man is eating the apple*	*NP VP NP*	irreversible active
13	*The shoe under the pencil is blue*	*NP (*PP) VP NP* [9]	reversible embedded

Key to Table 2.3. Sentence structures and types are those assigned in the CAT subtest; (*PP)= embedded prepositional phrase.

Table 2.4. Frequencies of initial n-grams of sentences 4 and 13 from the CAT subtest 9 (Swinburn et al., 2004)

Sentence 4		Sentence 13	
Initial n-grams	Spoken BNC frequency	Initial n-grams	Spoken BNC frequency
the man	657	*the shoe*	24
the man is	5	*the shoe under*	0

Key to Table 2.4. Spoken BNC frequencies are from Davies (2004-).

[7] Note, however, that sentence 13 does contain other n-grams of high frequency (e.g. *under the* = 842) and it is unknown how the different n-gram frequencies might affect comprehension of these sentences. However, it remains clear that there are, in any case, differences in these frequencies between the two test items, which could influence the participants' comprehension of them.

[8] Sentence 13 also intuitively seems relatively implausible as an utterance used by real speakers.

[9] The CAT's rationale for assigning the category NP to the word *blue* (and, similarly, to the word *red* in another sentence in this test) is unclear.

While frequency effects in aphasia are still very much focused on single words, a number of studies have begun to consider how word production may be affected by wider structural context. For example, Herbert, Gregory and Best (2014) compared the effect of two therapy types on noun retrieval by a participant with aphasia (anomia) in picture naming, narrative and conversation. These treatments included a 'lexical therapy' and a 'syntax therapy'. In summary, the lexical therapy targeted nouns as single words (bare nouns) through picture naming tasks, with the therapist providing phonological cues as necessary. The noun syntax therapy also involved picture naming but made additional use of a sentence frame that was presented in written and auditory form with each picture. The sentence frame ended with two slots, where a determiner and noun, respectively, were to be inserted in spoken form by the participant. In the earlier therapy sessions, the participant was also required to select and position a card with the correct determiner written on it onto the written sentence. The sentence frame used was the same for all items, as follows:

"The woman can see ___ ___" (Herbert et al., 2014, p.167)

In all sessions, two determiners were used: *some*, used with mass nouns and *a*, used with count nouns. Herbert et al. (2014) explain that the participant "…was alerted to the presence of the slots and asked to think about two words - the determiner and the object name - throughout the therapy" (p.167). The therapy thus had a particular focus on determiner and noun combinations.

Herbert et al. (2014) reported that naming of the treated words improved after both therapies but that only the syntax therapy impacted on noun production in narrative and conversation, which revealed greater noun production, "primarily in the context of determiner plus noun combinations" (p.162). Herbert et al. (2014) account for these findings explaining that by targeting nouns in phrasal and sentential contexts, the noun syntax therapy:

> …involves activation of noun syntax information; consequently, in connected speech, this syntax is produced more readily, with subsequent effects on noun production. Noun production increases as there is syntactic priming of nouns, created by the production of 'determiner plus __' structures into which the noun can be slotted" (p.172).

Although Herbert et al.'s study refers to lexis and syntax as different entities, their findings could be taken as support for the constructivist, usage-based idea that speakers learn and process linguistic items as wholes. Participants' production of determiner plus noun combinations in therapy may have facilitated re-activation or re-entrenchment of these bigrams as well as, potentially, of a schematic or partially-filled NP construction. This would fit with Herbert et al's finding that increased noun production in connected speech was mainly in determiner plus noun combinations, thus supporting the notion of frequency effects beyond the single-word level, in line with construction-based models.

There is also growing evidence in aphasia research of the influence of frequency at larger structural levels. One such type of frequency is 'lexical bias', "…the likelihood of a particular word […] occurring in a particular type of syntactic frame" (Gahl et al., 2003, p.224) [10]. For example, as Menn & Duffield (2013) explain, the verb *shrink* occurs more frequently in 'unaccusative' frames (in which the undergoer is the subject), such as (i) below, than it does in transitive structures, such as (ii):

(i) The sweater shrank two sizes

(ii) They shrank the sweater two sizes

(Examples from Menn & Duffield, 2013, p.654).

Gahl et al. (2003) examined the influence of lexical bias on sentence plausibility judgements by individuals with aphasia. They found that the participants were significantly better at judging passive structures containing passive-bias verbs than passive structures containing active-bias verbs. That is, generally, more accurate

[10] Compare 'item-in-construction frequency' (Lieven & Ambridge, 2011, p.261; see again section 2.4.4).

judgements were made for sentences in which the verb was in its most frequent frame. Similar results were found in Gahl's (2002) study which investigated three types of sentence (active transitive, passive and intransitive-undergoer-subject). As Gahl et al. (2003) state, these results indicate that frequency effects associated with larger structures appear to influence comprehension by PWA. Thus, these findings support a constructivist, usage-based approach.

2.6. The current project

The described research examining larger whole-form constructions in aphasia mainly conducts quantitative analyses of participants' language capabilities, measured through focused experimental testing. While these studies clearly have value in targeting specific abilities and hypotheses, it would also be beneficial to conduct an in-depth analysis of spontaneous speech. Such speech samples are not only more naturalistic than data from experimental testing, but can also highlight language differences across participants that may otherwise be masked in tests such as naming (Dell, Schwartz, Martin, Saffran, & Gagnon, 1997). There appear to be no existing studies that analyse spontaneous speech by speakers with aphasia from a constructivist, usage-based perspective. To address this, the current thesis examines the language produced by PWA in spoken narratives of the Cinderella story. Although narratives are arguably not as naturalistic as, for example, conversation, they can provide a more restricted context for interpreting the speech (cf. Dell et al., 1997), which might aid the analysis of constructions. This more restricted context can also allow examination of context-specific frequency effects on the participants' productions, as examined in chapter 8.

It is emphasised that in trialling the application of constructivist, usage-based theory to aphasic speech in this manner, the work in this thesis is exploratory in nature and thus constitutes the beginning stages of the 'scientific method': "(1) observe a phenomenon [and] (2) Formulate a hypothesis to explain it" (Eddington, 2008, p.1). In this way, it serves as a basis from which future research in this area may be developed.

3. Thesis aims

The overarching aim of this thesis is to demonstrate whether a constructivist, usage-based approach could offer a plausible theoretical perspective from which to characterise spoken language in aphasia.

This overall aim encompasses the following more specific aims:

1. To develop reliable methods suitable for the analysis of aphasic spoken language from a constructivist, usage-based perspective;
2. To examine the extent to which this theoretical approach might account for the nature of the spoken language produced by people with a range of aphasia types and severities;
3. To generate hypotheses based on this theory regarding aphasic language production and language storage and processing generally and, in doing so, to highlight areas for future research.

Aim 1 is addressed in chapters 6 and 7, which report the development and testing of procedures for transcription and segmentation/ string extraction, respectively. Aim 2 is addressed in the three main studies of the thesis, in chapters 8, 9 and 10. Finally, aim 3 is addressed within each of these studies and also in the general discussion following these (chapter 11).

Specific aims for each of the methodological development chapters and the three main studies are stated within the respective chapters.

4. Method of data collection

4.1. Participants

The total participant sample included in this thesis consists of 12 people with aphasia (PWA) and 12 healthy speakers (HSp) (see section 4.1.3 for summary of participants included in each of the three main studies).

4.1.1. Participants with aphasia

4.1.1.1. Overview of sample

The 12 PWA were all adults with aphasia resulting from cerebro-vascular accident (stroke). These included seven males and five females, with an age range of 43-81 (mean = 61.42). Data for five of these participants (DB, IB, BK, JS and JW) was retrieved from the PATSy database (Lum, Cox & Kilgour, 2012), while the other seven participants (KP, TH, LC[11], ST, HB, MH and RD[12]) were recruited specifically for the current project (and are hereafter referred to as the 'recruited participants'). The PATSy cases were initially chosen for use in developing and trialling the transcription methods, but since some of this data proved to be of interest for constructivist, usage-based theory, it was also included in the main analyses. The details of the PATSy and recruited participants are summarised in Table 4.1 (see chapter 5 for full language profiles). Throughout this thesis, the initials used for the PATSy database participants are those provided by Lum et al. (2012). Those used for the recruited participants are false initials assigned by the researcher in order to maintain participant confidentiality.

[11] LC was reported as KC by Hatchard, Wilkinson and Herbert (2013), but he is given the initials LC in this thesis to avoid confusion with participant KP.
[12] RD was reported as TD by Hatchard, Wilkinson and Herbert (2013), but he is given the initials RD in this thesis to avoid confusion with participant TH.

4.1.1.2. Inclusion criteria and selection process

All 12 PWA were native English speakers with no significant hearing or visual impairment, no significant unintelligibility of speech, no previous history of speech and language impairment prior to stroke, and no other neurological or psychiatric conditions. To ensure that they were also medically stable and psychologically able to take part in the research, they were also at least six months post stroke.

Selection of the PATSy database participants was also based on the availability of narrative recordings in which the majority of speech was intelligible. The recruited participants were selected on the basis that they had sufficient attention ability, comprehension and expressive language to understand the study, give informed consent to participate and to produce a spoken narrative. The sample of recruited participants mainly constituted a convenience sample, whereby recruitment targets individuals who are "…both easily accessible and willing to participate" (Teddlie & Yu, 2007, p.78). However, to make the participant group more representative of PWA generally, attempts were also made to include males and females with a range of aphasia types and severities. In this way, the method also involved an element of purposive sampling: "...selecting units (e.g., individuals, groups of individuals, institutions) based on specific purposes associated with answering a research study's questions" (Teddlie & Yu, 2007, p.77; see also Devers & Frankel, 2000).

All data from the PATSy database was accessed and used in accordance with the stated terms and conditions of that database (Lum, Cox, & Kilgour, 2012). All data collection procedures used for the recruited participants were approved by the Department of Human Communication Science's Research Ethics Committee.

Table 4.1: Details of the PWA ordered by participant group, then aphasia type[13].

Part. group	Part.	Gen.	Age at testing	Hand.	TPO (y:m) [14]	Previous employment	Aphasia type
PATSy	DB	F	59	R	2:6	Retail assistant	Broca's agrammatic
	IB	F	37-38 42[15]	Not known	Not known	Retail assistant; housewife	Broca's agrammatic
	BK	M	46	R	4:3 4:7	Shop tradesman	Transcortical motor
	JS	M	73	Not known	0:8	Skilled tradesman	Unclassified fluent
	JW	F	66	R	1:0	Clerical assistant	Conduction
Recr.	KP	M	50	R	2:8	Industrial labourer	Global
	TH	F	51	R	17:0 1:9	Business professional	Broca's agrammatic
	LC	M	64	R	2:5	Industrial labourer; hospitality worker	Transcortical motor
	ST	M	65	R	2:5	Salesman	Transcortical motor
	HB	F	81	R	4:0	Teacher; care worker	Wernicke's
	MH	M	69	R	5:0	Professional	Anomia
	RD	M	68	L	7:11	Technician	Anomia

[13] All details shown for the PATSy database participants are those provided in that database. All details shown for the recruited participants were recorded by the researcher during data collection (see section 4.2.2.1), with the exception of the aphasia types. These were assigned by the researcher subsequently, based on the participants' language profiles at the time of data collection, as described in chapter 5. They were also verified by a qualified speech and language therapist.

[14] Each time period listed in column six corresponds to one stroke. Therefore, where several time points are listed, this indicates that the participant has sustained more than one stroke.

[15] The PATSy data for IB was collected during two test periods.

Key to Table 4.1:

Part.=participant; Gen.=gender; Hand.=handedness; TPO=time post onset of aphasia; y=years; m=months; PATSy=PATSy Database participants; Recr.=recruited participants; M = male; F = female; L = left; R = right.

4.1.1.3. Recruitment and consent of recruited participants

The seven recruited participants were recruited from local aphasia support groups. As the researcher already worked as a volunteer at these groups, and was thus known to most group members, the issue of potential coercion to participate arose. Therefore, recruitment took place through the support group facilitator, who approached group members that fulfilled the inclusion criteria, and then forwarded the contact details of those wanting more information about the study to the researcher. These people were then sent an information pack containing an ‘aphasia-friendly’ leaflet for prospective participants (Appendix I), the format of which was informed by the *Accessible information guidelines* developed by Herbert, Haw, Brown, Gregory and Brumfitt (2012). A more detailed booklet was also included for prospective participants with sufficient reading capabilities or for friends and relatives of those with greater impairment (Appendix II). The researcher then contacted these individuals to assess interest in participation and to arrange data collection sessions as necessary. Consent was gained from each participant at the start of the first data collection session (see also section 4.2.2.1) using the consent form in Appendix III.

4.1.2. Healthy speakers

The healthy speaker speech samples were from those collected by Webster, Franklin, & Howard (2001; 2007). Twelve samples were selected to match the number of aphasic samples, so that group comparisons could also be made in the analysis as required. The healthy speaker sample included four males and eight females, with an age range of 22-80 (mean age=52.3). Details of these speakers are shown in Table 4.2, using the participant identifiers used (but not reported) by Webster et al. As Webster et al. (2007, p.369) state, all participants in their dataset had "..no history of language or cognitive difficulties and came from a wide range of social/educational backgrounds". This data set was used because it was readily available, and therefore the participants again mainly constituted a convenience sample. Purposive sampling was also used to the extent that the 12 participants were selected with the aim of including approximately equal numbers of males and females[16], but this was largely restricted by the available data rather than being a key feature of the sampling.

Table 4.2: Details of the 12 healthy participants (Webster, at al., 2001; 2007), ordered by gender and then age.

Participant	Gender	Age
N5	f	32
N9	f	38
N10	f	40
N3	f	44
N8	f	56
N7	f	62
N4	f	70
N6	f	80
N17	m	22
N2	m	38
N1	m	72
N18	m	74

[16] The available dataset only contained four male participants, however, and thus there were not enough males to make up half of the selected participant sample. Therefore, all the males (four) were included and the eight female participants were selected pseudo-randomly.

4.1.3. Summary of participants included in each main study of the thesis

The participants described above constitute the total participants reported in this thesis overall. Data from the 12 healthy speakers was reported in all three studies. However, the PWA included varied across these studies and these are summarised in Table 4.3. As stated, the PATSy database participants were mainly used for trialling methods (chapters 6 & 7) but two (IB and DB) were also studied as pilot cases for the noun and verb analyses (see Table 4.3). All PWA were included in the study of errors with marking nouns for grammatical number (chapter 9) to maximise the potential number of errors for analysis. The noun and verb case studies, in contrast, focused on five of the recruited participants (as well as the pilot cases described). These five recruited participants were chosen because there was most consistency across these speakers in the procedure of narrative elicitation (see section 4.2.2.1). In short, none of these five viewed pictures while producing the narrative, with the exception of KP, who viewed pictures from part-way through but mainly produced the same linguistic items with this resource as he did without it. The other two recruited participants, that were not chosen as case studies relied heavily on the pictures.

Table 4.3. Summary of participants included in each study

Study	Participants	
	PATSy	Recruited
1 (chapter 8)	IB	KP, TH, ST, HB, MH
2 (chapter 9)	All	All
3 (chapter 10)	DB	KP, TH, ST, HB, MH

4.2. Data collection procedures

4.2.1. PATSy database participants

The narratives from the PATSy database were elicited using Saffran, Berndt, & Schwartz's (1989) procedure. However, although this procedure recommends minimal interruptions from the interviewer, "...limited to general encouragement" (Saffran et al., 1989, p.469), there is considerable spoken input (including provision of language) by PATSy database interviewers during these narratives. In addition, some participants were provided with a verbal summary of the story prior to the task and/or were shown pictures to remind them of the story before or during narrative production. Details regarding the exact aids and stimuli provided to participants were not available from the PATSy database. However, some of this information can be ascertained from the narrative recordings, and this is summarised in Table 4.4. It should be acknowledged that there is a considerable amount of inconsistency in these stimuli across the five participants. However, as stated, these five cases were mainly used in piloting specific methods, and are mostly excluded from the analyses that draw direct comparisons across participants (see individual analysis chapters). It was therefore deemed acceptable to use this data for these purposes, whilst focusing most analyses on the recruited participants, for whom there was much greater consistency of data collection procedures (see section 4.2.2.4).

Table 4.4: Stimuli provided to the PATSy database participants (Lum et al., 2012a).

Participant	Prior to task		During task		
	Verbal summary	Pictures	Spoken input from researcher	Pictures	Other input
DB	Not known	Not known	✓	✓	X
IB	Not known	Not known	✓	Not known	✓ Individual written words
BK	✓	Not known	✓	Not known	X
JS	Not known	Not known	✓	✓	X
JW	Not known	Not known	✓	Not known	X

4.2.2. Recruited participants

4.2.2.1. Overview of data collection procedure

Each participant attended two data collection sessions of up to one hour each. All participants opted for these sessions to take place in their own homes, except for TH who chose to attend the university's speech and language clinic. The structure and content of the sessions is shown in Table 4.5. In the first session, the consent form was discussed and signed, and participant details were noted using the form in Appendix IV. In the event that a participant was unable to provide this information, it was obtained from a friend or relative, where available. In the remainder of the first session and the first part of the second session, selected tests from the Comprehensive Aphasia Test [CAT] (Swinburn, Porter, & Howard, 2004) were administered to establish a profile of the participants' aphasia (see also the extra measure used to rate participants' speech, section 4.2.4). The CAT tests were completed over two sessions (see again Table 4.5) to avoid similar assessments (for example, tests 7 and 8, or 12 and 14) being completed in the same session. Finally, in the latter half of the second session, participants were asked to narrate the story of Cinderella (see section 4.2.5.4 for procedure).

All tasks involving spoken output from participants (subtests 12, 14, 17 and 20 and the Cinderella narrative) were audio recorded using a Marantz PMD670/W1B recorder and a Sennheiser MD 425 hand-held microphone positioned on a stand next to the participant. The narratives were also video-recorded using a JVC GR-D728EK digital video camera on a tripod stand.

Table 4.5: Overview of data collection sessions.

Session	Tasks completed
1	Consent form discussed and signed
	Participant details recorded
	CAT subtests administered: 7. *Comprehension of spoken words* 9. *Comprehension of spoken sentences* 14. *Repetition of nonwords* 20. *Reading words* (aloud)
2	CAT subtests administered: 8. *Comprehension of written words* 12. *Repetition of words* 17. *Naming objects*
	Narrative task (Cinderella)

4.2.2.2. Administration and scoring of CAT subtests

All CAT subtests were administered and scored by the researcher, using the procedures specified in the CAT manual (Swinburn et al., 2004), with the exception that rather than tests being discontinued after a certain number of incorrect responses (as instructed in the manual), all were completed in their entirety to maximise the amount of test data collected. (The CAT results are reported in chapter 5.)

4.2.2.3. Elicitation of narrative

The narratives were elicited following the procedure used by Saffran et al. (1989) (cf. Webster et al., 2001; 2007; Bird & Franklin, 1996), except that no minimum or maximum duration was specified for the narrative; participants were simply asked to tell as much of the story as possible. Following Saffran et al.'s (1989) procedure, all participants were provided with a picture book illustrating the main points of the story to view at their own pace prior to the task. To minimise any potential priming of the participants' language, this book only contained images; no written language was shown to the participants. Participants were informed that this resource would subsequently be taken away and they would be asked to tell as much of the story as possible without access to the pictures. It was also emphasised that the images were to remind them of the storyline and that the aim of the task was not to try to remember everything in the pictures. While the participants were viewing the pictures, the researcher occasionally pointed to parts of the images that were key to the story, but, to minimize any priming of the participants' constructions (and in contrast to Saffran et al.'s (1989) method), the researcher did not speak during this time.

When participants confirmed that they had viewed the pictures sufficiently, this resource was removed and the start of the narrative was prompted by the researcher saying "*So, the story of Cinderella. What happened*?" From this point, the researcher spoke as little as possible during the task, limiting output to confirmatory noises (such as *mhmm*) and encouraging the participant through facial expressions and nodding. Although relatively infrequent, main exceptions to this were occasional prompts in the event of long periods of silence by the participant, such as *what happened?*, *what happened here?* or less commonly *do you remember what happened?*, and reassurances, such as *it's ok*, if an individual showed concern at their progress with the task. No lexis relating to the story was provided by the researcher other than the words *the story of Cinderella* used in the initial prompt described. The narratives were attempted without access to the picture book, but, in contrast to Saffran et al.'s (1989) procedure, if a participant seemed unable to produce any narrative without the pictures, the book was offered back to them to view during the storytelling. Three participants (KP, LC and RD) required the picture book to complete the task, whereas the other four (TH, ST, HB and MH) did not view the book during narrative production.

4.2.3. Healthy speakers

Webster et al.'s (2001; 2007) narratives were also elicited following the procedure of Saffran et al. (1989). Again, no verbal summary was given to participants prior to the task and minimal cues were provided to them during narrative production. However, the participants did not view any pictures of the story either before or during the task, since all were able to attempt the narrative without this resource.

4.2.4. Extra assessment of participants' speech: Fluency rating

Since the focus of this thesis is on spoken language production in spontaneous speech, it was decided to also rate the speech of the PWA for the length and complexity of the utterances it contained and the fluency with which these were produced. The aim of this was to gain greater insight into the differences in speech profiles across the participant group. In choosing an objective measure to gauge the speech in this way, one particular scale seemed to mirror quite closely a continuum of language ability as might be predicted by constructivist, usage-based theory, that is, ranging from limited production of single words and 'fixed' phrases, to more flexible use of longer and more complex grammatical structures. This measure is the fluency rating scale from the spontaneous speech section of the Western Aphasia Battery (WAB, Kertesz, 1982). In the case of the recruited participants, the researcher used this scale to rate the speech that had been produced in the narratives and also based the rating on the participants' general interactions with the researcher during data collection. The ratings were then verified by a qualified speech and language therapist. For the PATSy database participants, the WAB fluency ratings are those provided on that database, with the exception of that of JS, for whom no fluency rating was provided. In this case, the researcher again allocated a rating based on JS's narrative, and this score was then verified by a qualified speech and language therapist.

These fluency ratings will be referred to throughout the analytical chapters of the thesis. It is to be noted, however, that the ratings refer only to the participants' expressive language capabilities (production of spontaneous speech). The fluency rating is not to be confused with the general classifications of 'fluent' and 'nonfluent' that are commonly applied to aphasia profiles and which also consider comprehension ability. The fluency ratings assigned to participants, as well as further details about the rating scale, can be found in chapter 5.

4.3. Transcription

All 12 aphasic narratives were transcribed in their entirety by the researcher. The transcription methods employed are reported in chapter 6.

The narratives from the HSp were the raw, uncleaned versions transcribed by Webster et al. (2001; 2007) following the same procedure as Saffran et al. (1989). In brief, the narratives were transcribed orthographically, with any phonemic paraphasias or neologisms transcribed phonetically. Pauses of one second or above were noted impressionistically by the transcriber, with one full stop representing each second. Again, this differs from the method of transcribing pauses in the aphasic narratives, but this was not deemed to be problematic as none of the analyses involved consideration of pauses in the healthy narratives.

4.4. Analysis

Since separate methods of data extraction and analysis were used for each of the studies, these procedures are detailed within the respective chapters.

5. Language profiles of participants with aphasia

5.1. Chapter overview

5.1.1. Introduction

This chapter details the language profiles of the people with aphasia (PWA) studied in this thesis. In-depth profiles are provided for the seven participants that are studied in greater detail in the noun and verb case studies (chapters 8 and 10). Summarised details are then provided for the participants who have not been studied in such depth, but are included in the analysis of grammatical number errors (chapter 9) and development of methods (chapters 6 & 7). The test results for all recruited participants are those collected through the researcher administering subtests from the Comprehensive Aphasia Test [CAT] (Swinburn, Porter & Howard, 2004) during data collection. The profiles provided for the PATSy database participants are based on the descriptions provided on that database (Lum et al., 2012), except for the analyses of spontaneous speech and the fluency rating for IB and JS (see sections 5.2.6 and 5.3.4, respectively), which are provided by the researcher.

It should be noted that the theoretical concepts underpinning the tests used in this chapter may not necessarily fit with constructivist, usage-based theory[17]. However, providing profiles in this way does allow the participants to be situated within the aphasia literature, enabling comparison with cases reported in other aphasia research.

Since the main assessments used to profile the participants were the Western Aphasia Battery (WAB, Kertesz, 1982) and the CAT (Swinburn et al., 2004), it is useful to briefly outline the scoring procedures employed in these.

[17] See also the issues relating to potential frequency effects on test items in the CAT, section 2.5.3.

5.1.2. Scoring

5.1.2.1. WAB fluency rating

The fluency rating scale is from the spontaneous speech section of the WAB and rates speech in terms of the number, length and complexity of utterances, as well as how fluent and well-formed these productions are. A sample of the participant’s speech is rated on a scale of 0-10, where 0 is characterised by “No words or short, meaningless utterances” and 10 equates to “sentences of normal length and complexity, without definite slowing, halting, or articulatory difficulty”. In the current project, the ratings were assigned based on the participants’ speech in their Cinderella narratives as well as in their general spoken interaction with the researcher during data collection.

5.1.2.2. CAT subtests

All CAT subtests were scored following the guidelines specified in the CAT manual (Swinburn et al., 2004). For all of the subtests used, the score allocated per test item is 0-2. The points allocated for an item depend on the type of response given by the participant. These include prompt correct responses, delayed responses (defined as occurring more than five seconds after stimulus presentation, as counted impressionistically by the administrator), self-corrections and incorrect responses (including no responses). For tests involving an auditory stimulus, there is also the extra response type of ‘repetition’, whereby the stimulus is repeated on the participant’s request. The points allocated for each of these response types are shown in Table 5.1.

Table 5.1. Points allocated per response type on the CAT subtests used.

Response type	Points
Correct (prompt)	2
Delay	1
Self-correction	1
Repetition	1
Incorrect	0

5.2. Case study participants

5.2.1. KP

5.2.1.1. Background

KP is a 50-year old right-handed, monolingual speaker of British English, who sustained a single left-hemisphere CVA approximately two and a half years before his participation in the current study. He left school at age 16 and has mostly been employed in manual labour, but he has not worked since his stroke. KP's main symptom resulting from the stroke is his communication impairment. He has also had several seizures as a result of scar tissue from his stroke. He has no other physical symptoms and has normal mobility. At the beginning of his participation in the study, he was living with his partner but during the course of data collection he moved to live independently in sheltered accommodation. He also maintains some level of social activity, attending local aphasia support groups and visiting friends and family. KP received speech and language therapy whilst in hospital and for approximately one year after returning home, but he was not receiving any at the time of his participation in the study.

5.2.1.2. Spontaneous speech/ fluency rating

KP has very apparent difficulties in producing connected speech, as can be seen in the extract from his Cinderella narrative below. His spoken output is dominated by hesitation phenomena such as pauses and what seem to be audible hesitation tokens (e.g. *[œɹœ]*, lines 2 - 5). His language is mainly limited to a restricted number of single words, which are often produced as phonemic errors (e.g. *[tʃɪpəz]* for *slippers*, line 2) or as semantic or semantic association errors (e.g. *socks* produced when describing the ugly sisters trying on the slipper, line 12). KP only occasionally produces multiword utterances, but these are relatively short and simple in structure and are sometimes produced as phonemic errors (e.g. *[weənɹɪn] it*, line 7). He otherwise shows little ability to produce multiword sequences or use complex syntactic structures. His spoken output is consistent with a rating of 2 on the WAB fluency scale: “single words, often paraphasias, effortful and hesitant” (Kertesz, 1982, p.3).

1. R: d’y’ know what happened
2. Pa: [ɘ$^{\text{ˡ}}$] [ɘ] (.) [jɘ$^{\text{ˡ}}$] er^{n} (2.6) [$^{\text{ə}}$] [$^{\text{phuː}}$] [œɹœ] (.) [tʃɪpəz]
3. [œɹœ] (1.0) [ɘ$^{\text{ɹ}}$ə] [$^{\text{sʏm}}$bɛlə] (.) [œɹœ] [^{b}bœ] er^{dn} [gɪpəz] [œɹœ^{m}]
4. ((tut)) (.) erm (9.7) [œɹœ^{n}] ((tut)) ^{i}yeah[ɹ]er (4.0) [$^{\text{n ɘ}}$] (1.8) yes
5. [œɹœ]
6. R: ((laugh))
7. Pa: [tʃɪpəz] [ə] [œɹœ^{n}] (.) erm ((tut)) (4.3) [weənɹɪn] it [œɹœ] [œɹœ] (.)
8. [ə] [$^{\text{əə}}$ɛlə] [ɹ]er (3.9) yeah [wœ^{n}]
9. (1.7)
10. R: what (1.2) d’y know what happened (1.2) there
11. (1.1)
12. Pa: socks socks
13. R: mhmm

5.2.1.3. Language assessments

The results of KP's language assessments are shown in Table 5.2, before full details of his performance on each task are provided below. His WAB fluency rating is also shown in the table for convenience.

Table 5.2. Language assessment results for KP

Task	Max. score	Healthy		KP
		Mean	Range	Score
Language comprehension				
Single-word level				
Spoken word comprehension[a]	30	29.15 SD=1.35	25 – 30	17
Written word comprehension[a]	30	29.63 SD=0.79	27 – 30	14
Auditory sentence comprehension				
Spoken sentence comprehension[a]	32	30.17 SD=1.85	26 – 32	4
Expressive language				
Repetition				
Word repetition[a]	32	31.73 SD=0.67	30 – 32	18
Nonword repetition[a]	10	9.23 SD=1.48	4 – 10	2
Spoken language production				
Naming objects[a]	48	46.37 SD=1.6	42 – 48	14
Reading aloud				
Reading words[a]	48	47.42 SD=1.06	44 – 48	1
Connected speech				
Fluency rating[b]	10			2

Key to Table 5.2.

a = Comprehensive Aphasia Test (Swinburn et al., 2004); b = Western Aphasia Battery (Kertesz, 1982); SD = standard deviation.

5.2.1.3.1. Language comprehension

Single-word level

KP was also severely impaired on both comprehension tests, although his score was somewhat higher in the spoken than the written modality. On the spoken word comprehension test, he made four incorrect responses and five delays. All four incorrect responses were semantic errors, indicating that KP has an impairment at the semantic level. His difficulties on written word comprehension were revealed through six incorrect responses, three delays and a self-correction. Of the six incorrect responses, two were no responses, while the remaining four were all semantic errors. The self-correction was from a phonemic error.

Sentence level

KP's spoken sentence comprehension was also severely impaired. His difficulties on this test manifested as 12 incorrect responses, two delays and two self-corrections, and involved all sentences tested.

5.2.1.3.2. Expressive language

Repetition

Results also indicated considerable deficits for both types of repetition, with KP making seven errors on word repetition and four on non-word repetition. His incorrect responses on word repetition involved all types of word tested and were all phonemic errors comprising phoneme deletion or substitution. On nonword repetition, three of the four incorrect responses consisted of production of real words and the other involved substitution of a single phoneme.

Spoken language production: naming objects

KP's performance on picture naming revealed severe word-finding difficulties with all types of word tested. These difficulties resulted in 13 incorrect responses, five self-corrections and one delay. The seven incorrect responses included five phonemic errors, four semantic errors, three no responses and one phonemic error that was then 'self-corrected' to a semantic error. In addition, the five self-corrections were made after two phonemic errors, two semantic association errors and one semantic error.

Reading aloud

KP's score on reading words aloud was the lowest of his test results and showed severe impairment of this ability. He gave just one correct answer, but this was delayed, and otherwise produced 23 incorrect responses. These included three semantic errors, four semantic association errors, two phonemic errors, one instance where he produced both a semantic and a phonemic error, two involving phonemic paraphasias of semantic errors and finally two with no obvious relation to the target.

5.2.1.4. Summary and aphasia classification

KP's language assessments revealed that he is severely impaired on language comprehension and production, including repetition. In addition, his connected speech is dysfluent, being dominated by hesitation phenomena and mainly limited to single words that are often produced as paraphasias. His language profile can be matched to that of global aphasia.

5.2.2. TH

5.2.2.1. Background

TH is a 51-year old right-handed, monolingual speaker of British English, who had sustained two CVAs, approximately 17 and 1.75 years, respectively, prior to her involvement in the current study. TH was educated to degree level and her main employment was as a business professional. She is now retired. TH had language difficulties after her first stroke. These worsened after the second stroke but then improved slightly. She also had seizures after the first stroke but has not had any since. Apart from this, TH had weakness in her right side after the first stroke which then worsened after the second. Her mobility is considerably impaired, although she can walk short distances with the use of a walking stick. At the time of her participation in the study, she was living alone at home and maintaining a relatively active social life, including attending local aphasia support groups. After both strokes, TH received speech and language therapy in hospital and following her return (lasting for approximately six months in the case of her second stroke). She was not receiving any at the time of her participation in the study.

5.2.2.2. Spontaneous speech/ fluency rating

TH presents with speech that is halting, being frequently interspersed with hesitation phenomena (e.g. five pauses and four hesitation tokens, line 7), and her language is mainly limited to single words and short fragments. She shows signs of word retrieval difficulties, for instance, making semantic or phonological errors (e.g. *princess* for *prince*, line 1) and false starts (e.g. *[ᵊsɤnd]*, line 2), and using self-cuing to aid retrieval of certain words (e.g. serial counting to retrieve *twelve*, lines 3-4). Although there are islands of well-formed syntax (e.g. *well anyway so that's it*, line 8), TH's speech is frequently ungrammatical, often lacking verbs (e.g. for the subject *Cinderella*, line 4), function words (e.g. the determiner for *slipper*, line 7) and inflection (e.g. *go*, line 4). TH's speech profile is most consistent with a WAB fluency rating of 4: “Halting, telegraphic speech. Mostly single words, mostly paraphasic with occasional verbs or prepositional phrases. Automatic sentences only, e.g. “Oh I don’t know.” ” (Kertesz, 1982, p.3).

Pa: erm (.) and so (3.0) erm princess er no prince (1.4) prince (.) erm (.)
coming (.) and erm [^{ə}sɤnd] ^{ə}Cinderella (.) er [ə] but then erm (2.9)
err (1.5) (one two three four five six seven eight nine ten eleven)
twelve o’clock (.) erm (.) [^{ʔ}] go because er Cinderella (.) erm (3.3)
[kʊ] erm (.) not very (.) not very good ((laugh/sigh))
R: m-m
Pa: er but erm (3.5) [s] [p]slipper (.) erm (.) erm (1.1) falls (2.9) ((sigh))
(1.3) er^{m} (1.3) prince erm (3.9) ((sigh)) (2.6) well anyway so that’s it…

5.2.2.3. Language assessments

TH’s language assessment scores are provided in Table 5.3, followed by more detailed descriptions of her performance on each task below.

Table 5.3. Language assessment results for TH

Task	Max. score	Healthy Mean	Healthy Range	TH Score
Language comprehension				
Single-word level				
Spoken word comprehension[a]	30	29.15 SD=1.35	25 – 30	29
Written word comprehension[a]	30	29.63 SD=0.79	27 – 30	25
Auditory sentence comprehension				
Spoken sentence comprehension[a]	32	30.17 SD=1.85	26 – 32	16
Expressive language				
Repetition				
Word repetition[a]	32	31.73 SD=0.67	30 – 32	28
Nonword repetition[a]	10	9.23 SD=1.48	4 – 10	4
Spoken language production				
Naming objects[a]	48	46.37 SD=1.6	42 – 48	39
Reading aloud				
Reading words[a]	48	47.42 SD=1.06	44 – 48	42
Connected speech				
Fluency rating[b]	10			4

Key to Table 5.3.

a = Comprehensive Aphasia Test (Swinburn et al., 2004); b = Western Aphasia Battery (Kertesz, 1982); SD = standard deviation.

5.2.2.3.1. Language comprehension

Single-word level

TH scored towards the upper end of the healthy range on spoken word comprehension. Her only difficulty on this test manifested as a single request for repetition. However, she showed impairment on written word comprehension, giving one incorrect response and making three delays. The incorrect response was a semantic error, hinting at some impairment at the semantic level.

Sentence level

TH's results also revealed a relatively severe impairment on spoken sentence comprehension. Her difficulties here manifested as five incorrect responses, one self-correction and three requests for repetition. Two of the incorrect responses were no responses. However, the other three, and all the four other points of difficulty involved reversible, two-predicate sentences, suggesting that this sentence type may be more challenging for TH.

5.2.2.3.2. Expressive language

Repetition

TH also showed deficits in word repetition, making two phonemic errors on this test. However, her score for nonword repetition was within the healthy range, albeit at the lower limit. On this test, she made three phonemic errors.

Spoken language production: naming objects

TH was impaired, too, on picture naming, making two incorrect responses, one delay and four self-corrections. Of the incorrect responses, one consisted of phonemic errors followed by a semantic error, while the other was an abandoned attempt after a visual-semantic error. The four self-corrections were from phonemic errors. In addition, of all TH's seven points of difficulty on this test, six involved words of low imageability, indicating that she may find retrieval of this word type more challenging.

Reading aloud words

TH also showed deficits in reading words aloud, making three phonemic errors on this test. All three errors involved words of low frequency and imageability, suggesting potentially greater difficulty with this word type.

5.2.2.4. Summary and aphasia classification

TH has impairments in expressive language, including repetition, as well as in comprehension, although her spoken word comprehension is relatively preserved. Her spontaneous speech is halting and largely agrammatic, often lacking verbs, function words and inflections. Her language profile can be regarded as consistent with that of Broca's agrammatic aphasia.

5.2.3. ST

5.2.3.1. Background

ST is a 65-year old right-handed, monolingual British English speaker, who was admitted to hospital for operation after suspected transient ischaemic attacks [TIAs] (‘mini-strokes’) approximately two and a half years prior to his involvement in the study. ST then sustained a CVA during the operation and has also had two TIAs in the time since his stroke. ST left education part-way through sixth form, aged approximately 16-17, and worked as a salesman throughout his career before retiring. As well as his communication impairment, ST has some weakness in his leg but can walk unaided and also drives. At the time of participating in the study, he was living at home with his partner, and maintaining a relatively active social life, visiting friends and regularly attending an aphasia support group. ST received regular speech and language therapy for approximately 18 months after returning home from hospital, but was not receiving any at the time of participating in the study.

5.2.3.2. Spontaneous speech/ fluency rating

Impairments are noticeable in ST’s spontaneous speech, as the extract from his Cinderella narrative below illustrates. His speech is halted by frequent pauses, audible hesitation tokens (AHTs) and false starts (e.g. [ðᵊᵇ] [ðᵊ] the, line 5), all of which may indicate word-finding difficulties. He also makes semantic paraphasias (e.g. *funeral* for *ball*, line 11) and phonological errors (e.g. *[vɛɹi gəʊʷʲdmʊðə]* for *fairy godmother*, lines 13-14). In addition, while stretches of his language are grammatical, sometimes involving comparatively long and complex utterances (e.g. *she got presented to the king and all [ðᵘɛst] [the rest] of it*, lines 15-16), others are less well-formed (*it was went [tᶞbaːti] [to the party]*, line 15) and there are occasionally strings that are semantically implausible (*the shoe that fits the youngest of the pair will be queen*, line 6-7). ST’s speech is consistent with a WAB fluency rating of 6: “More complete propositional sentences. Normal syntactic pattern may be present. Paraphasias may be present” (Kertesz, 1982, p.3).

1. ST: …[iz] [iz] erm (2.8) [ʌʰ] (.) [ə] [ə] [ʌʰ] (1.1) ((tut)) (.) erm a message
2. (.) to the [k] (1.4) [ə] run of the mill (.) [g] [gæːˀ] (1.0) erm ([ˈᵍ]) (1.2)
3. ([ᵍ]) (7.0) erm (9.7 ((including deep breath out))) the girls (.)that [i-
4. wˈɵl] (1.8) erm (2.5) [ðɪᵍðᵊðɪsk] [ðɪsk] (.) [ðɪskʌˀ] (1.2) the (5.7) ((tut?))
5. (.) the shoe that (1.2) fits the [ðᵊᵇ] [ðᵊ] the (1.1) erm (3.5) the[s]
6. (1.0) the the the shoe that [ʌʰf] (.) fits the (.) [aə] (.) [ᵊʰ] (3.1)
7. youngest of the[ᵇ] (1.4) pair (.) will be queen […]
8. they all (1.4) erm (.) [tə] two[l] (1.3) [ˈə] [ə]glamourous erm
9. (4.2 ((including tut))) erm (3.7) ladies and Cinderella (.) erm [ᵆ]er er
10. are all (1.5) [kɒnˀ] (1.0) erm (7.5) [ð] (.) [ð] [ð] they study it (.) and
11. erm (3.3) [ᶞ] [ᶞ] they go [aːtəᶞᵊ] (.) the funeral erm the the party (.)
12. and leave (.) [s]Cinderella behind (.) and (1.9) cinderella (1.7) [gɪʔs]
13. gets (.) [ðᵊ] the (4.2) the (.) [ᵍ] the (3.0) the [vɛɹ] the [vɛɹi
14. gəʊʷldmʊðə] […]
15. it was (1.5) [ᵁʷ] went [tᶞbɑːti] (.) and erm (1.3) she (.) got (1.0) erm
16. (1.7) erm (2.4) presented to the king and all [ðᵁɛst] of it…

5.2.3.3. Language assessments

A summary of ST’s test results is provided in Table 5.4 and his performance on each test is reported in more depth below.

Table 5.4. Language assessment results for ST

Task	Max. score	Healthy Mean	Healthy Range	ST Score
Language comprehension				
Single-word level				
Spoken word comprehension[a]	30	29.15 SD=1.35	25 – 30	30
Written word comprehension[a]	30	29.63 SD=0.79	27 – 30	27
Auditory sentence comprehension				
Spoken sentence comprehension[a]	32	30.17 SD=1.85	26 – 32	27
Expressive language				
Repetition				
Word repetition[a]	32	31.73 SD=0.67	30 – 32	32
Nonword repetition[a]	10	9.23 SD=1.48	4 – 10	9
Spoken language production				
Naming objects[a]	48	46.37 SD=1.6	42 – 48	42
Reading aloud				
Reading words[a]	48	47.42 SD=1.06	44 – 48	47
Connected speech				
Fluency rating[b]	10			6

Key to Table 5.4.

a = Comprehensive Aphasia Test (Swinburn et al., 2004); b = Western Aphasia Battery (Kertesz, 1982); SD = standard deviation.

5.2.3.3.1. Language comprehension

Single-word level

ST's results for both tests of single word comprehension were within the healthy limits. He performed at ceiling on the spoken test, whilst his score for the written modality was at the lower limit of the healthy range. In this latter test, he made two delays and one self-correction from a semantic error.

Sentence level

ST's performance on spoken sentence comprehension was also within, but towards the lower end of, the healthy range. He made one incorrect response and three delays, all of which involved reversible, two-argument sentences, suggesting that he could have greater difficulty with this sentence type.

5.2.3.3.2. Expressive language

Repetition

ST also scored within the healthy limits on both repetition tests. He was at ceiling on word repetition and towards the upper limit of the healthy range on nonword repetition. His one difficulty on the latter test took the form of a self-correction from a false start.

Spoken language production: naming objects

On picture naming, too, ST performed within the healthy range, although his score was at the lower limit of this. He made one incorrect response, two delays and two self-corrections. The incorrect response involved addition of a single phoneme, but both self-corrections were from semantic errors. In addition, many of ST's difficulties were on low-frequency words (the incorrect response and both delays and self-corrections), inanimate words (both delays and self-corrections) and three-syllable words (the incorrect response, both delays and one of the self-corrections), suggesting possibly greater difficulty with these word types.

Reading aloud

ST's result for reading words aloud was towards the upper end of the healthy range. His single difficulty on this test manifested as a self-correction from a false start] phonemic error.

5.2.3.4. Summary and aphasia classification

ST language assessments showed relatively preserved comprehension, repetition and production abilities, although his scores for written word comprehension and naming were somewhat lower. His language difficulties are, however, apparent in his spontaneous speech, which is largely halting and non-fluent, with frequent false starts and paraphasias. This language profile could be most closely matched to that of transcortical motor aphasia.

5.2.4. HB

5.2.4.1. Background

HB is an 81-year old right-handed, speaker of British English, who had sustained a single CVA approximately four years prior to her participation in the current study. HB completed three years of university education followed by teacher training. She was then employed in teaching roles and religious work, working abroad for 12 years. During this time, she communicated on a daily basis in African languages, and still remembers these sometimes. She is now retired. Apart from her communication impairment, HB may have some cognitive difficulties with initiation, as reported by her daughter, but has relatively good physical mobility, being able to walk unaided. At the time of the study, she was living alone in her own home, and still maintaining social activity, having with regular interaction with family and also attending, for example, aphasia support groups. HB had received speech and language therapy for three months during her stay in hospital and for three months after returning home, but was not receiving any at the time of being involved in the study.

5.2.4.2. Spontaneous speech/ fluency rating

HB presents with fluent and sometimes voluble speech, that is largely grammatical. However, her language is often relatively semantically 'light', as she commonly makes use of semantically general words (e.g. *thing*, lines 5, 7 & 11). Neologisms are also a relatively common feature (e.g. *[dʒə dʒɜːn lə bɪgdʒæm]*, line 8; [*ϑəsəs*ː], line 12), as well as semantic paraphasias (e.g. *donkeys* for *horses*, line 9). In addition, HB produces some stretches of speech that are non-sensical (e.g. *what did I do with the have the [ϑəsəsː]*, lines 12; *everybody must try to find who this (.) had this child was[k] who came*, lines 13-14). This profile most closely fits with a WAB fluency rating of 7: "Phonemic jargon with semblance to English syntax and rhythm with varied phonemes and neologisms. May be voluble; must be fluent.” (Kertesz, 1982, p.3).

Pa: …and he sits there looking [ə-və]very sad (2.4) and that’s[w] when
the thing comes (.) [wə] the [mæ] the [mæg] the magic woman
she comes (.) in and she sits
R: mm
Pa: looking at him she says I’ll help you (1.6) and she turns [ðəs^{ɣ}] thing
looked like a tomato but I don’t know what it was (1.6) but anyway
it’s [də ɪːd] (.) does a big [^{ə}s]thing and it makes a lovely big (.) [^{t}ʃː^{ʔ}]
[dʒə dʒɜː^{n} lə bɪgdʒæm] (.) with [ɹ^{ə} ^{ə}ɹəʊpəz] on the [^{ən}] the [v] the
the donkeys no (.) the horses
R: mm
Pa: [ævəlɛm] with it(?) (1.3) and that takes her to the [θ]thing (3.6) no
(1.7) what did I do with the have the [θəsəsː] (.) the servant sends
out the[^{v}] [ð^{ə}s] the [faːm] [faː^{l}] goes round to say (that?) everybody
must try to find who this (.) had this child was[k] who came

5.2.4.3. Language assessments

The results of HB’s language assessments are shown in Table 5.5, before more detailed descriptions of her performance on each task.

Table 5.5. Language assessment results for HB

Task	Max. score	Healthy Mean	Healthy Range	HB Score
Language comprehension				
Single-word level				
Spoken word comprehension[a]	30	29.15 SD=1.35	25 – 30	25
Written word comprehension[a]	30	29.63 SD=0.79	27 – 30	30
Auditory sentence comprehension				
Spoken sentence comprehension[a]	32	30.17 SD=1.85	26 – 32	23
Expressive language				
Repetition				
Word repetition[a]	32	31.73 SD=0.67	30 – 32	21
Nonword repetition[a]	10	9.23 SD=1.48	4 – 10	2
Spoken language production				
Naming objects[a]	48	46.37 SD=1.6	42 – 48	25
Reading aloud				
Reading words[a]	48	47.42 SD=1.06	44 – 48	47
Connected speech				
Fluency rating[b]	10			7

Key to Table 5.5.

a = Comprehensive Aphasia Test (Swinburn et al., 2004); b = Western Aphasia Battery (Kertesz, 1982); SD = standard deviation.

5.2.4.3.1. Language comprehension

Single-word level

HB performed within the healthy limits on both tests of word comprehension, although her score was higher, being at ceiling, for the written modality. In contrast, her result for spoken word comprehension was at the lower limit of the healthy range. On this test, she gave two incorrect response and made one self-correction, all of which involved phonological errors.

Sentence level

HB's spoken sentence comprehension was impaired. She gave three incorrect responses on this test, as well as making two delays and one request for repetition. All these cases of difficulty involved reversible, two-argument sentences, indicating that HB finds this sentence type more challenging.

5.2.4.3.2. Expressive language

Repetition

HB's results also revealed an impairment on both word and nonword repetition. On word repetition, she gave five incorrect responses and one request for repetition, and these difficulties involved all words types tested. On nonword repetition, she made four errors, one of which involved production of a real word and the other three involved phoneme addition, deletion or substitution.

Spoken language production: naming objects

HB was severly impaired on picture naming, making eight incorrect responses and seven self-corrections on this test. Her responses in all points of difficulty were relatively voluble, each usually involving multiple error types. However, these were largely dominated by circumlocutions (featuring in nine responses) and neologisms (featuring in eight). Other than this, phonological errors featured in three responses, semantic errors in three, a semantic association error in one, a false start in one and an unrelated lexical error in one. Ten of HB's 15 points of difficulty involved three-syllable words, suggesting that words of this length may be more challenging for her.

Reading aloud

HB showed preserved ability to read words aloud, performing towards the upper end of the healthy range on this test. She made only one self-correction from a phonemically-related nonword.

5.2.4.4. Summary and aphasia classification

Overall, HB's results showed considerable impairment of language production, with severe deficits in both naming and repetition. She also revealed impaired comprehension of spoken sentences (as well as her score for spoken word comprehension being somewhat low). Her connected speech, in the narrative sample and in her test responses is fluent and usually grammatical, but is commonly non-sensical, featuring neologisms and circumlocutions. Her language profile can be matched to that of Wernicke's aphasia.

5.2.5. MH

5.2.5.1. Background

MH is a 68-year old, right-handed monolingual speaker of British English, who sustained a single CVA approximately five years prior to his involvement in the current study. MH left school aged 16 and was employed in a professional role throughout his working life. He is now retired. In addition to his communication difficulties, he has weakness in his right side, with no use of his right hand, and has limited mobility. At the time of participating in the study, he was living at home with his wife and maintaining a relatively active social life, for example, attending regular stroke group and social club meetings. MH had received speech and language therapy in hospital and intermittently within the subsequent two years, but was not receiving therapy at the time of study participation.

5.2.5.2. Spontaneous speech/ fluency rating

As can be seen in the extract of MH's Cinderella narrative below, his spoken language is fluent and grammatical overall, and relatively varied in terms of the lexis and structures produced. However, he nevertheless shows signs of word-finding difficulty. For instance, his speech is interspersed with pauses, AHTs, false starts (e.g. *gave*, line 10) and lexical substitution errors that he also sometimes comments on (e.g. *maids*, lines 6-7; *concert*, line 13). At other times, it seems that such retrieval difficulties lead him to abandon structures mid-utterance and restart or reformulate these utterances (e.g. after *gave*, line 10; after *but a*, line 13). There are also occasions when his language is somewhat less than idiomatic (e.g. *every [^{m}] woman of certain ages*, line 14), although these are relatively few. His speech can be most closely matched to a WAB fluency rating of 8: "Circumlocutory, fluent speech. Marked word finding difficulty. Verbal paraphasias. May have semantic jargon. The sentences are often complete but may be irrelevant" (Kertesz, 1982, p.3)[18].

1. MH … [wᶷᵈ ᶾᶲ]cinderella lived in a [hæv] big house (.) and[ˈ]
2. [ðʉjᶾæ]her job (.) was (1.0) the same day after day after day
3. (.) and it was [ᵛ]really about (3.4) cleaning the floors (.)
4. and[sk] and everything connected with (.) [ð] the floors (.)
5. and the house was (2.1) er and [ᵋ] [ᶞ] (.) [ᶞ] there were (.)
6. [ɛˈ] there were two or three (.) [mː] (3.1) I want to say
7. maids but I don't really think maids for that (.) and anyway
8. (.)[ð]they were busy cleaning the house (1.1) [ø] er and
9. (1.6) one (.) day (2.2) [ægsᵏ] (3.4) a servant on behalf of
10. the prince (.) came and (.) [v] he[ᵛ] [ᵍ] [ᵍ] gave[ᵊᶿ] (.) gave
11. (.) [əv] (1.1) and he[vʴᵊ] [sə] [ʊɐt] he said was (.) now listen
12. everybody (.)[ðˈ] there is the prince is going to [ʰˀʉˡᵗ] give a
13. (2.8) give a [kɑⁿˀ] [əgᵊ] [ⁿ] not a concert but a (1.3) and
14. every [ᵐ] woman of certain ages will be (1.4) has to go
15. along (.)

5.2.5.3. Language assessments

MH's test results are summarised in Table 5.6, with each task reported more fully below.

[18] NH's speech could in fact be placed between point 8 and 9 on the fluency rating scale. However, he was given a rating of 8 because he has very apparent word-finding difficulties causing considerable disruption to his speech.

Table 5.6. Language assessment results for MH

Task	Max. score	Healthy Mean	Healthy Range	MH Score
Language comprehension				
Single-word level				
Spoken word comprehension[a]	30	29.15 SD=1.35	25 – 30	29
Written word comprehension[a]	30	29.63 SD=0.79	27 – 30	28
Auditory sentence comprehension				
Spoken sentence comprehension[a]	32	30.17 SD=1.85	26 – 32	27
Expressive language				
Repetition				
Word repetition[a]	32	31.73 SD=0.67	30 – 32	32
Nonword repetition[a]	10	9.23 SD=1.48	4 – 10	10
Spoken language production				
Naming objects[a]	48	46.37 SD=1.6	42 – 48	48
Reading aloud				
Reading words[a]	48	47.42 SD=1.06	44 – 48	48
Connected speech				
Fluency rating[b]	10			8

Key to Table 5.6.

a = Comprehensive Aphasia Test (Swinburn et al., 2004); b = Western Aphasia Battery (Kertesz, 1982); SD = standard deviation.

5.2.5.3.1. Language comprehension

Single-word level

MH's scores on comprehension of both spoken and written words were within the healthy range, with his result performance being slightly higher for the spoken modality. He made just one delay on the spoken test and two delays on the written test.

Sentence level

MH's score on spoken sentence comprehension was also within healthy limits, although this was towards the lower end of the healthy range. All his answers on this test were correct but he gave five delayed responses, all of which were on reversible, two-predicate sentences, suggesting greater difficulty with this sentence type.

5.2.5.3.2. Expressive language

Repetition

MH's performance on both repetition tasks was at ceiling level.

Spoken language production: naming objects

MH's performance on picture naming was at ceiling.

Reading aloud

MH also performed at ceiling level on reading words aloud.

5.2.5.4. Summary and aphasia classification

MH's scores on all seven tests fell within the healthy range, with all four expressive language tests being at ceiling level. However, his spontaneous speech, while fluent and grammatical overall, shows clear signs of word-finding difficulty. This profile is consistent with that observed in anomic aphasia.

5.2.6. IB (PATSy database pilot case, Lum et al., 2012)

5.2.6.1. Introduction

As the PATSy database (Lum et al., 2012) states, IB is a speaker of British English who had sustained a single CVA (in her case, a subarachnoid haemorrhage resulting from a left middle cerebral artery aneurysm and infarct). She was assessed for the PATSy database in two time frames at which points she was aged 37-8 and 42, respectively. At these times, she was living at home with her husband.

5.2.6.2. Connected speech/ fluency

IB's difficulties in producing spontaneous speech can be seen in the extract of her Cinderella narrative below. Her speech is halting and the language is largely restricted to single words often connected by *and* (e.g. and *twelve* and *stairs*, lines 12-13). Multiword utterances are rare and usually ungrammatical, for instance lacking in function words (e.g. omitted determiner for *man*, lines 7 & 8) or containing inflection errors (*one shoes*, lines 13-4). This profile can be most closely matched to a WAB fluency rating of 4: "Halting, telegraphic speech. Mostly single words, mostly paraphasic with occasional verbs or prepositional phrases. Automatic sentences only, e.g. "Oh I don't know." " (Kertesz, 1982, p.3).

1. Pa: [baɪ] and erm *(1.4)* ball *(.)* [bɒ] ball ((short groan)) *(1.4)* ball
2. R: mhmm
3. Pa: and *(4.0)* up *(2.2)* erm stairs
4. R: mhmm
5. Pa: and *(2.5)* dancing [ɒᵊ] dancing no
6. R: mm (.) yeah
7. Pa: oh ((laughs)) yes *(1.9)* and (.) man *(1.7)* nice man *(1.7* but covered by

8.		[h]*)* and *(4.6)* erm *(1.0)* man *(1.3)* asking *(1.2)* [sɹə] (.) [wɛlæ]
9.	R:	mhmm
10.	Pa:	and *(1.9)* dancing [h]
11.	R:	mhmm
12.	Pa:	yeah *(1.5)* and *(1.6)* twelve *(.)* twelve *(1.2)* and *(7.5)* twelve *(3.6)* and
13.		stairs *(1.4)* and *(1.3)* [sk] [skuldᵊmɪl] *(.)* shoes *(1.4)* fall *(.)* and one *(.)*
14.		one *(2.5)* one *(.)* shoes *(.)* and *(3.5)* [baɪ] ((laugh))

5.2.6.3. Overview of language profile and aphasia classification

IB has multiple language deficits. As stated on the PATSy database, she is particularly impaired on comprehension of abstract words in spoken and written form, and also shows difficulties with auditory sentence processing. In addition, she has deficits in language production, with severe word-finding (naming) impairment. She also has some difficulty with reading aloud, especially with words that are abstract, such as function words. Her repetition is relatively preserved but longer words remain difficult for her in this respect. IB's spontaneous speech is non-fluent and agrammatic (see again the previous section). This language profile can be matched to that of Broca's agrammatic aphasia.

5.2.7. DB (PATSy database pilot case, Lum et al., 2012)

5.2.7.1. Introduction

DB is described on the PATSy database (Lum et al., 2012) as a 59-year old, right-handed British English speaker, who sustained a single CVA approximately two and a half years prior to completing the language assessments for the database. As a result of her stroke, she suffered severe speech loss and has a dense right hemiplegia. At the time of her assessments for the PATSy database, she was living at home with her husband.

5.2.7.2. Spontaneous speech/ fluency rating

DB shows severe deficits in producing spontaneous speech, as can be seen in the extract of her Cinderella narrative below. Her speech is halting, with the language mainly being limited to short utterances, often consisting of single words (e.g. *exciting*, line 2; *no* used to convey that Cinderella was not allowed to go to the ball, line 18). She does produce some multiword utterances but appears to make repeated use of a limited number of 'fixed' phrases (e.g. *I don't know*, lines 2 & 7). Her productions are also ungrammatical at times, for example, lacking function words and determiners and containing errors with verb form (e.g. *don't get ball* also used to relay that Cinderella was not allowed to go to the ball, line 20). Her speech is consistent with a WAB fluency rating of 4: "Halting, telegraphic speech. Mostly single words, mostly paraphasic with occasional verbs or prepositional phrases. Automatic sentences only, e.g. "Oh I don't know." " (Kertesz, 1982, p.3).

1. R: and . what did this mean to all of them

2. Pa: *(4.5)* I don't know exciting

3. R: mhmm

4. Pa: yeah

5. R: yes (.) and because they were excited what were they going
6. to do
7. Pa: *(2.5)* erm (.) ((tut)) *(3.7)* I don't know
8. R: mhmm . I'll give you some pictures to sort of *(1.0)* prompt you
9. a little *(4.0)* well [ðɜːə] that's them isn't it
10. Pa: yeah
11. R: being excited
12. Pa: yeah yeah
13. R: and what about this one
14. Pa: . this [kʊ] [ɛ] [kɹeɪn] [kɹeɪn] crying
15. R: who's who's crying
16. Pa: *(1.5)* [sɪləɛnᵈ] [sɪndᵊɹɛn]
17. R: why
18. Pa: *(1.3)* oh it's erm *(1.0)* no
19. R: *(3.6)* why's she crying
20. Pa: *(1.5)* don't ge(t) erm *(1.2)* don't get erm ball

5.2.7.3. Overview of language profile and aphasia classification

DB is described on the PATSy database as having good comprehension in general, with normal auditory processing, although her performance on syntactic comprehension was found to be remarkably low. Her performance is within healthy limits on tests of expressive language: repetition, naming and reading, but she has severe impairments in constructing connected speech (see again the previous section). Her speech is halting and often ungrammatical. This profile matches that associated with Broca's agrammatic aphasia.

5.3. Remaining participants (short profiles)

5.3.1. LC (recruited)

LC has obvious difficulties in producing spontaneous speech. His speech is nonfluent and, while he does produce stretches of grammatical language, these are often relatively simple and repetitive. He was given a fluency rating of 5: "Often telegraphic but more fluent speech with some grammatical organisation. Paraphasias may be prominent. Few propositional sentences" (Kertesz, 1982, p.3). LC's language assessments showed that he had relatively preserved comprehension of spoken words but impairment on comprehension of spoken sentences and written words. He revealed deficits in both spoken production tasks (naming and reading aloud) but performed within the healthy range on repetition of words and nonwords (see Appendix V for LC's full test results). Overall, LC's language profile can be most closely matched to transcortical motor aphasia.

5.3.2. RD (recruited)

RD's spontaneous speech is relatively fluent and grammatical overall, although this is interrupted[19] due to word-finding difficulties. His speech was rated at 9 on the WAB fluency rating scale: "Mostly complete, relevant sentences; occasional hesitation and/or paraphasias. Some word-finding difficulty. May have some articulatory errors" (Kertesz, 1982, p.3). He performed within the healthy limits on all of the language assessments (language comprehension and expressive language), although his scores for spoken word comprehension and naming were towards the lower end of the healthy range. He was at ceiling for written word comprehension, repetition of words and nonwords and reading words aloud (see

[19] Throughout the thesis, unless stated otherwise, the terms 'interrupted' and 'interruption' are used to refer to participants' own interruptions to their speech (e.g. due to word-finding difficulties), as opposed to interruptions from another speaker.

Appendix V for RD's full test results). RD's language profile is consistent with that of anomic aphasia.

5.3.3. BK (PATSy database, Lum et al., 2012)

BK's speech is nonfluent and halting and while his language is mainly grammatical, this is often limited to short utterances that are interspersed with phonemic errors and indications of word-finding difficulties (pauses and false starts). His speech is given a WAB fluency rating of 4 on the PATSy database: "Halting, telegraphic speech. Mostly single words, mostly paraphasic with occasional verbs or prepositional phrases. Automatic sentences only, e.g. "Oh I don't know." " (Kertesz, 1982, p.3). As the database reports, BK has considerable impairments in naming as well as reading words. However, his performance is at ceiling for spoken and written word comprehension and on syntactic processing. He is classified on the database as having transcortical motor aphasia.

5.3.4. JS (PATSy database, Lum et al., 2012)

JS's speech is largely fluent and grammatical. However, it often lacks meaning, containing neologisms and stretches of non-sensical language. No fluency rating is given for JS on the PATSy database, but his speech can be rated at 7 on this scale: "Phonemic jargon with semblance to English syntax and rhythm with varied phonemes and neologisms. May be voluble; must be fluent." (Kertesz, 1982). As reported on the PATSy database, JS shows impairments on both spoken and written word comprehension, although his performance on the latter is variable. He also has deficits in syntactic processing. In addition, he is severely impaired on naming and on repetition of words and nonwords. No classification of his aphasia is given on the PATSy database[20].

5.3.5. JW (PATSy database, Lum et al., 2012)

JW's spontaneous speech is fluent and grammatical, but she often shows signs of word-finding difficulty and also makes occasional phonemic errors. Her speech is given a WAB fluency rating of 9 on the PATSy database: "Mostly complete, relevant sentences; occasional hesitation and/or paraphasias. Some word-finding difficulty. May have some articulatory errors" (Kertesz, 1982, p.3). As reported on the PATSy database, she performs within healthy limits or at ceiling on tests of lexical and syntactic processing. However, she shows greater difficulties with reading words aloud and considerable impairment of repetition of words and nonwords. She is classified on the database as having conduction aphasia.

[20] The researcher and a qualified speech and language therapist also assessed JS's language profile, and both were in agreement that JS did not adequately match one aphasia classification. It was therefore decided not to assign an aphasia type to this participant.

6. Development of methods I: Transcription

6.1. Introduction

Studies of connected speech in aphasia use data from a range of speech samples, both monologic, such as storytelling narratives (e.g. Catani et al., 2013; Thompson et al., 2012; Ulatowska et al., 2013), picture description (e.g. Andreetta, Cantagallo, & Marini, 2012; Kavé & Nussbaum, 2012) and video description (e.g. Koukoulioti & Stavrakaki, 2014); and multi-speaker, for instance conversation (e.g. Beeke, Wilkinson, & Maxim, 2007; Savage, Donovan, & Hoffman, 2014). These samples are commonly analysed in transcribed form, meaning that transcription accuracy is paramount to the validity of the analysis (see also Crystal, 1988; Ochs, 1979). This should be a particular consideration with data from speakers with impaired language, which by its very nature can be more difficult to understand, increasing the risk of transcription error (cf. Saffron, Berndt & Schwartz, 1989). Furthermore, the need to minimise such errors is especially important since this area of research can have direct implications for clinical practice (Ferguson and Armstrong, 2009). However, transcription procedures have generally not been a focus of aphasia research, and while most studies complete reliability testing of coding procedures, this is often not the case for transcription methods[21]. Therefore, a reliable transcription protocol was developed for use with the data in this thesis. This chapter details the development and testing of this procedure.

Before describing the development of the transcription protocol, it is worth briefly defining 'reliability' in this context. Reliability in research "…refers to the consistency of results obtained from a particular analysis" (Ferguson & Armstrong, 2009, p.19). Two main types include 'intra-rater reliability', concerning the consistency of one person's ratings of the same data on two occasions, and 'inter-rater reliability', relating to the consistency of more than one rater's judgements on

[21] This is also true of research in other language areas (e.g. child language, although see the comprehensive testing of transcription procedures by Rispoli, Hadley, & Holt, 2009).

the same data sample (Ferguson & Armstrong, 2009; Gwet, 2012).[22] Consistency between ratings can be gauged by, for example, percentage agreement or using a statistical measure such as Cohen's (1960) Kappa, and minimum consistency levels are recommended for the procedure to be deemed reliable. For percentage agreement, a generally accepted level in studies of communication disorders is 80% (Ferguson & Armstrong, 2009), whereas for Cohen's (1960) Kappa, 0.6 or 0.7 is accepted in research generally (Wood, 2007, p.6).

In any area of language research, the aims of a transcription will depend on the aims of the subsequent analysis to be performed on it (cf. Menn, 2010; Ochs, 1979). Menn (2010) gives a comprehensive discussion of issues involved in the transcription of aphasic speech, stating that most transcriptions in this area are, in essence, 'word-level orthographic transcriptions', that is, "…renditions of the words that the transcriber has heard, using the standard writing system for whatever language is being spoken" (p.28). However, this is not often made explicit: many studies simply state that transcription has taken place, without outlining the protocol used (e.g. Catani et al., 2013; Faroqi-Shah & Virion, 2010; Kavé & Nussbaum, 2012; Stark, 2010; Ulatowska et al., 2013). Those that do provide information mostly keep this relatively brief, stating for example that "traditional orthographic transcription" was used (McCarney & Johnson, 2010, p.1020) or that the sample was transcribed "alphabetically" (Koukoulioti & Stavrakaki, 2014, p.1328) or "verbatim" (e.g. Marini, Andreetta, del Tin, & Carlomagno, 2011, p. 1379).

Perhaps the most comprehensive protocol is provided in Saffran et al.'s (1989) influential Quantitative Production Analysis (QPA), which specifies the notation used for various aspects of the transcription, including well-formed spoken output,

[22] A third main type, 'test-retest reliability', should also be acknowledged, which in communication disorder research, concerns the consistency of the elicitation method used with the same participant on two occasions (Ferguson & Armstrong, 2009, p.49). However, for the current project, data was not available from samples repeated at two points in time, and in any case, the language produced by PWA in a narrative is unlikely to be the same on two occasions. Therefore, the current tests focused on intra- and inter-rater reliability.

paraphasias and neologisms, intonation and pauses of one second or above. Several of these guidelines have also informed the protocol developed in the current study. However, the QPA aimed to analyse the number of items belonging to certain syntactic/ morphosyntactic categories and thus its aims differed considerably from those of the current project, which examines the nature of speakers' exact productions. In accordance with its aims, the QPA's transcription protocol does not focus on speech characteristics and thus does not include guidance on certain aspects of language production that would be relevant to the current project. For example, there is no guidance for transcribing quiet, overlapping or unintelligible speech, or any means of noting non-speech (e.g. coughing, laughing, sighing, etc.), which could influence how an utterance or pause is interpreted. Laughter, for instance, could aid the interpretation of an item as humorous, or if occurring throughout a pause, could show that the pause did not occur due to language difficulty. Therefore, the QPA transcription protocol was not fully sufficient for the aims of the current thesis, and a new protocol more suited to these aims was developed.

It was also important that any spoken contributions by the researcher or PATSy database interviewers were included in the transcriptions, to enable consideration of the potential effects of this input on the participants' language. The protocol was therefore developed using narratives that included speech by participants and PATSy database interviewers, that is accommodating the language of PWA in exchanges with healthy speakers.

6.2. Aims

The aims of this methodological development study were as follows:

1. To develop a protocol for transcription of spoken language by PWA, including in exchanges with healthy speakers;
2. To transcribe samples from a range of PWA using the protocol;

3. To test the intra- and inter-rater reliability of the procedure;
4. To revise the protocol and re-examine reliability in the same samples as necessary after initial testing;
5. To finalise the protocol for use in the current project and other projects involving spoken language samples from PWA.

6.3. Method

6.3.1. Participants

The speech samples used in developing and testing the transcription protocol were the Cinderella narratives produced by the five PATSY database participants: BK, DB, IB, JS and JW (see chapters 4 and 5 for participant details). All fives narratives were available in audio recorded format only. As mentioned, these narratives also contained spoken input from the PATSy database interviewers and therefore the samples included healthy as well as aphasic speech.

6.3.2. Development and application of protocol

The developed protocol is provided in full in Appendix VI. The rationale for each stage of the development process is now described, before details of the protocol reliability testing are given.

6.3.2.1. Overview of approach

While transcribers aim "…to transmit as much information as possible, with as little bias as possible", transcriptions would be overwhelming if they contained every detail about the speakers' language and interaction (Menn, 2010, p.24). There is therefore a need for selectivity regarding what should be included, based on the specific interests and goals of the study (Menn, 2010; Ochs, 1979). One issue with this, however, was that due to the exploratory nature of the current thesis, the exact analyses were not established at the time of developing the transcription protocol. Therefore, the general interests of this thesis were used as a focus for setting the transcription aims: to examine the exact constructions produced or attempted, as well as other indicators of language difficulty, such as pauses and hesitation phenomena. With this in mind, verbal (as opposed to nonverbal) content and pauses were identified as priorities for the transcription.

After identifying these priority areas, each narrative was transcribed impressionistically in its entirety. Creating an impressionistic transcription can be a helpful initial step in establishing more specifically which features would be useful to include (Menn, 2010). This type of transcription involves the transcriber "writing down 'everything'" and

> …uses standard spelling supplemented with some kind of phonetic information when necessary, including information about hesitations, mispronunciations, and false starts, plus notes about gesture and gaze,…and might also include notes about unclear words or word endings, and alternative interpretations of unclear words and morphemes (Menn, 2010, p.27).

The exception to this in the current procedure, however, was that nonverbal information was not included, since only audio recordings were being transcribed.

Through creating these initial transcriptions, it was decided to keep all the features included in the above definition of impressionistic transcriptions (excluding gesture and gaze). However, the transcription of spoken productions evolved more specifically into what Menn (2010, p.29) terms 'word-level transcription style with phonetic annotation', in which "...most words are transcribed orthographically, but words whose pronunciation is at issue, unidentifiable strings of sounds, and ambiguous morphemes are presented in IPA" (p.29). In addition, as the influence of researcher speech on participant productions was also of potential interest to the analyses, elements of conversation-analytic transcription, with its focus on multi-speaker interaction (see again Menn, 2010), were incorporated to accommodate features such as overlapping speech.

6.3.2.2. Specific details of procedure

6.3.2.2.1. Layout

In terms of the physical layout of the data on the page, a 'classic vertical "script" format' (of one column) was adopted, in which the utterances were listed in chronological order of production from the top to the bottom of the page (see Ochs, 1979, p.48). This format has some disadvantages compared to, for example, using separate, side-by-side columns for each speaker (e.g. it is more difficult to analyse the relationship between one speaker's turns). However, it has the benefit of not giving prominence to one speaker over another, which can occur if separate columns are used. As Ochs (1979, p.50) explains, placing a speaker in the left column can give the impression (in English language transcripts) that this person is the dominant participant in the interaction. Placing the speaker turns in the same column arguably reduces any such biased representation of the dynamics between speakers (the PWA and the interviewer).

6.3.2.2.2. Turns

As the narratives contained speech by PWA and the PATSy database interviewers, a procedure for including and distinguishing the contributions of different speakers was needed. For this purpose, speakers' productions were organised by means of the standard conversational unit used in multi-speaker transcripts: the turn. A turn can typically be defined as "… a conversational contribution by one speaker followed either by silence or by a contribution from another" (Lesser & Perkins, 1999, pp.94-95; but see also section 7.3.1.1.). However, since aphasic speech commonly contains often lengthy pauses in the middle of utterances, only the contribution of another speaker, and not silence, was used to determine the ends of turns. To clearly distinguish different turns, each new turn was placed on a new line, with the speaker responsible noted in the margin, as is standard practice in many transcription procedures (cf. Ochs, 1979; Saffran et al., 1989).

6.3.2.2.3. Verbal productions

As the transcription aimed to record all constructions attempted by the speakers and capture points of difficulty with these items, all spoken productions were noted in the transcription, including words, paraphasias, neologisms, false starts (single phonemes and partial words), unintelligible speech and what Wells and Whiteside (2008, p.552) term 'audible hesitation tokens' (e.g. *er*, *erm*). The data was not 'cleaned up' in any way from how it was heard by the transcriber (e.g. by restoring 'missing' morphemes that would make the utterance resemble the well-formed productions of healthy speakers, see Menn, 2010).

As conventional in aphasia research, well-formed words were transcribed using standard English orthography (cf. Saffran et al., 1989; see again Menn, 2010). However, to represent forms as closely as possible, a 'modified orthography' was also employed, which "…captures roughly the way in which a lexical item is pronounced versus the way in which it is written", used to include such items as *gonna* (Ochs, 1979, p.61).

Also, again to convey the exact productions as closely as possible without bias, phonetic transcription (IPA) was used for the following:

1) individual phonemes occurring in isolation or as false starts to another production;
2) phonemic paraphasias and neologisms (cf. Saffran et al., 1989);
3) ambiguous productions which could be interpreted as one of several homophonous items (see also Crystal, 1988; Menn, 2010).

Superscript IPA symbols were used to signify any such productions (in 1-3) that had been produced with reduced volume.

6.3.2.2.4. Speech characteristics

Apart from signifying phonemes with reduced volume using superscript symbols, (see previous paragraph), it was also decided to note certain other characteristics of the speech, including firstly, when speech was produced 'under the breath', as this could constitute sub-vocalic rehearsal productions and indicate difficulties with producing an item. Secondly, it was noted when the speech of more than one speaker overlapped, as this could potentially aid analysis of how the interviewer's productions may influence those of the PWA. In CA transcription, overlapping speech is commonly indicated by placing square brackets around the overlapping section as well as underlining these (e.g. Jefferson, 2004). However, some overlaps begin mid-word and the brackets would then interrupt the word or phonetically transcribed item. As some of these items would already be potentially difficult to read due to the impaired nature of the speech, it was decided that using brackets within these items could reduce the readability of the transcriptions further. It was therefore decided to mark overlapping speech only by underlining the overlapping section.[23]

6.3.2.2.5. Punctuation

Crystal (1988) emphasises the need for consistency in the use of punctuation in transcriptions and clarity regarding what each symbol represents. Therefore, the protocol included guidelines relating to this feature. Since the transcription aimed to not make any judgements about the structures within speakers' productions, it was decided to exclude any punctuation that could impose such structure, such as

[23] Underlining is commonly used in CA transcription to denote some form of stress in speech (e.g. Jefferson, 2004). However, as the current transcription did not include phonological features, this formatting could instead be adopted for overlapping speech.

sentence-initial capitalisation, commas or full stops (cf. Saffran et al., 1989; although see 6.3.2.2.6. for use of full stop symbol in representing micropauses). However, within-word punctuation, such as the apostrophe in *can't* or the hyphen in *good-looking*, was included, since this forms part of the words and should not bias interpretation of utterance structures.

6.3.2.2.6. Pauses

It was decided that the transcription should include pauses in speech, since these can indicate speakers' points of difficulty with production or awareness of missing linguistic elements, as well as potentially aiding identification of 'conversational units' such as turns (Menn, 2010). As mentioned, Saffran et al. (1989) only included pauses of one second or above in the QPA transcription procedure. However, shorter pauses could also be meaningful to the later analysis. Ochs (1979) describes any pause above 0.3 seconds as potentially 'significant'. However, this was stated with healthy child language in mind and Ochs acknowledges that what counts as significant could depend on the individual situation. In the current study, lengthier pauses were expected due to participants' language impairments. Therefore, it was decided to include any pause above 0.5 seconds (noting those between 0.5 - 1.00 seconds as 'micropauses' and anything longer as a pause; see Appendix VI). It was decided that pauses would be measured instrumentally to one tenth of a second, as is common practice in the Jeffersonian system of transcription notation used in conversation analysis (e.g. Jefferson, 2004), with the aim of increasing accuracy and consistency of measurement. Pauses that preceded more speech by the same speaker were listed within that person's speech, whereas those preceding speech by another speaker (and therefore occurring between turns) were placed on a new line between the two turns (cf. the notation of 'gaps' versus 'pauses' in conversation analysis transcription, Sacks, Schegloff, & Jefferson, 1974).

6.3.2.2.7. Non-speech

As mentioned, non-verbal information was not a primary focus of the transcription. However, as explained, noting non-speech could help in interpreting an utterance or in determining whether a pause was due to participant language difficulties or simply because, for example, the speaker was coughing or laughing. Therefore, these details were recorded in the transcription.

6.3.2.2.8. Transcriber comments

Any other noteworthy details about the data, such as when a form was ambiguous or difficult to determine, were included as footnotes inserted next to the relevant item (cf. Saffran et al., 1989; see also Menn, 2010).

6.3.3. Reliability testing:

The transcription procedure was tested for intra- and inter-rater reliability. The testing targeted three main areas of the transcription separately: speaker turns, verbal content and pauses (including both pause position and length). Turns were chosen as a focus because accurate notation of which speaker was responsible for each production was essential. Verbal content and pauses were targeted because these were priority areas for the transcription (see again 6.3.2.1).

To measure intra-rater reliability, 10% of each narrative (measured by duration and selected pseudo-randomly) was transcribed by the researcher for a second time using the protocol. For inter-rater reliability, a second person, experienced in transcription of spoken language by PWA, transcribed 10% of each narrative, again chosen pseudo-randomly, following the protocol. In both tests, the sections re-transcribed were taken from different points into the recording for each participant (see Table 1) to counterbalance any effects of the time point into the narrative task on participants' speech and thus on ease of transcription. In addition, the sections tested for intra-rater reliability were different to those used in the inter-rater tests.

In each test, the two transcriptions were then examined for agreement on the three identified aspects of transcription separately (See Appendix VII for full comparison procedure).

Table 6.1: Sections of recordings re-transcribed in reliability testing

Participant	10% section of recording tested	
	Intra-rater	Inter-rater
BK	10th	1st
DB	6th	3rd
IB	4th	6th
JS	3rd	8th
JW	1st	10th

The tested sections included a percentage of each person's narrative (rather than testing entire narratives from a smaller number of people) in order to gain a more representative sample of spoken language from PWA. However, this meant that the number of tokens compared for some aspects was rather low in some participant cases, and even a small number of disagreements could result in low agreement in these individual cases. Therefore, protocol reliability was measured by the total agreement of ratings across all five participants. Agreement on turns was measured using Cohen's (1960) Kappa, for which a value of 0.7 was taken as a minimum for reliability (see again Wood, 2007). Agreement on the other aspects was measured as a proportion of instances compared, adopting the minimum 80% agreement level recommended by Ferguson and Armstrong (2009) (see Appendix VII for rationale for using Cohen's Kappa versus proportional agreement).

6.4. Results

6.4.1. Overview

The protocol was found to be reliable on all three transcription aspects, both within and between raters (see Table 6.2). Intra-rater agreement was higher than inter-rater agreement in all cases, but all results were above the minimum levels specified for reliability.

Table 6.2. Reliability results for each transcription aspect

	Agreement (n for each analysis in parentheses)			
	Turns (Cohen's Kappa)	Verbal content (prop.)	Pauses	
			position (prop.)	length (prop.)
Intra-rater	0.905*** (80)	0.98 (317)	0.92 (52)	0.92 (48)
Inter-rater	0.839*** (81)	0.85 (340)	0.87 (70)	0.84 (61)

Key to Table 6.2: Prop.=proportional agreement; significance levels for Cohen's Kappa are *** $p \leq 0.001$; ** $p \leq 0.01$; * $p \leq 0.05$.

6.4.2. Points of disagreement on each aspect

6.4.2.1. Turns

Of the disagreements on turns, none were regarding which speaker was responsible for a given production. Rather, they mainly related to the position of turn boundaries. These disagreements tended to occur at points of overlap between the interviewer's and participant's speech, where it was thus more difficult to determine precisely where each speaker's turn began and ended. To maintain rigorous reliability testing, such instances were classed as disagreements. However, in some such cases, the disagreement was in fact only slight, as can be seen in the following example (from the intra-rater testing of DB's narative):

1st transcription:

Pa: *(1.4)* erm *(6.7)* ((makes noise as if about to speak))

R: what happens at twelve o'clock

2nd transcription:

Pa: erm

(6.7)

R: what happens at twelve o'clock

Pa: ((makes noise as if about to speak))

Disagreement here only relates to the point of occurrence of DB's item *((makes noise as if about to speak))*, that is, whether this occurs simultaneously to or just after the start of the researcher's production *what*. This resulted in DB's productions being classed as one turn in the first transcription but split into two turns in the second transcription. However, this difference was not deemed problematic for the subsequent analysis in the current study, since the extraction of strings for analysis was not based on turn boundaries (see chapter 7) and such a slight difference in timing of turns should not affect any analysis of the influence of one speaker's productions on those of another. More important is the accurate identification of the speaker responsible for each turn (on which there was total agreement).

The other disagreements mainly related to an extra item that was seen as constituting a turn being included by one transcriber but not the other. However, some of these extra items were marked as being barely audible or had again occurred in a section of frequently overlapping speech in which it was potentially more difficult to hear all productions.

6.4.2.2. Verbal content

Agreement on verbal content was also high within and between raters, but especially in the former case. Disagreements were mainly cases where an extra item had been included in one transcription. These items mostly comprised either unintelligible speech or short productions such as isolated single phonemes or the audible hesitation token *er*. Such items are likely to be more difficult to perceive than full words in connected speech (e.g. due to their short length and being non-salient syllables).

Some of the inter-rater disagreements also related to the form of a production included in both transcriptions. Several pairs of items, such as *erm* and *arm*, were similar in form, but were different enough, in their functions, to constitute distinct constructions and thus affect the subsequent analysis. These were therefore classed as disagreements.

6.4.2.3. Pauses

6.4.2.3.1. Pause position

There were a number of disagreements on pause position, involving an extra pause being included in one transcription. In some of these instances there was no obvious explanation for the disagreements and they could simply have been due to human error. However, other disagreements occurred at points that are again likely to have been more difficult to hear. For example, one extra pause was placed immediately after speech produced under the breath, where it is likely to have been more difficult to distinguish where this quiet production ended and the pause began. Another involved an extra single phoneme, *[p]*, being perceived within what was noted by the other transcriber as a longer pause, meaning that one transcriber included two pauses whilst the other noted only one. Again, this could be a consequence of this extra speech being an individual phoneme, which should typically be more difficult to distinguish (e.g. from background noise) than longer productions. Apart from this, in two of the inter-rater disagreements, the extra pause was placed between speaker turns. These pauses had been judged by the other transcriber to be micropauses and thus excluded (only 'full' pauses were to be included between speaker turns; see Appendix VI). Therefore, the discrepancy here in fact related to pause length, rather than pause position[24].

6.4.2.3.2. Pause length

Some of the disagreements on pause length may have resulted from similar issues to those highlighted for the other transcription aspects. For example, one disagreement involved the issue described for pause position above, where one transcriber had included a longer pause but the other had noted extra speech within this, dividing the pause into two shorter ones. Since the longer pause was only compared with the first of the two shorter pauses (regarded as being in the same position as the longer pause), the compared pause lengths showed disagreement. However, the summed lengths of the two shorter pauses plus the extra speech were approximately equal to the duration of the longer pause. Therefore, had the extra speech been distinguished in both transcriptions, the two pauses either side are likely to have been similar in length to the two in the other transcription. Another disagreement related to a pause between a production of *[phː]*, marked in a footnote as resembling a sigh, and speech produced under the breath, and it is again likely to have been more difficult to establish the beginning and end of the pause amongst this non-speech and quiet output.

Apart from this, two other disagreements resulted from different levels of non-speech detail being noted. In both these instances, the second transcriber had

[24] A pause and a micropause do not necessarily show disagreement on pause length, though, as a pause could still be within +/- 0.1 seconds of a micropause, which would be classed as agreement under the current comparison method (see Appendix VII).

included a non-speech item (a ‘lipsmack’ and a ‘breath’ respectively) immediately adjacent to a pause and measured only the remaining section of pause after these items. In contrast, the other transcriber had not distinguished any nonspeech in the pause and took the whole stretch of recording as the pause, resulting in a different pause length being noted. This could reflect the more subjective nature of the decision required regarding which non-speech phenomena to include (the protocol states that non-speech items to be transcribed should include “…noise produced by a speaker that cannot be regarded as speech, but could either be viewed as having communicative value or impacting on the person’s ability to speak”; see Appendix VI). Consequently, the protocol might be improved by specifying in more detail exactly which non-speech items to include or disregard. However, such an inclusion list may depend on the particular goals of the study concerned.

6.5. Discussion

This chapter has detailed the development and testing of a procedure for transcribing spoken language of PWA in exchanges with healthy speakers. In doing so, it has provided a rationale for the transcription method, and confirmed the reliability of this procedure within and across raters. While the protocol was found to be reliable, there were still disagreements between transcriptions, even in the intra-rater tests. This suggests that reliability of transcription, at least of impaired speech, may not simply be assumed without testing. In addressing this issue, a reliable transcription procedure has been developed for use in the current project. It is hoped that this protocol is also sufficiently general for employment in other studies of spoken language in aphasia which may have a variety of aims. It might also serve as a base to be adapted for use in studies with more specific aims. In addition, by discussing the disagreements arising in the reliability tests, the chapter identifies potential areas of difficulty in transcribing using this protocol. Particularly highlighted in this regard, are productions that were less perceptible, such as the isolated individual phonemes and audible hesitation tokens common in aphasic speech, as well as items produced during overlapping speech.

Of course, there are also limitations with the protocol. Firstly, while the overall results for each transcription aspect exceeded the minimum reliability levels, some results for individual participant narratives did not. This was most noticeable for inter-rater agreement on pause length and, less so, spoken content, in BK's narrative. This could reflect the likelihood that some participants' speech will inevitably be more difficult to transcribe, depending on the nature and severity of their impairment. However, these difficulties might also be linked to the proportion of nonwords and non-speech in the test sections used for this participant. BK's sample contained the highest proportion of nonwords and nonspeech[25] of those compared for inter-rater agreement (see Table 6.3). These items are potentially more difficult to distinguish and in the case of nonspeech could have been affected by the subjectivity involved in deciding which items to include (see again 6.4.2.3.2). However, there is no obvious relationship between such proportions and agreement levels in the other participant cases.

Table 6.3: Proportions of nonspeech and nonwords in the transcription sections compared for inter-rater reliability[26].

Participant	Proportion of non-words and non-speech; (of total items, shown in parentheses)
BK	0.56 (48)
DB	0.29 (83)
IB	0.40 (40)
JS	0.13 (60)
JW	0.19 (148)

[25] Nonwords here include individual phonemes, nonwords/paraphasias, audible hesitation tokens and general noises expressing, for example, frustration or confirmation, such as *oohh* and *mhmm*. The proportions of non-words and non-speech here include all instances where at least one transcriber had noted an item of this type.

[26] These figures include the participants' and interviewers' productions, the proportions of which vary in each case.

Another consideration is that the section of BK's narrative compared for inter-rater reliability was the first 10%, and at this point, BK could have been more challenged at starting the task or self conscious at being observed/recorded (cf. Labov, 1972). This could have led to BK's speech being more disrupted and thus more difficult to transcribe. However, not all inter-rater results for BK were below the minimum reliability levels, so if any 'observer effects' did play a role, it is possible that certain transcription aspects are more vulnerable to these than others.

There are also more general methodological considerations with the reliability results. Firstly, the effects of familiarity with the data and protocol should be considered. The more familiar a transcriber is with the data or protocol, the more likely they may be to perceive extra items and produce a more thorough transcription. This could explain the finding that when extra spoken content was included in one transcription in the intra-rater tests, this was usually present in the second set of transcriptions, which were completed after the researcher had already transcribed all five narratives in full. In the inter-rater tests, too, the extra items were usually noted by the researcher rather than the second transcriber, and this might have been due to the researcher's greater familiarity with the data and protocol. It may be that providing in-depth training on use of the protocol to new users could reduce such differences.

In terms of general limitations with the protocol, as with any transcription procedure, not all aspects of the speech could be included. In particular, no details were noted regarding, for example, phonological features of the speech (e.g. intonation). Also, the reliability testing focused on those areas of the procedure that were identified as being of primary importance to the general goals of the later analysis: turns, spoken content and pauses. It did not investigate other elements of the protocol such as transcription of non-speech, which could affect other transcription aspects (e.g. pause length; see again 6.4.2.3.2).

There are also considerations regarding the speakers involved in the speech samples used. The data included language by both healthy speakers (PATSy database interviewers) and PWA. This is favourable as it is relevant for the growing body of aphasia research that examines the language of PWA in interaction with their usual conversation partners, who are, typically, healthy speakers (e.g. Wilkinson, Lock, Bryan, & Sage, 2011). However, it also means that the transcription protocol has not been tested solely on data from PWA. The reliability results could have been influenced by the content from the healthy speakers, which would be expected to be easier to transcribe, and therefore less at risk of transcription error. It may be that lower reliability results would be recorded if the data consisted only of aphasic speech, and this is a potential area for future testing.

More generally, the number of samples tested is somewhat limited and it would be useful to apply the developed procedure to the speech of further PWA. It would also be interesting to assess how transcription reliability might vary according to the different aphasia profiles of the speakers involved.

Another issue worth raising is that the narrative recordings used were produced approximately twenty years earlier and greater audio clarity would be expected with newer recordings. It might be that the highlighted difficulties relating to audibility would be less, and thus a higher reliability rate achieved, if newer recordings were used (this should apply to any transcription procedure, however). Nevertheless, even with the highest quality recordings and indeed even when sitting with a speaker in person, there will always be some level of human error in perceiving the person's speech. This is especially so in the case of aphasic productions.

6.6. Conclusion

In summary, this chapter details the development and testing of a protocol for transcribing the speech of PWA in exchanges with healthy speakers. Since this was found to be reliable, it was then used to transcribe the spoken narratives examined in this thesis. It is also hoped that the procedure may be employed in other projects investigating aphasic spoken language or serve as a base from which to develop transcription procedures for studies with more specific transcription aims.

7. Development of methods II: Segmentation/ string extraction

7.1. Introduction

One of the main studies in this thesis is an examination of verbs and the constructional combinations these are produced in. At the beginning of the PhD project, however, a specific focus on verbs had not been decided and the general aim was to analyse all constructional combinations in the participants' narratives. With either aim, such an analysis necessarily involves segmenting the speech in some way into units in which constructions could be regarded as occurring in combination. Since this procedure would shape the subsequent analysis, a reliable segmentation protocol was essential. Such procedures do exist in the aphasia literature (e.g. Marini et al., 2011; Saffran, Berndt, & Schwartz, 1989; see section 7.3.1.4). However, none have been developed with the aim of analysing constructions as defined in constructivist, usage-based theory, and potential difficulties were foreseen in applying the existing procedures in a study with these analytical aims (see again 7.3.1.4). Therefore, a segmentation protocol was developed specifically for the current project.

This development process in fact involved the creation and testing of two approaches. Firstly, when the aim of the analysis was still relatively general (i.e. to analyse all constructional combinations), an approach was trialled in which segment boundaries were imposed onto the speech, in order to then analyse the structures within these segments. However, testing highlighted reliability issues with this first protocol. In light of these issues, and to accommodate the project's more specific analytical aims, a second procedure was developed that built on what had been learned from trialling the first procedure and which was also more suited to the refined analytical aims. The approach employed in this second protocol was to take each verb token as a starting point and work outwards from this to examine the constructions adjacent to or 'hosting' it. After testing, amending and retesting this procedure, the protocol was accepted as reliable and fit-for purpose in the current study. This chapter details the processes of developing and testing the two protocols, providing a rationale for the decisions taken.

7.2. Aims

The aims of the protocol development were as follows:

1. To develop a method of extracting segments for the subsequent analysis of constructional combinations.
2. To test this procedure for intra-and inter-rater reliability.
3. To further develop and test the procedure as necessary to ensure reliability.

7.3. First protocol

7.3.1. Development of procedure

As stated, the aim of the first procedure was relatively general, reflecting the more general aim of the proposed analysis at that time: to examine all constructional combinations in the speech samples. With this in mind, constructions occurring in combination with each other were taken to be those found within stretches of speech that had been produced as one unit, and the main task was then to decide how such a unit should be defined. To do so, various segmentation units from the literature were considered before elements of several types were adopted in the protocol developed. A short review is now presented of the different types of units considered from the literature, namely those based on the structure of interaction, syntactic properties, functional/ pragmatic criteria and prosodic features, along with some segmentation methods from the aphasia literature that adopt a combination of these indicators.

7.3.1.1. Units based on structure of interaction

The main unit based on structure of interaction in the literature is the 'turn', which can be defined as "…one or more streams of speech bounded by speech of another, usually an interlocutor" (Crookes, 1990, p.185). From the outset, this unit appeared unsuitable for the current project since the main data collected would be narratives in which any contributions from a second speaker would be kept minimal. Other definitions state that rather than being bounded by another speaker's contribution, turns may simply be delimited by silence (Lesser & Perkins, 1999) or "periods of inactivity of that [original] speaker" (Bunt & Petukhova, 2010, p.218; see also Allwood, 2000). However, these definitions do not appear to specify how long the silence must be to constitute a turn ending. This could be problematic in segmenting aphasic speech, which commonly contains pauses at points where a turn end may be less likely in healthy speech (e.g. mid-word or phrase).

Irrespective of which definition is accepted, the occurrence of silences within one person's contribution could also indicate other, separate and meaningful units within a turn (see also Geertzen, Petukhova, & Bunt, 2007), and thus the turn may not be sensitive to smaller constructional combinations that are in fact distinct. For instance, employing the turn as a segmentation unit in the current study would result in *she* and *it* in the following example being regarding as occurring in the same constructional combination, but this does not intuitively seem to be the case:

she** got the thing (.) ((tut)) what d'y' call **it

The turn was therefore deemed unsuitable as a unit in the current procedure.

7.3.1.2. Functional/ pragmatic criteria

Units can also be determined using functional/pragmatic criteria. One example of such a unit is the 'functional segment', defined as "(possibly discontinuous) stretches of communicative behaviour that have one or more communicative functions" (Bunt & Schriffin, cited in Geertzen et al., 2007, p.141). Use of these units, however, is not without difficulties even in the context of unimpaired speech. For instance, within a turn, several different functional segments beginning at the same point may not end in the same place and no one means of segmentation would capture all of these overlapping segments (Geertzen et al., 2007). This challenge was addressed by Geertzen et al. (2007), by using multiple segmentations to enable more accurate identification of all the functional segments linked to a given utterance. However, in the context of aphasic speech, segmentation based solely on semantic/ functional criteria could be problematic (cf. Saffran et al., 1989) since language is often used with meanings that would not be paired with the same form in conventional usage. This can make identification of an utterance's function difficult, and therefore it was decided that semantic/ functional criteria would not be the main focus of the segmentation.

7.3.1.3. Syntactic criteria

Several units based on syntactic criteria were considered, including the 'sentence', the 't-unit', the 'communication unit' ('c-unit') and the 'idea unit'. The sentence is "principally a unit of written grammar" consisting of "…at least one main clause" (Carter & McCarthy, 2006, p.486). This contrasts with the 't-unit' (Hunt, 1966), which is limited to "one main clause plus whatever subordinate clauses happen to be attached to or embedded within it" (Hunt, 1966, p.737). For instance, based on this definition, example (i) below would contain one t-unit, whereas (ii) would contain two because the second clause is coordinate rather than subordinate:

(i) Laurie eats steak

(ii) Laurie eats steak but he doesn't eat pomegranates

However, these units appear to be specified with well-formed syntax in mind and thus their application in aphasic speech could be problematic, which depending on the impairment severity, may rarely contain a sentence or even a main clause. Furthermore, employing the sentence and t-unit even in healthy speech, could lead to many productions being excluded from the analysis, such as the answer in the following (based on an example from Crookes, 1990, p.184):

(Q) *Rita, what are you doing?*

(A) *drawing*

A possible improvement is the 'c-unit (Loban, 1966) which is similar to the t-unit but also includes "isolated phrases not accompanied by a verb, but which have a communicative value" (cited in Crookes, 1990, p.184). Nevertheless, the definitions of the t- and c-units, as well as the sentence, are largely specific to written language (cf. Carter & McCarthy, 2006; Crookes, 1990; Kroll, 1977), and this too may prove to be problematic for use in segmenting the spoken language data in the current project.

A unit proposed as an alternative to such segments based on grammatical criteria was the 'idea unit': "…a chunk of information which is viewed by the speaker/ writer cohesively as it is given a surface form… related… to psychological reality for the encoder" (Kroll, 1977, p.85). Since the full definition of this unit is relatively lengthy, it will not be repeated here, but the influence of grammatical properties on this definition are apparent just from its first criterion: "a subject and verb counted as one idea unit together with (when present) (a) a direct object, (b) prepositional phrase, (c) adverbial element, or (d) mark of subordination" (Kroll, 1977, p.90).

More importantly, if employed in the current study, the idea unit is likely to result in too many boundaries being imposed, leading to the separation of basic constructional combinations. For instance, the verb *screaming* is separated from its subject in Kroll's (1977, p.90) example of idea units as follows (idea units separated by /):

Sue roared all the harder./ She claimed I looked funny,/ clinging there,/ screaming.

[four idea units]

This unit was thus also deemed unsuitable for use in the current procedure.

In summary, it was decided that basing the segmentation primarily on syntactic criteria could be problematic because of the heavy influence of written language on the definitions of existing syntactic units, and because these units are largely defined for well-formed grammar. Therefore, it was predicted that these could be problematic when used with impaired, spoken language. Consequently, it was concluded that the syntactic units discussed would not be suitable for use the current procedure, and other alternatives were considered.

7.3.1.4. Units based on prosodic criteria:

Of the units based on prosodic criteria, the main one considered was the 'tone unit'. A tone unit (also 'tone-group' or 'pitch contour') can be defined as "…a finite set of pitch movements, formally identifiable as a coherent configuration, or contour, and used systematically with reference to other levels of language, especially syntax" (Crystal, 1981. p.62). Tone-units contain at least one tonic syllable (Crystal, 1981), that is, the syllable which carries "maximum prominence" in a section of speech, signalled mainly through pitch movement, "…but extra loudness is involved, and duration and silence may be used to heighten the contrast between what precedes and follows" (Crystal, 1981, p.63). The following examples illustrate speech separated into tone units, with the tonic syllable of each unit underlined.

| she <u>got</u> it | | she got the <u>wand</u> |

| <u>yes</u> | | I <u>did</u> |

A short example of tone units marked in aphasic speech can be found in Wells and Whiteside (2008), although this is used to exemplify prosodic impairments, rather than addressing the aims of the current segmentation issues. It was decided, though, that the tone unit held potential as a possible unit for the current procedure, as speech that was produced in a continuous but delimited stretch might be taken as having been produced 'in one go', that is, with the constructions occurring in combination with each other. However, the exact placement of boundaries around a tone unit "…is not straightforward even when transcribing typical English speakers" (Wells & Whiteside, 2008, p.552). Therefore a combined approach that also incorporated other criteria was potentially necessary, and with this aim, procedures employing such mixed criteria in the aphasia literature were considered.

7.3.1.5. Procedures incorporating mixed criteria to segment aphasic speech

Marini et al. (2011) state the need to consider multiple types of criteria in segmentation procedures. Their protocol jointly incorporated "acoustic, semantic, grammatical and phonological criteria" (p.1379). However, there could be difficulties in applying these criteria as defined by Marini et al., to the data of the current thesis. The 'acoustic criterion', they explain, specifies that "an utterance is an emission of sounds delimited by pauses that can be easily identified and may be either empty (such as silence) or full (non-lexical emissions such as "ehm" or fillers such as "I think", or "Let me guess") (Marini et al. (2011, p.1380). However, this definition again shares the same limitation stated for turns above: that it does not specify a minimum length for the pauses delimiting the utterance. Therefore the frequent and often lengthy pauses that are characteristic of some aphasic speech could lead to 'over-segmentation', that is, the separation of syntactically coherent constructional combinations, which arguably applies to Marini et al.'s separation of the following example into two distinct utterances:

> " This is a…(5 seconds)/ child/. " (p.1380)

The 'semantic criterion' also has limitations. With reference to Olness, Matteson & Stewart (2010), Marini et al. (2011) state that according to this criterion, "…an utterance is a conceptually homogenous piece of information – i.e., a proposition, defined as a semantic unit consisting of the main predicate with its arguments and all embedded predicates and arguments associated with it" (p.1380). They further explain that "…if there is not a sensible pause in the flow of speech, utterance boundaries can be identified whenever a proposition has been formulated and a new one has been introduced" (Marini et al., 2011, p.1380). This too seems potentially problematic for the current project, as aphasic utterances can involve relatively non-sensical utterances and this could pose difficulties in identifying 'propositions'. Also, Marini et al. describe how unfinished utterances should be classed as distinct from any subsequent reformulations of the utterance following such false starts. This is also stated in relation to the 'phonological criterion' used by Marini et al., which would separate false starts from each other and from any finally produced version of the attempted item, as Marini et al. illustrate with the following example:

/ and she is a ca- / stroking his d- / his d- / the dog of the the man /

[four distinct utterances; Marini et al., 2011, p.1380)

With regard to the current study, however, including such repeated attempts within the same segment would allow simultaneous analysis of the wider utterance attempted, including the difficulties and resolutions involved in such attempts. Therefore, it would be of greater advantage if the segmentation procedure did not separate repeated attempts.

Another procedure that incorporates several types of criteria is that employed by Saffran et al. (1989) in their Quantitative Production Analysis of aphasic speech. This is based on 'syntactic indicators', 'prosodic indicators', 'pauses' and 'semantic criteria', although Saffran et al. state that the last two of these may not be applied reliably in marking utterance boundaries in aphasic speech. They therefore give primary importance to syntactic and prosodic indicators, whilst also emphasising the need to consider "the overall pattern of a patient's productions" (p.470). However, the syntactic criteria are again only described in terms of well-formed syntax and, in fact, only mention sentences, stating that "unless there are strong indications to the contrary (e.g. strong prosodic contraindications), a well-formed sentence should be taken to be an utterance" (p.470). The prosodic indicators are also not stated extensively. These specify only that "falling intonation suggests (though not invariably) the end of an utterance (Saffran et al., 1989, p.470). This segmentation procedure was judged not to be sufficient for the current purposes and thus, a more detailed protocol was developed with the specific aims of the subsequent analysis in mind.

7.3.2. The developed (first) protocol

The first protocol developed is provided in Appendix VIII. Following the example of Marini et al. (2011) and Saffran et al. (1989), this procedure also incorporated combined criteria. Similarly to that of Saffran et al. (1989), it placed most focus on syntactic and phonological indicators. However, as explained, the syntactic units in the literature seemed to be mainly defined with well-formed syntax in mind and it was difficult to envisage how this would be suitable for the aphasia data in the current study, especially since several of the participants had agrammatic aphasia. Therefore, primary weighting was given to prosodic criteria, basing the unit primarily on the tone unit (see again section 7.3.1.4.), but with a number of syntactic and semantic indicators also being incorporated alongside this.

Segments were taken to be "…items or groups of items which, through their intonation, give the sense of being one cohesive unit" (Appendix VIII, section 3a). However, some key exceptions were also determined. Firstly, it was decided that any speech that formed a sentence should be treated as one segment, regardless of whether this spanned several tone units. Saffran et al. (1989) state in their segmentation procedure that "boundaries should be drawn conservatively: when in doubt, place boundaries to create shorter rather than longer utterances". However, employing this approach in the current study could have led to wider syntactic constructions being missed and therefore, it was decided that the reverse caution was necessary. That is, the productions should be kept together, regardless of pauses within them, if there was continuous syntax (see Appendix VIII, section 3b(i)). Another key exception to the idea of the tone unit was that while this unit usually contains a tonic syllable (see again 7.3.1.4), this was not essential in the segment defined in the developed protocol (see protocol section B (ii)). This aimed to accommodate unfinished utterances that were cut off before the point of the tonic syllable had been reached.

Finally, another main point was that all repeated attempts at an item should be kept together within one segment to allow the later analysis of these attempts, including the points of difficulty and any resolutions of these, simultaneously (see Appendix VIII, section 3c(i)).

Based on the above considerations, the protocol was developed by the researcher segmenting the transcribed Cinderella narratives of the five PATSy database participants (Lum et al., 2012a; see chapters 4 & 5 for participant details). These narratives included the speech of the participants and of the PATSy database interviewers. Therefore, the protocol was developed using aphasic and healthy speech.

7.3.3. Reliability testing

7.3.3.1. Method of reliability testing

The procedure was tested for both intra- and inter-rater reliability. In the *intra-rater* tests, 10% of each narrative (measured by duration) was re-segmented by the researcher on a separate occasion. For the *inter-rater* testing, 10% of each narrative was segmented by a second person (a postgraduate experienced in analysing aphasic speech), using the developed protocol. In both tests, the sections used for re-segmentation were selected pseudo-randomly from a different point of the recording for each participant, to counterbalance any effects of the time point into the task on the participant's speech and potentially, therefore, on the ease of segmentation. Also, the sections used in the intra-rater tests were different to those chosen for the inter-rater testing.

The first and second segmentations by the researcher were then compared for intra-rater agreement and the second person's segmentations were compared with the researcher's first segmentations for inter-rater agreement. Agreement was defined here as both segmentations including a boundary at the same point in the transcription. Agreement levels were examined overall for all speech segmented and also separately for the healthy speech of the PATSy database interviewers and for that of the PWA. A level of 80% agreement (recommended by Ferguson & Armstrong, 2009) was taken as a minimum for reliability to be confirmed.

7.3.3.2. Reliability results

The results of the reliability tests are shown in Table 7.1. The overall figure was calculated by averaging the agreement proportions for the interviewer and aphasic speech, to avoid any skewing of this figure resulting from the higher number of instances compared from the aphasic speech. Within-rater agreement was high in all cases, confirming the intra-rater reliability of the protocol both overall and for the speech of the healthy interviewers and PWA separately. There were differences in agreement levels for these two speech groups, though, with disagreements in fact only arising in the segmentation of the aphasic speech. In contrast, the overall inter-rater agreement fell below the recommended amount. Although this still reached a reasonable level (0.70), the breakdown of results revealed considerable differences for the two speech groups. Agreement exceeded the minimum level for the healthy speech, but was considerably below this for the aphasic speech (0.57). In addition, while the reliability was measured by overall agreement across all five narratives, it should be noted that the inter-rater agreement was particularly low in the individual case of BK's narrative.This was 0.31 for his narrative overall (13 instances compared) and just 0.10 for the aphasic speech (10 instances compared).

Table 7.1: Intra- and inter-rater reliability results for first protocol

Participant group	Agreement between ratings, as a proportion of instances compared (n for each analysis in parentheses)	
	Intra	Inter
Interviewer	1.00 (49)	0.83 (46)
PWA	0.87 (60)	0.57 (65)
Overall (averaged proportions)[27]	0.93	0.70

7.3.3.3. Discussion of reliability results

While the first protocol was reliable within raters, it was not reliable across raters, and the problem lay specifically in segmenting the aphasic rather than the healthy speech. In addition, while the protocol reliability was measured by the overall agreement level across the five participant narratives, there was also concern that the agreement was particularly low in some individual participant cases, most notably that of BK. It may be that application of the protocol is particularly problematic for certain speech profiles. Indeed, both the researcher and the second rater reported a high degree of difficulty in segmenting BK's narrative. The intra-rater agreement level on BK's narrative was, contrastingly, the highest of the individual results for this reliability type. However, it may be that the researcher remembered where she had placed the boundaries in the first segmentation due to having given this participant sample so much consideration.

Several key areas of difficulty were identified as the main cause of the inter-rater disagreements. Firstly many such difficulties arose due to conflicts between the phonological and syntactic properties of the speech. Specifically, there were stretches of speech that seemed to constitute one tone unit but which contained

[27] The overall proportions of agreement simply taken as the proportion of agreement of all instances compared (skewed for aphasic speech) was 0.93 (n=109) for intra-rater reliability and 0.68 (n=111) for inter-rater reliability.

distinct syntactic units. Conversely, there were instances in which the syntax seemed continuous but stretched over productions that were interspersed with, sometimes lengthy, pauses or appeared to contain different tone units. This issue also arose in cases where one of the seemingly distinct syntactic units appeared to be used as a filler preceding another item. An example of this was DB's production of *I don't know* (see also section 10.4.2.2.1), which was segmented as follows

Researcher: Pa: *(1.6)* **|**I don't know it's ball **|**

Second rater: Pa: *(1.6)* **|** I don't know **|** **|** it's ball**|**

Although this stretch of speech did have a sense of containing separate intonation contours, it was produced relatively quickly within one breath, which added to the impression of it being one continuous segment.

There were also difficulties with speech containing repeated attempts at an item especially when these attempts were separated by clear pauses and distinct intonation patterns, such as in the following example from IB's narrative:

Researcher **|** (.) and one (.) one *(2.5)* one (.) shoes **|** (.) **|**and *(3.5)* [baɪ] ((laugh)) **|**

Second rater **|** and one **|** (.) **|** one **|** *(2.5)* **|** one (.) shoes **|** (.) **|** and *(3.5)* [baɪ] **|** ((laugh))

In fact, this issue was heightened in IB's sample because of her halting speech pattern. Her productions were mainly limited to single words that might each be classed as one tone unit.

Confusion also arose when the repeated attempt actually involved self-corrections or reformulations to elaborate on the initiated utterance, such as the following speech by JS:

Researcher **|**well he's *(1.4)* she's a [səɹənə]…

Second rater **|** well he's **|** *(1.4)* **|** she's a [səɹənə]…

Whilst the protocol stated that repeated attempts should be kept within the same segment, it did not specify that this should also be the case for items that were self-corrected, that is, that were reformulated from the initial production. Clarification was therefore necessary regarding this point.

Lastly, there was also disagreement about items at the edge of segments. These were often short items outside of main argument structures, such as particles (yes/no) or audible hesitation tokens, that sometimes had separate intonation but whose semantics suggested that they were closely tied to a preceding or subsequent item. These highlighted a need for the protocol to clarify the procedure for including such short items in segments.

Apart from these shorter items, however, there were also similar difficulties with isolated noun and verb phrases. Such fragments can be a common feature of aphasic speech (particularly in non-fluent aphasias), and difficulties arose in deciding whether such phrases were indeed separate to preceding or succeeding items or belonging to an utterance whose parts seemed somewhat separated because conventionally expected items in their structure were absent. Such an instance can be seen in the following example from BK's narrative:

Researcher: … she had to go *(5.2)* [twə] twelve o 'clock…

Second rater: …she had to go **|** *(5.2)* **|** [twə] twelve o 'clock…

It is difficult to judge here whether *twelve o'clock* should be treated as an isolated phrase or seen as part of a wider but ill-formed sequence with functional words missing, that is *she had to go* [*at*] *twelve o'clock*. This is likely to be a difficulty in general with interpreting aphasic speech. However, it was decided that guidance relating to such isolated phrases should also be built into the final protocol.

Overall, the low inter-rater results are partly indicative of the difficulties inherent in analysing aphasic speech. In addition, it should be considered that method of comparing segmentations used could result in the agreement level being somewhat negatively skewed. This is because it only considers agreement on where a boundary is placed and does not take into account the (implicit) agreement on where a boundary should not be placed. Nevertheless, the procedure as it stood was deemed unreliable, with problems mainly arising due to conflicting phonological and syntactic indicators in the speech, and because certain details had not yet been considered, or were underspecified, in the protocol. Therefore, redevelopment of the protocol was necessary.

7.4. Second protocol

7.4.1. Development of procedure

One of the main issues with the first protocol was that the prosodic and syntactic features had often seemed in conflict and this resulted in uncertainty regarding whether certain stretches of speech were continuous or contained distinct units. Focusing mainly on the prosodic indicators had proved somewhat subjective and it was therefore considered whether a focus on syntactic features instead might offer a more objective means of extracting segments. In addition, the aims of the study had by this time become more specific to analysing verbs and the constructions these were produced in. Therefore, it was decided that the syntactic criteria used to define the segments could be specified in relation to verb argument structures.

Consequently, the decision was taken to incorporate the learning gained from trialling the first protocol to create a new one more tailored to the refined analytical aims. The analysis would address all the linguistic structures produced adjacent to, or hosting, each verb, and how well-formed these productions were in terms of which parts of the verb-argument structure were fulfilled. However, this could potentially include a substantial amount of the verb's wider linguistic context, especially for example, if fragmented utterances simply joined by *and* were considered as a continuous combination. It was thus necessary to place some restriction on the amount of wider context included in a string and it was decided that strings would therefore be limited to the main clause that the verb was produced in and any clauses linked to that clause through subordination. The result was a unit similar to the t-unit or c-unit (see again section 7.3.1.3.) but which was tailored to the potentially fragmented and ill-formed nature of the speech. Rather than basing the syntactic criteria on units defined with healthy speech in mind, the new protocol reframed the perspective of the protocol to eliminate any expectation of fully-formed verb argument structures and instead focussed on the elements of such structures that *were* present.

In addition to changing the focus to syntactic criteria, it also incorporated more guidance on the points of difficulty highlighted in testing the first protocol: inclusion of repeated attempts and self-corrections, particles, audible hesitation tokens and isolated phrases.

The procedure was again also developed and refined by the researcher segmenting speech samples. However, as the data for the thesis had been collected in the meantime, the second protocol was developed by segmenting the actual data to be used in the verb analysis. This consisted of the narratives by six PWA (the PATSy database participant DB and the five recruited participants, KP, TH, ST, HB and MH) as well as the twelve healthy speaker narratives (see chapters 4 & 5 for participant details).

The use of these different samples highlighted phenomena which the previous segmentation protocol had not considered. In particular, some of the new samples contained lengthy stretches of direct speech and there had been no guidance in the first protocol regarding how this should be segmented. It was decided that such stretches were somewhat long to keep as one string and that they should instead be segmented in the same way as the other language in the narrative. The protocol was therefore updated to reflect this.

The second protocol is included in full in Appendix IX.

7.4.2. First reliability testing of second protocol

7.4.2.1. Method of reliability testing

The verb string extraction procedure was tested for intra- and inter-rater reliability. To measure intra-rater reliability, strings were extracted by the researcher on a second occasion for 25% of the verbs produced in all six aphasic narratives and 12.5% of the verbs produced in half (six) of the healthy narratives. For inter-rater testing, strings were extracted for 25% of the verbs produced in six aphasic narratives and 12.5% of the verbs produced in half of the healthy narratives by a second person (a postgraduate research student with a background in linguistics). The proportion of verbs used from the aphasic narratives was doubled compared to the proportion of healthy verbs, to allow for the fact that some of the aphasic narratives contained a small number of verbs. For all tests, the healthy narratives and all the verbs tested were selected pseudo-randomly. The two sets of strings extracted by the researcher were compared for intra-rater agreement and the researcher's first set was compared with the strings extracted by the second person for inter-rater agreement.

Agreement was defined as the string extracted for a given verb token being identical in both cases. However, an exception to this was that flexibility was allowed for minor differences relating to the inclusion of short phonemic productions constituting false starts on the first item of a string. For example, the strings below, in which the researcher included an extra phoneme, *[v]*, at the start, were classed as being in agreement:

Researcher: ***[v]*** *when she was standing at the door (.) the prince (5.1) the prince looked at [ᵊ] her*

2nd rater: *when she was standing at the door (.) the prince (5.1) the prince looked at [ᵊ] her*

7.4.2.2. First reliability results of second protocol

The results from the first reliability testing of the second protocol are shown in Table 7.2. This procedure was found to be reliable within raters: agreement levels were high both overall and on each of the two speaker groups, in fact being slightly higher for the aphasic speech (1.00). However, the inter-rater agreement again failed to meet a reliable level. Once more, there was again a reasonable level of agreement on string extraction from the healthy speech, but this was not so for that of the aphasic speech.

Table 7.2: First reliability results for second protocol

Participant group	Agreement between ratings, as a proportion of instances compared (n for each analysis in parentheses)	
	Intra	Inter
Healthy	0.98 (60)	0.79 (56)
PWA	1.00 (79)	0.59 (81)
Overall (averaged proportions)[28]	0.99	0.69

[28] The overall proportions of agreement simply taken as the proportion of agreement of all instances compared (skewed for aphasic speech) was 0.99 (n=139) for intra-rater reliability and 0.67 (n=137) for inter-rater reliability.

7.4.2.3. Discussion of first reliability results for second protocol and further development of the protocol.

Similarly to the first protocol, the second procedure was reliable within but not across raters, and the problem was again with segmenting the aphasic speech. However, the disagreements related to specific issues that could be addressed by including further guidance in the protocol (see below). It was therefore predicted that reliability could be achieved if such details were added.

Firstly, disagreement arose over ambiguous phrase that could plausibly have been part of the preceding or subsequent string. For example:

Possible string

Cinderella leaves the ball (.) as the clock strikes midnight (.) she runs down the stairs

Possible string

A point was therefore added to highlight such cases and recommend that extra attention be paid in such cases to phonological and semantic criteria (see point 3, Appendix IX).

Secondly, there were still ambiguities regarding repeated attempts at an item. The second protocol had incorporated procedures for keeping such attempts, including self-corrections, within one segment. However, it had not clarified that false starts (e.g. consisting of a single phoneme) should also be included in the same string as any more complete attempts at the item. This too was added to the protocol (see point 4, Appendix IX).

There were also still some disagreements over items at the edge of strings, namely linking words such as coordinating conjunctions and also exclamations. Therefore, extra detail was added to state that since these did not usually constitute an argument or adjunct of the verb, they should be excluded from strings. An exception to the exclusion of linking words, however, was that the word *then* should be kept in a string if it was used as a time phrase (adjunct) (see point 5, Appendix IX.

Disagreement also arose over temporarily aborted strings. For instance, a speaker may begin a string but halt this because of, amongst others, word-finding difficulties. They could then begin another utterance but then indeed access the difficult word and return to complete the original utterance. For example (aborted and continued sections of string shown in bold):

she went off in the *erm er (.) but she (.) erm* ***coach the coach***

It was decided that in cases such as this, the two parts of the temporarily aborted utterance should be kept together in one string, to allow analysis of the whole sequence (including the point of difficulty and the resolution). Guidelines were therefore added to the protocol to explain this (see point 6, Appendix IX).

Further detail was also needed regarding subordination of clauses. The procedure had included examples of clauses joined with a subordinator between them, but had not specified that in some clauses joined by subordination, the subordinator occurred at the start of the first clause, as follows:

although *the sisters were there they didn't recognise Cinderella*

Therefore, a point was incorporated to clarify this (see point 2 b, Appendix IX).

Finally, greater clarification was necessary regarding the reporting verbs produced with direct speech. The protocol had already specified the procedure for segmenting direct speech (see again section 7.4.1). However, the example provided for this in the protocol was only of a case where the reporting verb preceded the direct speech. It did not draw attention to the possibility of this verb being after the direct speech. For example:

*don't worry Cinderella/ I'll help you **said** the fairy godmother*

This example was therefore added to the protocol (point 7, Appendix IX).

The added sections for the points above are also identified in the protocol through footnotes (Appendix IX).

7.4.3. Second reliability testing of second protocol

7.4.3.1. Method

The amended version of the protocol was tested within and across raters. To do so, the tests followed the same method as the first tests of this protocol, and used the same proportions of verbs as these previous tests, but the healthy narratives and verbs used were pseudo-randomly selected anew. The same comparison procedure as adopted in the previous tests was then used to measure the intra- and inter-rater reliability.

7.4.3.2. Second reliability results of second protocol

The amended protocol was judged to be reliable within and across raters, both overall and for the aphasic and healthy groups separately (Table 7.3). Although the overall (averaged) results reached the ideal minimum of 80% recommended by Ferguson and Armstrong (2009), the agreement level for the aphasic speech did not: this was 0.70. However, this was deemed to be acceptable given the challenging nature of applying such procedures to aphasic speech. The intra-rater disagreements were resolved by re-analysis by the researcher, and the inter-rater disagreements were discussed by both raters to reach consensus.

Table 7.3: Second reliability results for second protocol (amended version)

Participant group	Agreement between ratings, as a proportion of the instances compared (n for each analysis in parentheses)	
	Intra	Inter
Healthy	0.91 (54)	0.90 (58)
PWA	0.99 (80)	0.70 (80)
Overall (averaged proportions)[29]	0.95	0.80

7.5. Discussion

This chapter has detailed the development and testing of a procedure for extracting strings for analysis in chapter 10. Two different approaches were trialled. The first of these, largely based on phonological criteria, was found to be unreliable. The judgement required by this procedure proved to be too subjective, and problems especially arose when these phonological features were in conflict with syntactic properties of the speech. It is important to note, though, that it is possible that with further development and testing, such a protocol could achieve a reliable level. However, this was not pursued in the current study, because of the refined aims of the subsequent analysis (focus on verb structures). Instead, a different approach was trialled, with a focus on syntactic criteria. This provided a more objective means of distinguishing strings and after two stages of development and testing, was deemed to be reliable. This is therefore the string extraction procedure used in chapter 10.

[29] The overall proportions of agreement simply taken as the proportion of agreement of all instances compared (skewed for aphasic speech) was 0.96 (n=134) for intra-rater reliability and 0.78 (138) for inter-rater reliability.

Nevertheless, there remain limitations with this procedure, mainly in the constructions that can later be analysed in the strings. For example, due to the positioning of boundaries, the procedure does not allow examination of even larger, 'higher-level' constructions. For instance, direct speech was divided in the same way as other language, whereas if this included a reporting verb, it could be argued that the complete episode of direct speech that follows constitutes the direct object of this verb in a larger host structure (string boundary indicated by **/**):

she said [direct speech]

she said [*the fairy godmother said now you must be home by the stroke of twelve otherwise you'll be left in all your rags pumpkin back again and everything* **/** *you must come by the stroke of twelve*]

(from N6's narrative)

Another example of such larger constructions that are not captured are in the often lengthy, cohesive utterances that span across coordinated clauses with separately stated subjects:

he decided he was about to leave when erm buttons said there was another girl in the house ***/ and /*** *that was Cinderella* ***/ and /*** *he said oh well we'd better try her as well* ***/ but /*** *the sisters didn't like the idea and complained* ***/ but /*** *he insisted* ***/ so /*** *they went down to the kitchen and tried the slipper on Cinderella's foot*

(from N1's narrative)

The procedure therefore also does not allow examination of these conjunctions themselves or other items used to link or initiate utterances unless these items can be classed as arguments or adjuncts of the verb (such as *then* used as a time phrase). An example of such an item that is used to initiate an utterance but would not be included in any verb string is MH's exclamation (in bold) in the following utterance:

oh dear crikey / *I've forgotten* **/**

In addition, it does not allow simultaneous examination of instances of ellipsis together with their antecedents if the two fall in coordinated clauses with separately stated subjects:

> *The fairy godmother told Cinderella to fetch her a pumpkin* **/** *and* **/** *she* ***did so***

Finally, because of the string criteria employed, the subsequent analysis does not compare directly to research on sentence production, as the strings do not equate to sentences. In fact, though, the developed protocol is more inclusive in the items it examines, as the definition of string not only includes all sentences but also allows incomplete utterances containing verbs to be analysed.

7.6. Conclusion

In conclusion, this chapter has detailed the development of a procedure for extracting strings for analysis. It highlights the inherent difficulties in segmenting aphasic speech generally, but also identifies specific challenges with the protocols trialled, especially with segments based on phonological features. By redesigning the protocol using syntactic criteria, a more objective procedure was developed that was also better suited to the refined analytical aims (the focus on verb constructions). Since this protocol was found to be reliable, it was therefore used to extract the data for that analysis (chapter 10).

8. Examination of nouns

8.1. Introduction

Much research has examined noun production in aphasia, mainly analysing nouns as single words and from a quantitative perspective, measuring correct noun production in, for example, naming and repetition tests (e.g. Mätzig, Druks, Masterson, & Vigliocco, 2009; Nozari, Kittredge, Dell, & Schwartz, 2010). However, it is also interesting to examine exactly which nouns people with aphasia (PWA) use in spontaneous speech and consider whether some are more likely candidates for production over others. Various factors are reported to have a facilitatory effect on word retrieval, but one of particular interest for constructivist, usage-based theory is frequency.

In aphasia, word frequency has been found to affect performance on various tests, for example, of naming (e.g. Kittredge, Dell, Verkuilen & Schwartz, 2008; Nozari et al., 2010) and repetition (e.g. Jacquemot, Dupoux & Bachoud-Levi, 2007; Lallini, Miller, & Howard, 2007; Nozari et al., 2010). However, there are also contradictions to these findings. Nickels and Howard (1995) point out that in previous studies that reported frequency effects on word production, frequency could have been confounded by other variables, such as imageability and word length, and when the effects of such variables were controlled in their own study, they found a significant frequency effect in only two of the 27 participants tested. Other studies have also failed to find any frequency effect, for instance on word repetition (e.g. Ackerman & Ellis, 2007), or have even reported reverse frequency effects, again on repetition (Hoffmann, Jeffries & Lambon Ralph, 2011), and also on identification of abstract words (Crutch & Warrington, 2005). However, Hoffmann, Rogers and Lambon Ralph (2011) argued that frequency effects in such cases may be masked by another variable, the semantic diversity of words, and found that an otherwise absent effect of frequency was indeed present in verbal comprehension when semantic diversity was taken into account.

Apart from these contradictory findings regarding word frequency, however, there are other considerations regarding frequency effects in aphasia that are yet to be investigated. Firstly, frequency is mainly addressed only at the single word level and this is noticeable not only in the focus of research into frequency effects in aphasia but in the very definitions of frequency given in this context: Martin (2013, p.141), for instance, states that "frequency refers to how common a word is compared to other words in the language". However, this neglects the fact that there is growing evidence of frequency effects beyond the single word level (see again sections 2.3 & 2.5.2.). Such frequency effects at various grain-sizes form a central tenet of the constructivist, usage-based approach and these are addressed in relation to verbs in chapter 10. There is also a further consideration with frequency at any grain-size, though, that is yet to be examined in the aphasia literature on word frequency, which is that items of any size may be subject to different types of frequency effect simultaneously.

Martin (2013) does acknowledge the distinction between a word's general frequency in spoken language and the frequency with which an individual has personally encountered the word, referred to as the level of 'familiarity'. However, there is little, if any, recognition of another type of frequency, that is, context-specific frequency. From a constructivist, usage-based perspective, all language consists of constructions (form-meaning pairings) that are acquired through an individual being exposed to the repeated use of an item in similar contexts. The production context therefore has a direct influence on the meaning/ function acquired for a construction and, indeed, pragmatic properties are listed among the key types of features that constitute the 'meaning' component of form-meaning pairings (e.g. Croft & Cruse, 2004; see again section 2.4.1). Certain constructions should be more frequent than others in certain contexts, meaning that they should be more entrenched in such contexts in the speaker's mind, and more likely candidates for production in that or similar contexts. This context-specific frequency may be quite different to general frequency in spoken language. For example, the noun *pumpkin* has a low general frequency (two entries in the Spoken BNC, Davies, 2004-), but a (healthy speaker's) narrative of the Cinderella story, is likely to always include this noun, meaning that it should have a high context-specific frequency in this narrative.

It is therefore interesting to examine the nouns used by a selection of the PWA in their Cinderella narratives. The nouns used by the healthy speakers (HSp) for the same referents can be used to represent which nouns are typical in this context and the frequency with which the HSp use a given noun for a certain referent can provide an estimate of the noun's context-specific frequency in the Cinderella story. Therefore, the nouns used by the PWA can be compared with those of the healthy group to assess whether the PWA are using nouns that are frequent in this specific narrative context. If not, it is interesting to examine which ones they are producing instead and whether these have a higher general frequency than the healthy speakers' nouns for the same referents. In this way, the study can also begin to explore the interplay between context-specific and general frequencies.

8.2. Aims/ research questions

The study aimed to examine the nouns produced in narratives by PWA, comparing these with those used by HSp for the same referents. The specific research questions were as follows:

(1) Do the PWA use the same nouns as the healthy participants?
(2) If so, are the nouns produced by the PWA affected by their context-specific and/or general frequencies?
(3) If not, which nouns do the PWA use and do these suggest any effect of general frequency?

An additional aim that arose from completing the analysis was as follows:

(4) Does the order of production of tokens for a given referent affect which nouns are produced?

8.3. Method

8.3.1. Data/ Participants

The data in this study were the nouns produced by six PWA when narrating the Cinderella story and those used for the respective referents by the 12 HSp narrating the same story. The PWA included one PATSy database participant (Lum et al., 2012a), IB, and five of the recruited participants, KP, TH, ST, HB and MH. IB was chosen as a pilot case for the noun analysis as it was noticed that some of her nouns often deviated from those that might typically be expected in the Cinderella story and often had a relatively high level of semantic generality. The recruited participants were selected from those for which there was greater consistency in the narrative procedure (see again section 4.2.2.3) and to include speakers with a range of aphasia severities. A summary of participant details is repeated in Table 8.1 for convenience (see chapter 5 for full profiles).

8.3.2. Data extraction

All nouns were extracted from the narratives using part 1 of the protocol in Appendix X[30]. In brief, this used a standard definition of 'noun' based on semantic criteria and syntactic distribution, as applied to unimpaired language. This emphasised that a noun is *usually* "a word that refers to a person, place, thing, event, substance, or quality: 'Doctor', 'tree', 'party', 'coal' and 'beauty' are all nouns" (Cambridge Advanced Learner's Dictionary and Thesaurus, 2013). In addition, productions were classed as nouns if they appeared in a position where a noun would be expected in relation to other syntactic categories in standard English (e.g. a noun "…can combine with *the* to form a complete phrase", Börjars & Burridge, 2010, p.48). Noun tokens produced during repeated attempts at an item

[30] (This full protocol was developed for the study of grammatical number errors reported in chapter 9.)

were only included once. The noun extraction procedure was tested and found to be reliable within and across raters (see Appendix XI[31]).

Table 8.1: Participant details ordered by WAB fluency rating (Kertesz, 1982)

Part.	Gen	Age at testing	Hand.	Previous employ.	TPO (y:m)[32]	Aphasia type	Fluency rating (WAB)
KP	M	50	R	Industrial labourer	2:8	Global	2
IB [pilot case]	F	37-38 42[33]	Not known	Retail assistant; housewife	Not known	Broca's agram.[34]	4[35]
TH	F	51	R	Business professional	17:0 1:9	Broca's agram.	4
ST	M	65	R	Salesman	2:5	Transcort. motor	6
HB	F	81	R	Teacher; care worker	4:0	Wernicke's	7
MH	M	69	R	Professional	5:0	Anomia	8

Key to Table 14.1: Partic.=participant; Hand.=handedness; employ.=employment; TPO=time post onset of aphasia; class.= classification; WAB= Western Aphasia Battery (Kertesz, 1982); F = female; M = male; R = right; NF = non-fluent; F = fluent; agram.=agrammatic; transcort.=transcortical.

[31] Reliability testing here was that conducted for the whole of the protocol in Appendix X (developed for the study of errors with grammatical number, chapter 9).
[32] Each time period listed corresponds to one stroke (where several time points are listed, this indicates that the participant has sustained more than one stroke).
[33] The PATSy data for IB was collected during two test periods.
[34] Aphasia type assigned for IB on the PATSy database (Lum et al., 2012a).
[35] This fluency rating was assigned by the researcher as no WAB fluency rating was available for IB on the PATSy database (Lum et al., 2012a).

After this, the extracted nouns were judged for inclusion in the analysis using the protocol in Appendix XII. Each included noun was then coded for its referent using the same protocol (Appendix XII). The main inclusion criterion was that, as the study compared the nouns used for a given referent, the included nouns must refer to discernible referents in the story. However, it was decided to also include the terms *twelve* and *twelve o'clock*, since these were used as synonyms for the noun *midnight* and both terms can be regarded as having noun-like properties[36]. Therefore, both terms were included as references to midnight, and, from here forth, any mention of nouns will include these terms. The protocol for noun inclusion and referent identification was also tested and found to be reliable within and across raters (see Appendix XIII).

8.3.3. Calculating the total words in each narrative

In order to also give an overview of the noun proportions in each narrative, the total number of narrative words produced by each participant was counted using the protocol in Appendix XIV. This procedure was also tested and found to be reliable within and across raters (see Appendix XV).

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[36] Although *twelve* (alone or in *twelve o'clock*) could be a quantifier, referring, for example, to twelve hours or strikes of the clock, it could also denote the physical number on the clock face, in which case it would be a noun and included in the analysis (see again Appendix X). Moreover, these terms have a noun-like distribution since both can and sometimes do replace *midnight* in its usages by the HSp. For example:

N5:	*she had to be back by* <u>*midnight*</u>
N2:	*she had to be back by* <u>*twelve*</u>
N7	*she must get home by* <u>*twelve* o'clock</u>

8.3.4. Analysis

In accordance with the study aims, the nouns produced by each PWA were compared to those used for the same referents by the healthy group, focusing on the following questions:

1. Are the nouns produced by the PWA the same as those used by the HSp for the respective referents?

2. If so, are the nouns affected by
    a. their context-specific frequencies in the Cinderella narrative?
    b. their general frequencies in spoken British English?
3. If not, which nouns do the PWA use, and are these affected by the nouns' general frequencies?

8.3.5. Frequency measures

Context-specific frequency was taken here as the frequency of a noun lemma in the 12 healthy narratives for a given referent. This was calculated as the number of tokens of a noun as a proportion of all noun tokens used for that referent. General frequency was taken as the noun's lemma frequency in the Spoken BNC (Davies, 2004-). For this, all searches were limited to yield only noun entries, except in the case of the terms for midnight (see above), for which unlimited searches were used.[37]

[37] Since neither *twelve* nor *twelve o'clock* is classed as a noun in the corpus, neither yields results in a noun-only search. The other term compared for this referent, *midnight*, yields the same results (118 entries) whether the search is limited to nouns or not.

8.4. Results

8.4.1. Overview of noun tokens

Table 8.2 shows the total narrative words produced by each participant, the number of noun tokens, both as a raw number and as a proportion of all narrative words, and the proportion of all noun tokens that were included in the analysis. Participants are listed in order of their expressive language capability (measured by their WAB fluency rating, Kertesz, 1982; see again section 4.2.4), with the most impaired speaker first. Firstly, it can be seen that although the raw noun token number generally increased with participants' greater expressive language capability, the proportion of nouns per narrative decreased. In terms of the proportion of nouns included in the analysis, this was higher in the three participants with the most limited expressive language, with the proportions for KP and TH being higher than the healthy mean. However, in the participants with greater expressive language capabilities, this figure was noticeably less than that of either the most impaired speakers or the healthy mean, being particularly reduced in HB's case.

Table 8.2. Number and proportion of noun tokens per narrative and proportion of nouns included in analysis.

Participant	Total words in narrative	No. noun tokens	Prop. nouns in narrative	Prop. nouns included in analysis
Healthy				
mean	344.50	63.17	0.19	0.80
range	104-548	19 - 93	0.14 - 0.24	0.69 - 0.89
SD	126.73	20.87	0.02	0.05
KP	31	17	0.58	0.94
IB	167	40	0.24	0.88

TH	104	29	0.28	0.79
ST	197	40	0.20	0.68
HB	337	40	0.12	0.58
MH	623	97	0.16	0.63

Key to Table 8.2. No.=number; Prop.=proportion.

8.4.2. Participant KP

The speaker with the most restricted expressive language, KP, referred to only three referents, using five nouns across 17 tokens. KP's tokens are compared against those of the HSp in Table 8.3, in which the format is as follows: The left-most column gives the referent of the noun. The second column lists all the nouns produced either by KP or the HSp for that referent, with those produced by KP shown in bold. The nouns are ordered by their context-specific frequencies (the frequency with which they were produced by the HSp). These frequencies are given in the third column. A blank space in this column indicates that the noun was not used by the HSp. The fourth column then lists the frequency of the nouns in KP's narrative, with blank spaces in this column indicating the nouns that were not used by KP. Finally, the fifth column then gives the general frequencies of the nouns in the Spoken BNC (Davies, 2004-).

Most of the nouns KP produced (0.88) were nouns also used by the HSp for the respective referents, and the majority (0.82 of all tokens) were those with the highest context-specific frequency (see also Figure 8.1). Because KP mainly produced nouns also used by the healthy group, there were insufficient tokens (two) of other nouns to fully analyse any effect of general frequency on these. However, these still merit reporting for completeness of information.

Of these two tokens, *dog*, used for the single horse at the end, had a higher general frequency than the respective healthy nouns. The other was *princess* used for Cinderella. In this case, some of the nouns used by the HSp, *girl*, *woman* and *daughter*, had a much higher general frequency than KP's noun. However, these three healthy nouns were only used by the HSp either to introduce Cinderella at the beginning of the narrative or to refer to her through her relationship to another character: as a woman unknown to the prince or as someone's daughter. If these three nouns are excluded, KP's noun is indeed more frequent than the healthy nouns that name Cinderella directly.

Table 8.3. Nouns used by KP compared to those of the HSp.

Referent	Nouns	Frequency in HSp narratives (context-specific) (token no. in parentheses)	Frequency in KP's narrative (token no. in parentheses)	General frequency (Spoken BNC)
Cinderella	***CINDERELLA***	**0.91 (97)**	0.86 (6)	20
	GIRL	0.05 (5)		2613
	CINDY	0.02 (2)		26
	WOMAN	0.01 (1)		3680
	DAUGHTER	0.01 (1)		639
	CINDERS	0.01 (1)		0
	PRINCESS		0.14 (1)	89
horse at end	*HORSE*	0.93 (13)		1142
	PONY	0.07 (1)		104
	DOG		1.00 (1)	1703
slipper/s	***SLIPPER***	**0.50 (25)**	0.89 (8)	84
	GLASS SLIPPER	0.34 (17)		0
	SHOE	**0.12 (6)**	0.11 (1)	702
	THING	0.02 (1)		23028
	GOLDEN SLIPPER	0.02 (1)		0

Key to Table 8.3:

Bold indicates noun used by the participant with aphasia; blank space indicates noun not used.

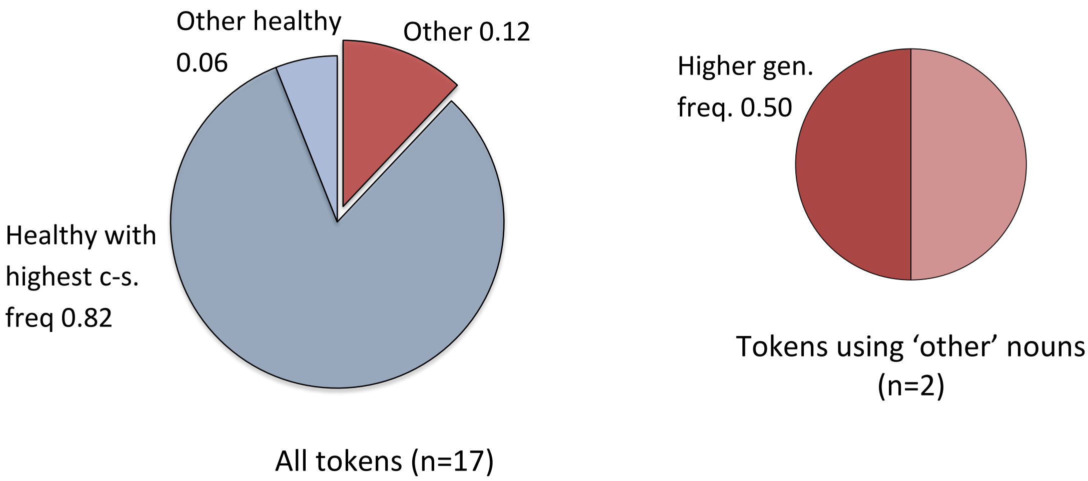


Figure 8.1. Summary of KP's noun tokens.

Key to Figure 8.1. c-s. freq.= context-specific frequency; gen. freq.=general frequency.

The order in which KP produced his noun tokens is shown in Figure 8.2, with the tokens grouped by referent. The three referents were Cinderella, the slipper/s and the horse at the end of the story. For each of these referents, every vertical line represents an instance when KP referred to that referent. In turn, on each line, the crosses represent the nouns used by the HSp for the respective referent. The blue circle symbolises which of these healthy speaker nouns KP produced. The red circles symbolise instances in which KP used a noun other than those produced by the HSp.

For all three referents, KP's initial token was a noun that was either different to those used by the HSp or was used relatively infrequently by the HSp (that is, a noun which had a relatively low context-specific frequency). In subsequent productions, KP then shifts to producing the nouns most commonly used by the HSp (that is, with the highest context-specific frequency). In both cases where such a shift occurs (for Cinderella and the slipper/s), the noun used initially has a higher general frequency than that used in the subsequent tokens.

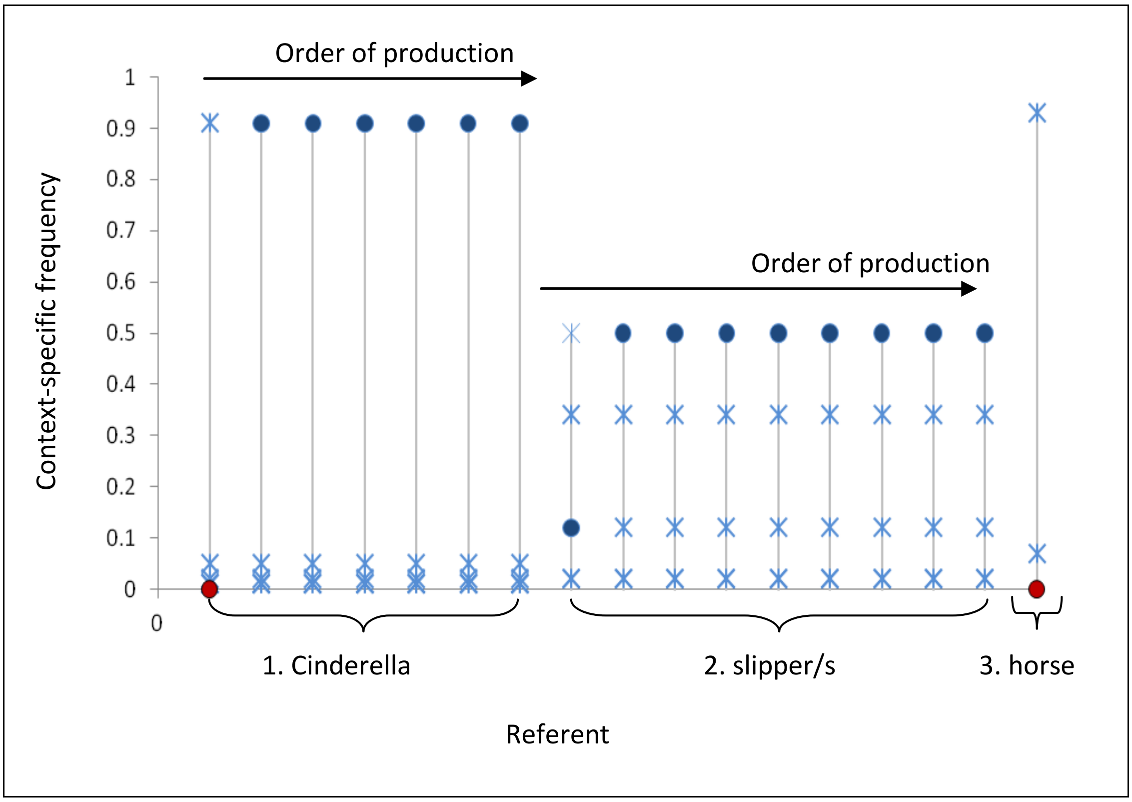


Figure 8.2. Noun tokens produced by KP, grouped by referent, then order of production

Key to Figure 8.2.

| Referent

● Noun used by KP, also used by Hsp

⚹ Noun used by HSp, not used by KP

● Noun used by KP, not used by HSp.

8.4.3. Participant IB (PATSy database pilot case)

In total, IB referred to 11 referents, using 11 unique nouns across 35 tokens (Table 8.4). However, one of these referents (referring to the item Cinderella was cleaning) was not included by any HSp, meaning there were no healthy nouns to compare in this case. Therefore, while this noun is listed in Table 8.4 for information, it is excluded from the proportional analysis reported from here. Just over half of IB's tokens (0.53) were nouns also used by the HSp and, in turn, just over half of these (0.29 of all tokens) were those with the highest context-specific frequency (see also Figure 8.3). In the remaining tokens where a healthy speaker noun was used, two of these, involving *twelve* used for midnight, still had a relatively high context-specific frequency and also had a much higher general frequency. In the other tokens, the nouns used, *gown* and *shoes*, had the highest general frequency of the those referring more specifically to the referent, that is, naming Cinderella's outfit as a gown rather than just a dress or clothes, and naming the slipper as an item of footwear rather than just a thing. In the instances where a noun other than those of the HSp was used, all (0.41 of all tokens) were nouns with a considerably higher general frequency than the healthy nouns for these referents. They were also more semantically general than those of the HSp: IB used *man*, *woman* and *lady* for the fairy godmother, prince and ugly sisters, rather than naming these characters more specifically.

Table 8.4. Nouns used by IB compared to those of the HSp.

Referent	Nouns	Frequency in HSp narratives (context-specific) (token no. in parentheses)	Frequency in IB's narrative (token no. in parentheses)	General frequency (Spoken BNC)
what Cinderella was scrubbing/ cleaning	***HALL***		1.00 (1)	844
ball	***BALL***	**0.97 (58)**	1.00 (4)	1099
	PARTY	0.02 (1)		2704
	SITUATION	0.02 (1)		2043
Cinderella	***CINDERELLA***	**0.91 (97)**	1.00 (1)	20
	GIRL	0.05 (5)		2613
	CINDY	0.02 (2)		26
	WOMAN	0.01 (1)		3680
	DAUGHTER	0.01 (1)		639
	CINDERS	0.01 (1)		0
pumpkin	***PUMPKIN***	**1.00 (16)**	1.00 (3)	2
stairs (palace)	***STAIR***	**0.60 (3)**	1.00 (1)	360
	STEP	0.20 (1)		647
	STAIRCASE	0.20 (1)		35
wand	***WAND***	**0.88 (7)**	1.00 (1)	14
	MAGIC WAND	0.13 (1)		8
midnight	*MIDNIGHT*	0.57 (13)		118
	TWELVE	**0.35 (8)**	1.00 (2)	2893
	TWELVE O 'CLOCK	0.09 (2)		94
new clothing	*DRESS*	0.50 (7)		300
	GOWN	**0.14 (2)**	1.00 (3)	56

	BALL GOWN	0.14 (2)		3
	CLOTHES	0.14 (2)		601
	BALL DRESS	0.07 (1)		2
slipper/s	*SLIPPER*	0.50 (25)		84
	GLASS SLIPPER	0.34 (17)		0
	SHOE	**0.12 (6)**	1.00 (5)	702
	THING	0.02 (1)		23028
	GOLDEN SLIPPER	0.02 (1)		0
fairy godmother	*FAIRY GODMOTHER*	0.65 (20)		8
	FAIRY	0.23 (7)		62
	GODMOTHER	0.06 (2)		10
	STEP MOTHER	0.03 (1)		6
	FAIRY GODMOTHER THING	0.03 (1)		0
	MAN		0.67 (2)	6508
	WOMAN		0.33 (1)	3680
prince	*PRINCE*	0.92 (46)		138
	SON	0.06 (3)		859
	PRINCE CHARMING	0.02 (1)		4
	MAN		1.00 (5)	6508
ugly sisters	*UGLY SISTER*	0.41 (22)		0
	STEP SISTER	0.24 (13)		1
	SISTER	0.20 (11)		801
	UGLY STEP SISTER	0.09 (5)		0
	STEP DAUGHTER	0.04 (2)		0
	DAUGHTER	0.02 (1)		639
	LADY		1.00 (6)	1396

Key to Table 8.4:

Bold indicates noun used by the participant with aphasia; blank space indicates noun not used.

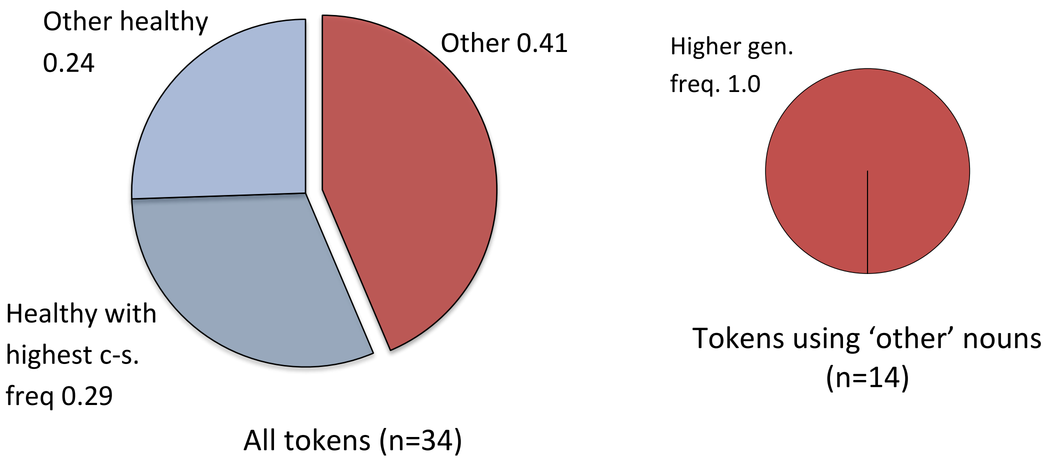


Figure 8.3. Summary of IB's noun tokens.

Key to Figure 8.3. c-s. freq.= context-specific frequency; gen. freq.=general frequency.

In terms of the production order of tokens for each referent, IB only used one noun for each referent, with the exception of her references to the fairy godmother, in which she used two nouns, *man* and *woman* (both of which were different to those of the HSp). Because of this lack of variety in nouns per referent, there is no evidence of any shift in noun use similar to that described in relation to KP's tokens (from nouns with a higher general frequency towards those with a higher context-specific frequency).

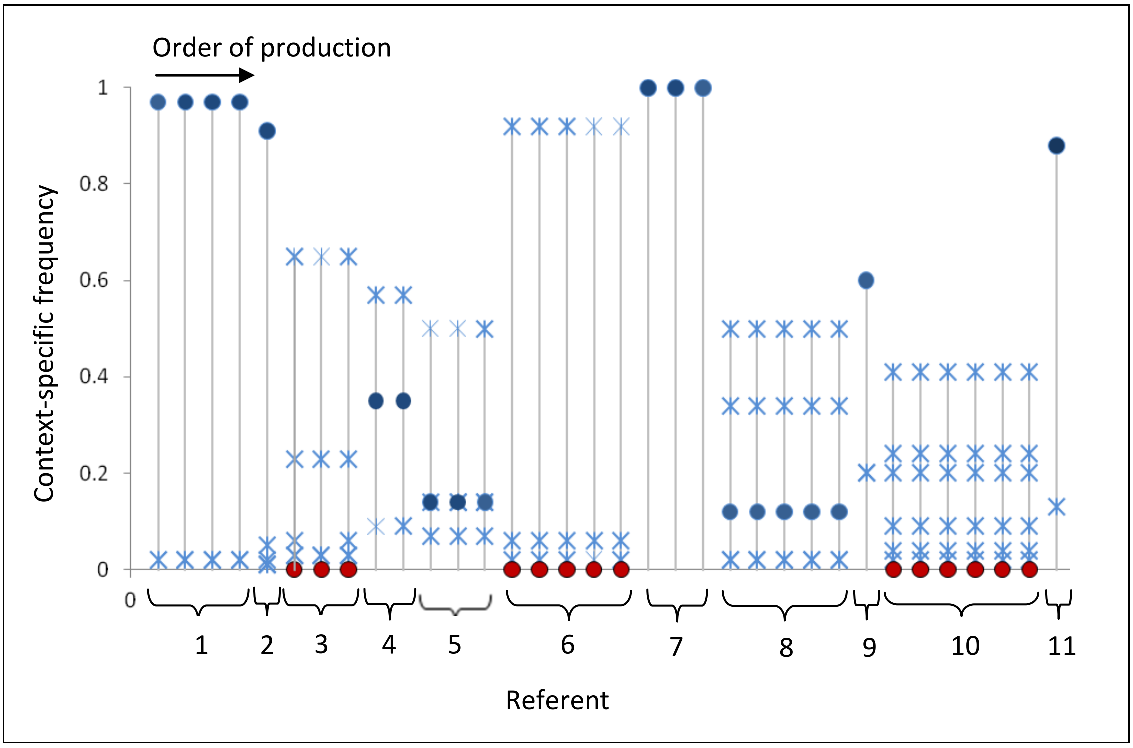


Figure 8.4. Noun tokens produced by IB, grouped by referent, then order of production

Key to Figure 8.4.

Referent

Noun used by IB, also used by Hsp

Noun used by HSp, not used by IB

Noun used by IB, not used by HSp.

Referents: 1=ball; 2=Cinderella; 3=fairy godmother; 4=midnight; 5=new clothing; 6=prince; 7=pumpkin; 8=slipper/s; 9=stairs; 10=ugly sisters; 11=wand.

8.4.4. Participant TH

TH referred to 11 referents, using 14 different nouns produced across 23 tokens (Table 8.5). One of these referents, Dandini[38], was not included by any HSp. Therefore, while this noun is listed in Table 8.5 for information, it is excluded from the proportional analysis reported from here. Of the remaining 22 tokens, most (0.86) were also used by the HSp. The majority of these were those with the highest context-specific frequency (0.77 of all tokens, see also Figure 8.5). In the remaining two tokens where a healthy speaker noun was used, the nouns were not higher in general frequency and in fact one, *step-daughter*, had no corpus entries. However, the other, *twelve o'clock*, could have been influenced by the high general frequency of *twelve*, which may have facilitated retrieval of the phrase *twelve o'clock*. Of TH's nouns that were different to those of the HSp, none were higher in general frequency than the healthy speaker nouns and two, *god-daughter* and *stepson*, in fact had very low general frequencies. The other, *princess* used for the *prince* (before being self-corrected), is similar in form to *prince* and could have been influenced by the fact that the most prominent character in the story (Cinderella) is female and becomes a princess.

[38] Dandini is a character in, for example, Rossini's opera of Cinderella.

Table 8.5. Nouns used by TH compared to those of the HSp.

Referent	Nouns	Frequency in HSp narratives (context-specific) (token no. in parentheses)	Frequency in TH's narrative (token no. in parentheses)	General frequency (Spoken BNC)
Dandini	***DANDINI***		1.00 (1)	2 [39]
Cinderella	***CINDERELLA***	**0.91 (97)**	0.83 (5)	20
	GIRL	0.05 (5)		2613
	CINDY	0.02 (2)		26
	WOMAN	0.01 (1)		3680
	DAUGHTER	0.01 (1)		639
	CINDERS	0.01 (1)		0
	GOD-DAUGHTER		0.17 (1)	0
horses	***HORSE***	**0.93 (13)**	1.00 (1)	1142
	PONY	0.07 (1)		104
mice	***MOUSE***	**1.00 (11)**	1.00 (1)	204
midnight	*MIDNIGHT*	0.57 (13)		118
	TWELVE	0.35 (8)		2893
	TWELVE O 'CLOCK	**0.09 (2)**	1.00 (1)	94
new clothing	***DRESS***	**0.50 (7)**	1.00 (1)	300
	CLOTHES	0.14 (2)		601
	GOWN	0.14 (2)		56
	BALL GOWN	0.14 (2)		3
	BALL DRESS	0.07 (1)		2
palace	***CASTLE***	**0.60 (3)**	1.00 (2)	121
	BUILDING	0.20 (1)		1462
	PALACE	0.20 (1)		140

[39] Corpus entries spelled *Dandeanee*.

prince	***PRINCE***	**0.92 (46)**	0.75 (3)	138
	SON	0.06 (3)		859
	PRINCE CHARMING	0.02 (1)		4
	PRINCESS		0.25 (1)	89
pumpkin	***PUMPKIN***	**1.00 (16)**	1.00 (1)	2
slipper/s	***SLIPPER***	**0.50 (25)**	1.00 (3)	84
	GLASS SLIPPER	0.34 (17)		0
	SHOE	0.12 (6)		702
	THING	0.02 (1)		23028
	GOLDEN SLIPPER	0.02 (1)		0
ugly sisters	*UGLY SISTER*	0.41 (22)		0
	STEP SISTER	0.24 (13)		1
	SISTER	0.20 (11)		801
	UGLY STEP SISTER	0.09 (5)		0
	STEP DAUGHTER	0.04 (2)	0.50 (1)	0
	DAUGHTER	0.02 (1)		639
	STEPSON		0.50 (1)	1

Key to Table 8.5:

Bold indicates noun used by the participant with aphasia; blank space indicates noun not used.

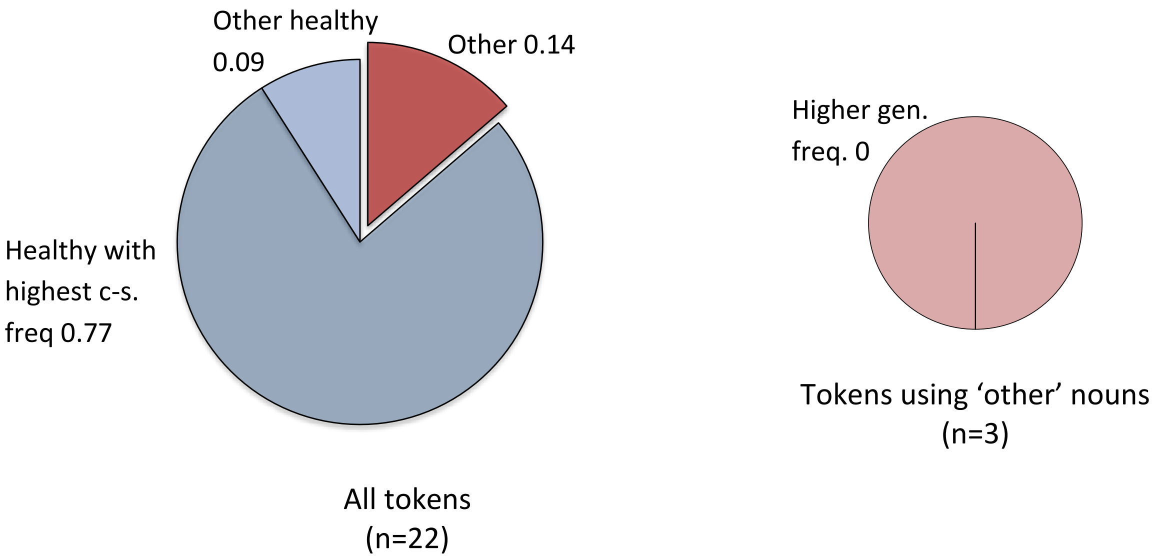


Figure 8.5. Summary of TH’s noun tokens.

Key to Figure 8.5. c-s. freq.= context-specific frequency; gen. freq.=general frequency.

The order of production of TH’s noun tokens per referent (shown in Figure 8.6) reveal a similar pattern to that of KP. When TH produces a noun other than those used by the healthy group, this is always the first of the tokens for the respective referent, before the subsequent tokens move to or towards the nouns with the highest context-specific frequency (see referents 1, 7 and 10). However, only one of these initially-used nouns (*stepson* for the ugly sisters) has a higher general frequency than the subsequent tokens for that referent.

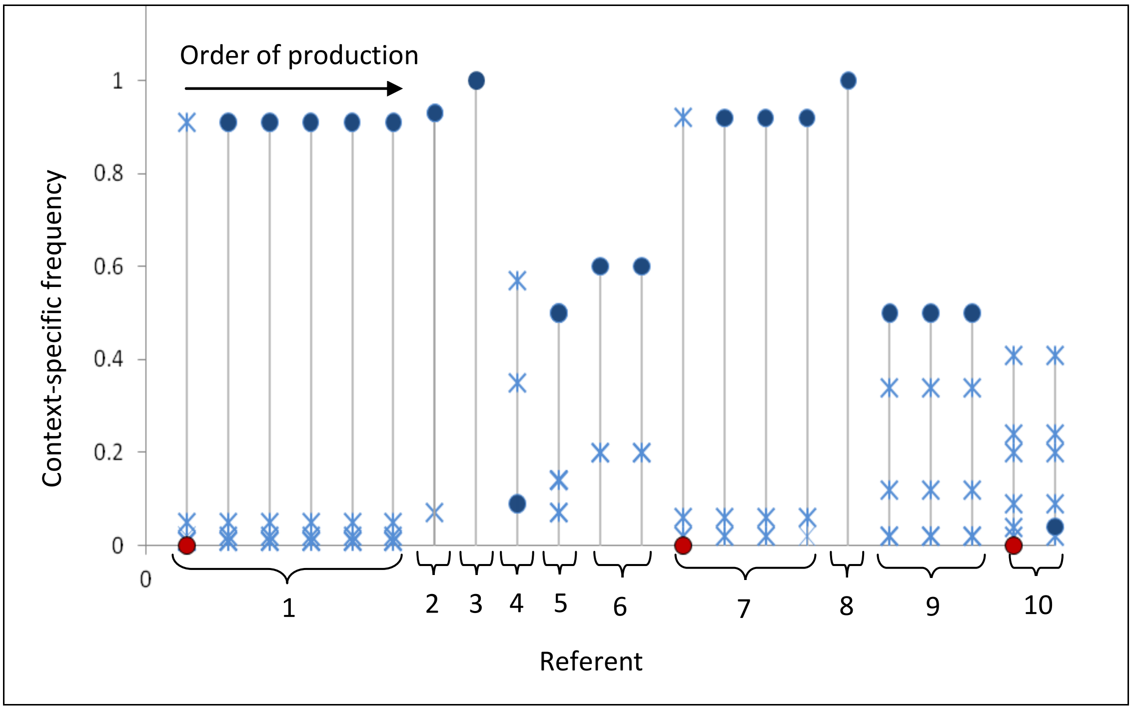


Figure 8.6. Noun tokens produced by TH in order of production per referent

Key to Figure 8.6.

| Referent

● Noun used by TH, also used by Hsp

✳ Noun used by HSp, not used by TH

● Noun used by TH, not used by HSp.

Referents: 1=Cinderella; 2=horses; 3=mice; 4=midnight; 5=new clothing; 6=palace; 7=prince; 8=pumpkin; 9=slipper/s; 10=ugly sisters.

8.4.5. Participant ST

ST referred to 13 referents, using 17 unique nouns across 27 tokens (Table 8.6). However, again, one of these tokens (referring to the item Cinderella was cleaning) had no comparable healthy nouns and is therefore excluded from the proportions now reported. As was the case for the previous participants, most of ST's remaining tokens (0.65) were nouns used by the HSp and, indeed, the majority were those with the highest context-specific frequency (0.50 of all tokens) (see also Figure 8.7). Of the tokens produced by ST that differed from those of the HSp, only two (accounting for 0.22 of the 'other' noun tokens) involved nouns with a higher general frequency than those of the HSp (*tomato* used for the pumpkin and *ladies* for the ugly sisters).

Table 8.6. Nouns used by ST compared to those of the HSp

Referent	Nouns	Frequency in HSp narratives (context-specific) (token no. in parentheses)	Frequency in ST's narrative (token no. in parentheses)	General frequency (Spoken BNC)
what Cinderella was scrubbing/ cleaning	***FLOOR***		1.00 (1)	1048
ball	***BALL***	**0.97 (58)**	0.25 (1)	1099
	PARTY	**0.02 (1)**	0.50 (2)	2704
	SITUATION	0.02 (1)		2043
	FUNERAL		0.25 (1)	171

Cinderella	***CINDERELLA***	**0.91 (97)**	0.50 (3)	20
	GIRL	0.05 (5)		2613
	CINDY	0.02 (2)		26
	WOMAN	0.01 (1)		3680
	DAUGHTER	0.01 (1)		639
	CINDERS	0.01 (1)		0
	PRINCESS		0.33 (2)	89
	QUEEN		0.17 (1)	413
clock	***CLOCK***	**1.00 (5)**	1.00 (1)	298
fairy godmother	***FAIRY GODMOTHER***	**0.65 (20)**	1.00 (1)	8
	FAIRY	0.23 (7)		62
	GODMOTHER	0.06 (2)		10
	STEP MOTHER	0.03 (1)		6
	FAIRY GODMOTHER THING	0.03 (1)		0
horse at end	***HORSE***	**0.93 (13)**	1.00 (1)	1142
	PONY	0.07 (1)		104
horses	***HORSE***	**0.93 (13)**	1.00 (2)	1142
	PONY	0.07 (1)		104
midnight	***MIDNIGHT***	**0.57 (13)**	1.00 (1)	118
	TWELVE	0.35 (8)		2893
	TWELVE O 'CLOCK	0.09 (2)		94
palace	***CASTLE***	**0.60 (3)**	1.00 (1)	121
	BUILDING	0.20 (1)		1462
	PALACE	0.20 (1)		140
prince	*PRINCE*	0.92 (46)		138
	SON	0.06 (3)		859
	PRINCE CHARMING	0.02 (1)		4

	KING		1.00 (3)	457
pumpkin	*PUMPKIN*	1.00 (16)		2
	TOMATO		1.00 (1)	185
slipper/s	***SLIPPER***	**0.50 (25)**	0.50 (2)	84
	GLASS SLIPPER	0.34 (17)		0
	SHOE	**0.12 (6)**	0.50 (2)	702
	THING	0.02 (1)		23028
	GOLDEN SLIPPER	0.02 (1)		0
ugly sisters	*UGLY SISTER*	0.41 (22)		0
	STEP SISTER	0.24 (13)		1
	SISTER	0.20 (11)		801
	UGLY STEP SISTER	0.09 (5)		0
	STEP DAUGHTER	0.04 (2)		0
	DAUGHTER	0.02 (1)		639
	(GLAMOUROUS) LADY		1.00 (1)	1396

Key to Table 8.6:

Bold indicates noun used by the participant with aphasia; blank space indicates noun not used.

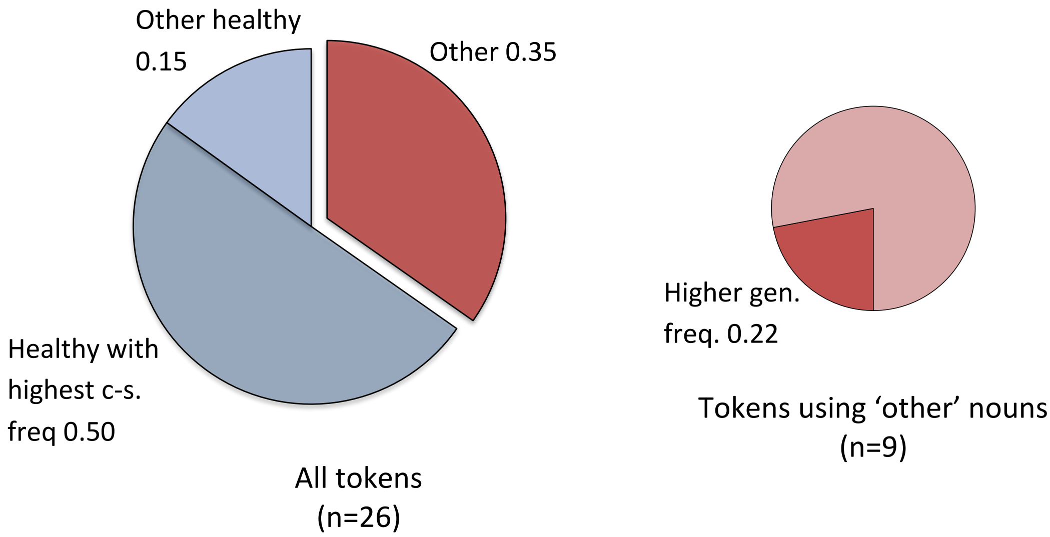


Figure 8.7. Summary of ST's noun tokens.

Key to Figure 8.7. c-s. freq.= context-specific frequency; gen. freq.=general frequency.

With regard to the order of production of ST's nouns for each referent, there is again some suggestion of the 'shifting' pattern noted in relation to KP and TH's tokens. In almost all cases when nouns other than those of the healthy group are used or healthy nouns that are relatively infrequent in the HSp narratives, these are produced when ST first refers to the referent, before he then either continues to use the same noun or shifts towards ones that are higher in context-specific frequency. This occurs for referents 1, 2, 9 and 11, although ST's tokens for referent 2 (Cinderella) also later shift back to using 'other' nouns (*princess* and *queen*). This could be because Cinderella becomes a princess/queen later in this story. In almost all cases where ST's 'other' nouns precede such a shift, the initially-used nouns have a higher general frequency than the subsequent noun, which is instead higher in context-specific frequency.

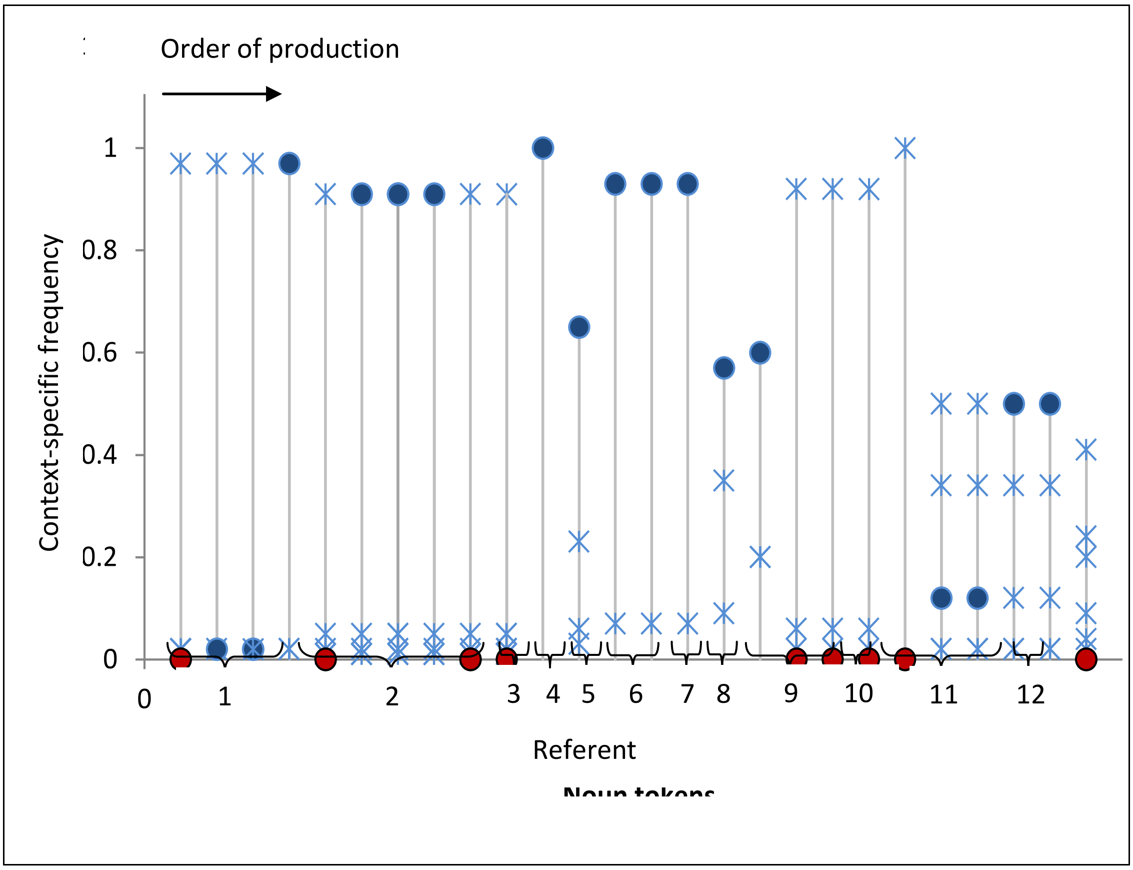


Figure 8.8. Noun tokens produced by ST in order of production per referent

Key to Figure 8.8.

Referent

Noun used by ST, also used by Hsp

Noun used by HSp, not used by ST

Noun used by ST, not used by HSp.

Referents: 1=ball; 2=Cinderella; 3=clock; 4=fairy godmother; 5=horse at end; 6=horses; 7=midnight; 8=palace; 9=prince; 10=pumpkin; 11=slipper/s; 12=ugly sisters.

8.4.6. Participant HB

HB referred to 13 referents, using 13 different nouns (including one neologism) produced across 23 tokens (Table 8.7). However, one of these tokens (referring to the item that Cinderella was cleaning) had no comparable healthy speaker nouns and is excluded from the proportions now reported. In contrast to the other participants, most of HB's tokens (0.68) were nouns other than those used by the HSp, and of the tokens when she did use a healthy speaker noun, only three of these (0.14 of all tokens) were the nouns with the highest context-specific frequency for the respective referent (see Figure 8.9). Of the instances where she produced a noun other than those used by the HSp, the majority of these (0.73) had a higher general frequency than the respective healthy group nouns.

Table 8.7. Nouns used by HB compared to those of the HSp.

Referent	Nouns	Frequency in HSp narratives (context-specific) (token no. in parentheses)	Frequency in HB's narrative (token no. in parentheses)	General frequency (Spoken BNC)
what Cinderella was scrubbing/ cleaning	***FLOOR***		1.00 (1)	1048
area searched	*LAND*	0.38 (3)		1758
	COUNTRY	0.25 (2)		2681
	ESTATE	0.25 (2)		478
	CITY	0.13 (1)		1617
	EVERYWHERE		1.00 (1)	431
Cinderella	***CINDERELLA***	**0.91 (97)**	0.33 (1)	20

	GIRL	**0.05 (5)**	0.33 (1)	2613
	CINDY	0.02 (2)		26
	WOMAN	0.01 (1)		3680
	DAUGHTER	0.01 (1)		639
	CINDERS	0.01 (1)		0
	CHILD		0.33 (1)	5124
coach	*COACH*	0.57 (12)		197
	CARRIAGE	0.43 (9)		123
	[tʃː?] [dʒə dʒɜːn lə bɪgdʒæm]		1.00 (1)	N/A
fairy godmother	*FAIRY GODMOTHER*	0.65 (20)		8
	FAIRY	0.23 (7)		62
	GODMOTHER	0.06 (2)		10
	STEP MOTHER	0.03 (1)		6
	FAIRY GODMOTHER THING	0.03 (1)		0
	THING		0.50 (1)	23028
	MAGIC WOMAN		0.50 (1)	0
horse at end	***HORSE***	**0.93 (13)**	1.00 (1)	1142
	PONY	0.07 (1)		104
horses	***HORSE***	**0.93 (13)**	0.50 (1)	1142
	PONY	0.07 (1)		104
	DONKEYS		0.50 (1)	62
palace	*CASTLE*	0.60 (3)		121
	BUILDING	0.20 (1)		1462
	PALACE	**0.20 (1)**	1.00 (1)	140
prince	*PRINCE*	0.92 (46)		138
	SON	0.06 (3)		859
	PRINCE CHARMING	0.02 (1)		4
	MAN		1.00 (2)	6508

prince's servant	*SERVANT*	1.00 (2)		159
	MAN		1.00 (1)	6508
pumpkin	*PUMPKIN*	1.00 (16)		2
	THING		1.00 (1)	23028
slipper/s	*SLIPPER*	0.50 (25)		84
	GLASS SLIPPER	0.34 (17)		0
	SHOE	**0.12 (6)**	0.50 (1)	702
	THING	**0.02 (1)**	0.50 (1)	23028
	GOLDEN SLIPPER	0.02 (1)		0
ugly sisters	*UGLY SISTER*	0.41 (22)		0
	STEP SISTER	0.24 (13)		1
	SISTER	0.20 (11)		801
	UGLY STEP SISTER	0.09 (5)		0
	STEP DAUGHTER	0.04 (2)		0
	DAUGHTER	0.02 (1)		639
	GIRL		1.00 (5)	2613

Key to Table 8.7:

Bold indicates noun used by the participant with aphasia; blank space indicates noun not used.

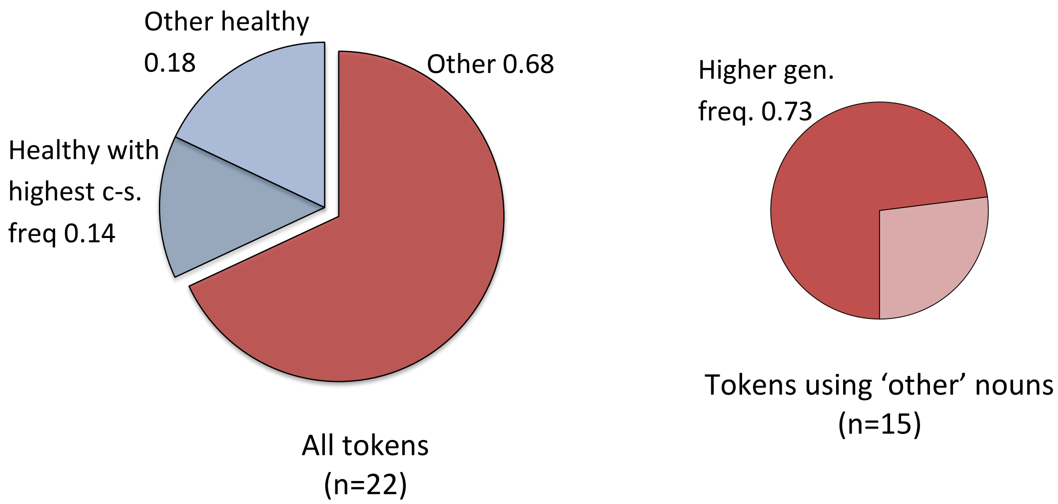


Figure 8.9. Summary of HB's noun tokens.

Key to Figure 8.9. c-s. freq.= context-specific frequency; gen. freq.=general frequency.

In terms of the production order of HB's tokens for each referent (Figure 8.10), in most cases she made repeated use of one noun per referent. However, there were four referents for which she used more than one noun. From these cases, though, it is unclear whether HB may show any 'shift' pattern of the kind described for some of the previous participants. For two referents (the horses and the slipper/s), HB's productions shift from an 'other' noun or noun with a relatively low context-specific frequency towards those with higher context-specific frequency. However, this is not so in the other two cases (for Cinderella and the fairy godmother), and one of these (Cinderella) even shows the reverse pattern. There is also no obvious link with general frequency: while HB shifts from higher to lower general frequency nouns in two cases (the fairy godmother and the slipper), the opposite shift occurs for the other two referents (Cinderella and the horses).

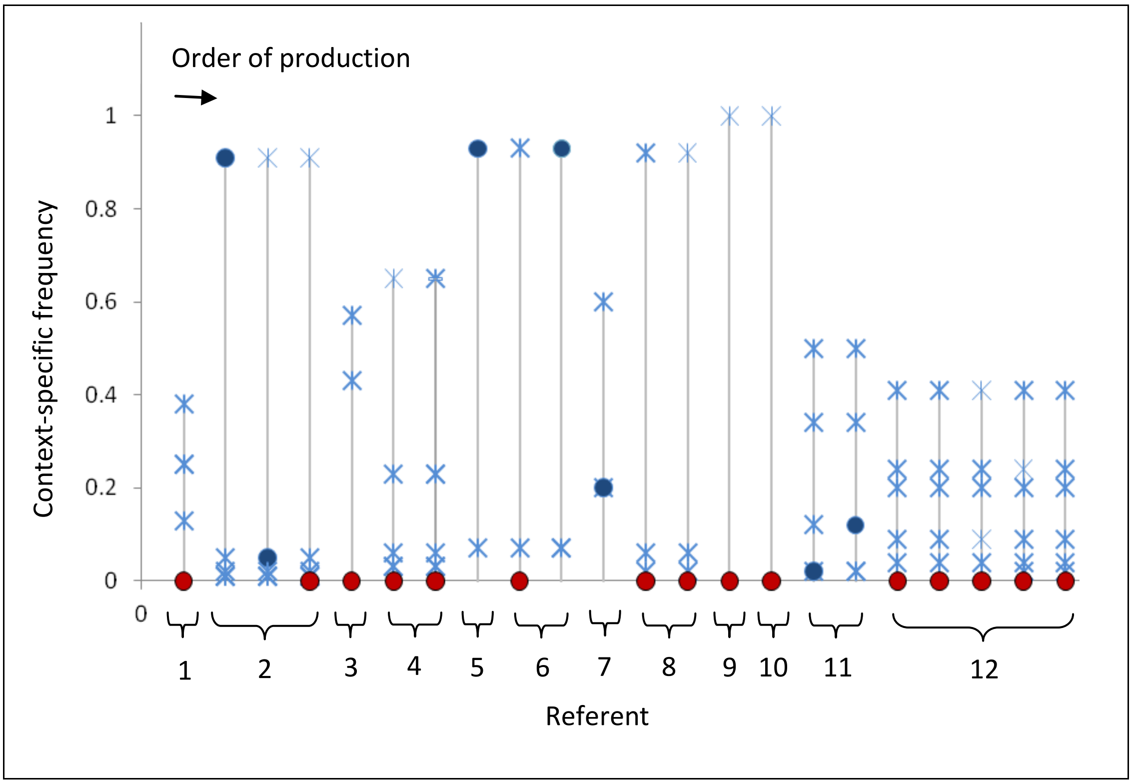


Figure 8.10. Noun tokens produced by HB in order of production per referent

Key to Figure 8.10.

| Referent

● Noun used by HB, also used by Hsp

⁎ Noun used by HSp, not used by HB

● Noun used by HB, not used by HSp.

Referents: 1=area searched; 2=Cinderella; 3=coach; 4=fairy godmother; 5=horse at end; 6=horses; 7=palace; 8=prince; 9=prince's servant; 10=pumpkin; 11=slipper/s; 12=ugly sisters.

8.4.7. Participant MH

MH referred to 22 referents, using 26 different nouns which he produced across 61 tokens (Table 8.8). Three of these referents (the hill to the palace, the palace door and the item Cinderella was cleaning) had no comparable healthy speaker nouns, and the tokens involved are therefore excluded from the proportions reported. Of the remaining 58 tokens, the majority (0.88) were ones used by the HSp and, again, most of these (0.78 of all tokens) were those with the highest context-specific frequency (see Figure 8.11). Of the remaining six tokens where MH used healthy speaker nouns, all the four nouns involved had a higher general frequency than those that were most frequent in the healthy speaker narratives, and indeed in five of these six tokens, the nouns (*twelve* for midnight and *sister* and *daughter* for the ugly sisters) had the highest general frequency of all the respective healthy nouns. The remaining token, *SHOE*, also had the highest general frequency of the healthy nouns that referred to that referent (the slipper) specifically as an item of footwear (only the less specific *thing* had a higher general frequency for this noun). Of the tokens for which a noun other than those of the HSp was used, only 0.17 had a higher general frequency than the respective healthy speaker nouns.

Table 8.8. Nouns used by MH compared to those of the HSp.

Referent	Nouns	Frequency in HSp narratives (context-specific) (token no. in parentheses)	Frequency in MH's narrative (token no. in parentheses)	General frequency (Spoken BNC)
hill to the palace (at end)	***HILL***	N/A	1.00 (1)	657
palace door	***DOOR***	N/A	1.00 (1)	3065

what Cinderella cleaned	***FLOOR***	N/A	1.00 (1)	1048
area searched	*LAND*	0.38 (3)		1758
	COUNTRY	0.25 (2)		2681
	ESTATE	0.25 (2)		478
	CITY	0.13 (1)		1617
	NEIGHBOURHOOD		1.00 (1)	130
ball	*BALL*	0.97 (58)	0.75 (3)	1099
	PARTY	0.02 (1)		2704
	SITUATION	0.02 (1)		2043
	[Ka^{nʔ}]		0.25 (1)	188
	[START OF CONCERT]			
Cinderella	***CINDERELLA***	**0.91 (97)**	0.85 (11)	20
	GIRL	0.05 (5)		2613
	CINDY	0.02 (2)		26
	WOMAN	0.01 (1)		3680
	DAUGHTER	0.01 (1)		639
	CINDERS	0.01 (1)		0
	PRINCESS		0.08 (1)	89
	MAID		0.08 (1)	69
Cinderella’s house	***HOUSE***	**0.91 (20)**	1.00 (6)	5720
	CASTLE	0.09 (2)		121
clock	***CLOCK***	**1.00 (5)**	1.00 (1)	298
coach	***COACH***	**0.57 (12)**	0.50 (1)	197
	CARRIAGE	0.43 (9)		123
	THING (big [sɜːk^{ə}lə ˅] thing)		0.50 (1)	23028
dishes	***DISH***	**1.00 (1)**	1.00 (1)	260
horse at end	***HORSE***	**0.93 (13)**	1.00 (1)	1142
	PONY	0.07 (1)		104
horses	***HORSE***	**0.93 (13)**	1.00 (1)	1142

	PONY	0.07 (1)		104
mice	***MOUSE***	**1.00 (11)**	1.00 (4)	204
midnight	*MIDNIGHT*	0.57 (13)		118
	TWELVE	**0.35 (8)**	1.00 (1)	2893
	TWELVE O ’CLOCK	0.09 (2)		94
prince	***PRINCE***	**0.92 (46)**	1.00 (7)	138
	SON	0.06 (3)		859
	PRINCE CHARMING	0.02 (1)		4
prince’s servant	***SERVANT***	**1.00 (2)**	1.00 (2)	159
pumpkin	***PUMPKIN***	**1.00 (16)**	1.00 (3)	2
slipper/s	***SLIPPER***	**0.50 (25)**	0.50 (1)	84
	GLASS SLIPPER	0.34 (17)		0
	SHOE	**0.12 (6)**	0.50 (1)	702
	THING	0.02 (1)		23028
	GOLDEN SLIPPER	0.02 (1)		0
stairs at palace	***STAIR***	**0.60 (3)**	1.00 (1)	360
	STEP	0.20 (1)		647
	STAIRCASE	0.20 (1)		35
stairs in Cinderella’s house	***STAIR***	**0.60 (3)**	1.00 (2)	
	STEP	0.20 (1)		
	STAIRCASE	0.20 (1)		
ugly sisters	*UGLY SISTER*	0.41 (22)		0
	STEP SISTER	0.24 (13)		1
	SISTER	**0.20 (11)**	0.20 (1)	801
	UGLY STEP SISTER	0.09 (5)		0
	STEP DAUGHTER	0.04 (2)		0
	DAUGHTER	**0.02 (1)**	0.60 (3)	639
	NEIGHBOUR		0.20 (1)	416

Key to Table 8.8:

Bold indicates noun used by the participant with aphasia; blank space indicates noun not used.

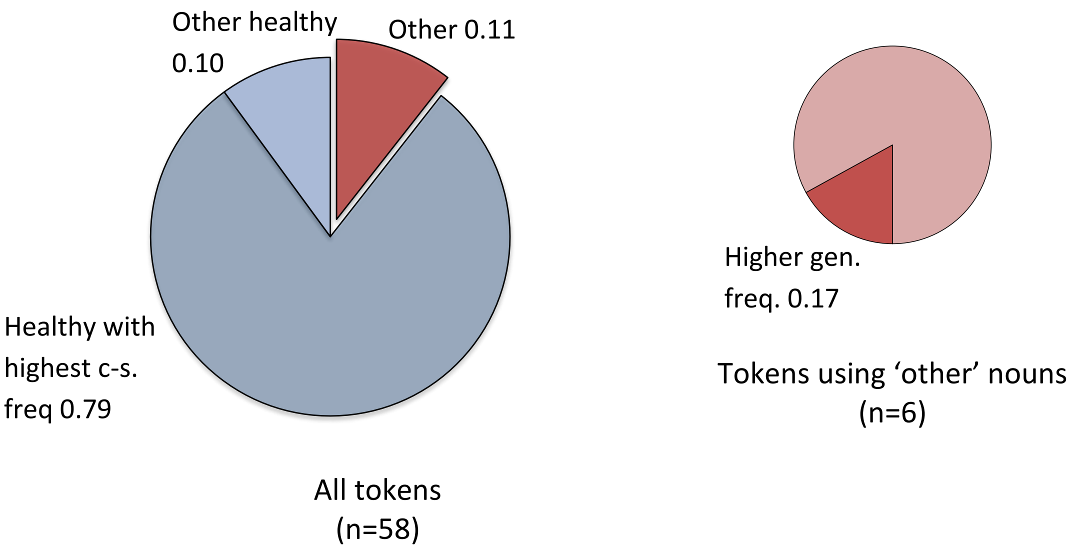


Figure 8.11. Summary of MH’s noun tokens.

Key to Figure 8.11. c-s. freq.= context-specific frequency; gen. freq.=general frequency.

The production order of MH’s tokens for each referent can be seen in Figure 8.12. Here MH’s tendency to use the nouns with the highest context-specific frequency can be seen clearly (most of his productions being the noun at the top of each line). There is also some small suggestion of the shifting pattern mentioned for previous participants (in MH’s references to the ball, the coach and to some extent the ugly sisters), but this is not prominent in MH’s productions. These shifts also do not show any clear link with general frequency (the movement is from higher to lower frequency nouns for two referents (the coach and slippers), but in the opposite direction for the other two (the ball and ugly sisters)). Moreover, MH’s tokens for the referent Cinderella in fact show movement in the opposite direction. Here MH produces the noun with the highest context-specific frequency, *Cinderella*, from the outset and only produces the two ‘other’ nouns (*princess* and *maid*) after 11 tokens of this noun. The use of these ‘other’ nouns at this point seems to relate to the storyline context, rather than being linked with frequency, because the terms used are appropriate for the perspective from which Cinderella is referred to at the point of production.

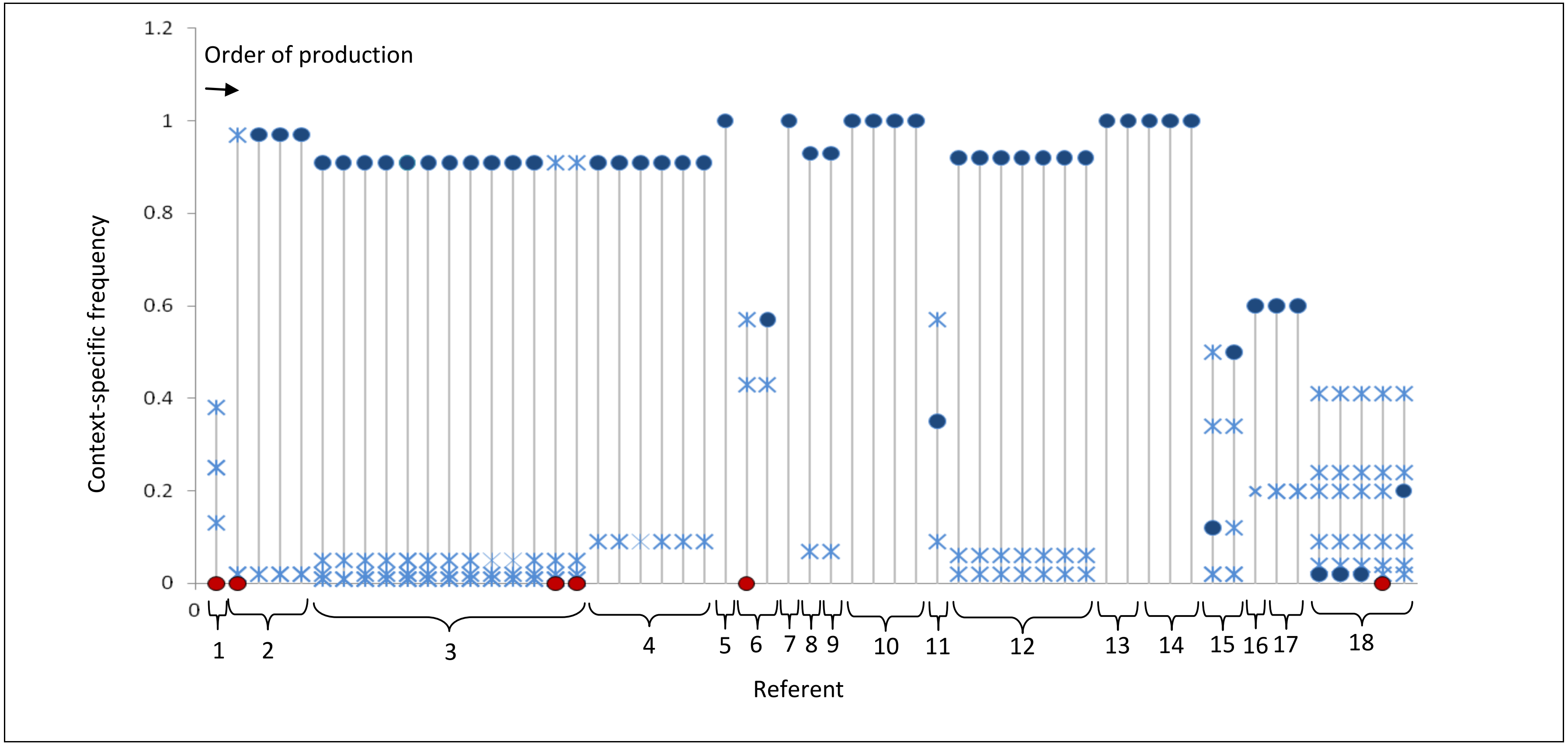


Figure 8.12. Noun tokens produced by MH in order of production per referent

Key to Figure 8.12.

Referent

Noun used by MH, also used by Hsp

Noun used by HSp, not used by MH

Noun used by MH, not used by HSp.

Referents: 1=area searched; 2=ball; 3=Cinderella; 4=Cinderella's house; 5=clock; 6=coach; 7=dishes; 8=horse at end; 9=horses; 10=mice; 11=midnight; 12=prince; 13=prince's servant; 14=pumpkin; 15=slipper/s; 16=stairs at the palace; 17=stairs in Cinderella's house; 18=ugly sisters.

8.5. Discussion

8.5.1. Findings

Before discussing which nouns were used, it is interesting to summarise the noun token numbers across participants (see again Table 8.2). Firstly the 'raw' number of tokens increased with greater expressive ability (WAB fluency rating) across the PWA. This supports the idea that those with less severe aphasia should have more constructions at their disposal generally and are therefore likely to produce more tokens (and words) overall. However, the proportion of nouns per narrative in fact decreased with greater expressive ability/ increased fluency rating and this could support previous research suggesting that nouns are more impaired in people with (the fluent) anomic and Wernicke's aphasias. However, another possible explanation for this is that if such speakers have access to more constructions generally, they could produce more items from a wider variety of grammatical classes. Therefore, the proportion of nouns are likely to then be reduced compared to in individuals who have fewer constructions overall. Therefore, it may not be the case that people with fluent aphasia are impaired on nouns as a class, but that they have a greater number and variety of other words, leading to a reduction in the *proportion* of words that are nouns.

It is also interesting to comment briefly on the inclusion rates for the participants' nouns (recall that only nouns that referred to discernible items in the storyline were included in the study; see Appendix XII for other criteria). These were similar amongst the participants with more limited expressive language, all being relatively high. Indeed, the inclusion rates for two of these speakers were higher than both the healthy mean and the fluent PWA. An explanation for this could be that the individuals with more severe aphasia are more likely to produce concrete or imageable nouns rather than those used with a more abstract or metaphorical meaning. Concreteness and imageability are recognised as having facilitatory effects on, for example, picture naming in aphasia (e.g. Nickels, 1995) and a greater reliance on concrete words has also been reported in the spontaneous speech of some PWA (e.g. Goodglass, 1969). Such a reliance could be more likely in individuals with more severe aphasia and in the current study, that could lead to a higher inclusion rate of nouns in the analysis, because only nouns referring to discernible referents in the story (mainly concrete) were included. The less impaired PWA and the HSp had some nouns excluded due to these being used with an abstract meaning but this was not the case for the most impaired speakers, whose exclusions were mainly productions that were concrete nouns but whose referent could not be ascertained. The latter also applied in the fluent cases and was particularly so for HB's productions as this speaker often produced nouns with a high level of semantic generality for which referent identification was difficult (see methodological considerations below). This led to HB's noun inclusion rate being the lowest of all the participants.

In terms of the nouns used by the PWA, in five of the six participants, the majority were nouns also used by the HSp for the same referents. In addition, these nouns were mostly those with the highest context-specific frequency for the referents concerned, regardless of whether they had a high general frequency. These findings support the idea of context-specific frequency effects: despite having a low general frequency, an item might be highly frequent within a given context and this could make it more likely to be produced than others in that context. From a constructivist, usage-based perspective, such context-specific frequency effects would be plausible because all language is comprised of constructions (form-meaning pairings) acquired through individuals repeatedly encountering the same forms being used with the same meaning in similar situations. The context of production therefore directly influences the functional/pragmatic properties acquired that contribute to the meaning component of a construction (e.g. Croft & Cruse, 2004; see section again 2.4.1).

The one exception to this pattern was participant HB, who actually produced more tokens of nouns that were other than those of the healthy group. In addition, the healthy nouns that she did use were mostly not those with the highest context-specific frequency. This suggests that HB's nouns are less affected by the context-specific frequency effects in this narrative. This is likely to be due to the fact that individuals will have been exposed to a given story to different degrees and the words that are highly specific to that narrative will be less entrenched in that narrative context in some speakers. That is, rather than some individuals simply being vulnerable to context-specific frequency effects and some not, the effect should depend on the particular individual's familiarity with the specific narrative in question. This could explain the particularly high proportion of healthy nouns and indeed of those with the highest context-specific frequency observed for TH and MH. TH's use of the name *Dandini* (a character from Rossini's opera version of Cinderella) suggests that she may have a relatively high level of familiarity with the story. Also, MH mentioned after the task that he was very familiar with the Cinderella story through reading it to children.

The tendency of most participants to mainly use 'healthy' nouns meant that in some cases there were few tokens of 'other' nouns to analyse for any link with general frequency. Indeed, no such effect was noticeable in most participant cases. It could simply be that some speakers do not reveal general frequency effects because these frequency levels differ from the individual's own familiarity with the nouns. However, it is possible that such effects would emerge with greater token numbers. In fact, in the two PWA who produced the highest number of 'other' noun tokens (IB and HB), the majority of these were indeed higher in general frequency (1.00 and 0.73) than the respective healthy nouns. It is also interesting that the 'other' nouns used by these speakers were often much more semantically general than those of the healthy group for the same referents. For example, IB and HB used nouns such as *man*, *woman* and *thing* for characters that were usually referred to by HSp using proper nouns. These more general nouns may be easier for PWA to produce because of their high general frequencies and can also 'cover more ground' as they can be used for a wider range of referents. This would fit with the finding in other studies that proper names may be more difficult for some PWA to retrieve than common nouns (see, for example, Yasuda, Beckmann, & Nakamura, 2000, for an overview).

An additional observation was that there may be some effect of production order on the nouns produced. In four of the participants, there was some hint of a ‘shift’ tendency in which the ‘other’ nouns or nouns lower in context-specific frequency were produced when first referring to a referent, before subsequent productions for that referent utilised nouns that were higher in context-specific frequency. It is difficult to assess such a possible tendency with the number of nouns in the current data. However, this could be examined in larger speech samples. If found, such a tendency might suggest that the first production referring to a referent is the more difficult and participants retrieve whichever noun they can that most closely represents the referent. Retrieval of this might then help to activate similar nouns, including those which are more specific to the relevant context. It would be interesting to examine the potential interplay between context-specific and general frequency effects in relation to any such shifts.

8.5.2. Limitations and methodological considerations

There are several limitations and methodological considerations with this study. Of course, there are general limitations, for example that the participant sample is relatively small and, in particular, contains only one or two speakers of each aphasia type/severity. It would be useful to include a greater number and variety of PWA in future studies of this kind. These issues are also taken up in the general discussion (chapter 11).

In terms of data extraction, this study has highlighted the difficulty of assigning grammatical class to some productions in aphasia and particularly of identifying referents of some nouns. The latter is made especially difficult by the fact that some individuals seem to rely on semantically general nouns, for example, *man*, *woman* or *thing*, which have more potential referents than nouns with a more specific meaning. This problem can be further exacerbated by the fact that the linguistic context of production may also be lacking or ill-formed, and therefore does not provide the extra clues to a noun’s referent that might be available in healthy spoken language. Another consideration is that a noun that may be appropriate for one referent, such as *ball* referring to the event held by the prince, may actually be a paraphasia for another referent. This was the case for one of ST's nouns, *ball*, which was eventually excluded because the exact referent could not be ascertained. This noun happens to be the most frequent of the healthy group nouns to describe the event held by the prince. However, it was clear from ST's gestures as well as the production context that this was in fact a visual paraphasia for the pumpkin or the coach (both of which were ball-shaped in the picture book that ST viewed prior to the task). This highlights the need for careful consideration of both video and audio data, where available, and thorough examination of the production context in both cases.

There are also a number of limitations relating to frequency measurements. Firstly, as mentioned, the distinction between frequency and familiarity must be considered: whilst general frequencies derived from corpora provide an estimate of an item's frequency in general usage, these do not equate to individual speakers' levels of familiarity with the item. Apart from this, the frequency of words in the corpus is not the *construction* frequency but only the frequency of its orthographic form. The entries in the corpus include all uses of the form, which may be polysemous and not have been used with the same meaning/ function as the form when used by a participant. An example of this is *ball*, used in the narrative context to refer to the event held by the prince, but whose corpus entries often refer to the ball in football contexts. This potential mismatch between the participant's item and the usage of the form in corpus entries could be heightened in aphasic language, since PWA commonly use words to convey meanings that deviate considerably from the words' meanings in conventional usage. Therefore, the corpus entries are unlikely to truly reflect the construction used by the PWA. Another limitation is that the general frequencies of nouns could not be compared directly with the context-specific frequencies. This is because it was not possible to measure the general frequencies of a noun as a proportion of all noun tokens referring to a given referent, as separation of the corpus entries by referent would be extremely laborious.

Also, crucial to the constructivist, usage-based approach, is that the study did not consider frequency effects beyond the single-word level and this is an important area for examination. Such effects are addressed in the analysis of verbs (chapter 10), but it would also be interesting to examine these frequency effects on noun phrases, which may offer some explanation for any unevenness observed within individuals in, for instance, their use of (obligatory) determiners (see chapter 10 for examples).

It should also be remembered that this study only examined the noun lemmas rather than distinguishing whether these were produced in their singular or plural forms. If the general frequencies of the exact (lexical) forms of the nouns used by participants were considered instead, the frequency relations between the different nouns for a given referent may be different to those of the lemmas. In addition, differences were observed between the grammatical number used for some nouns by the PWA compared with those used for the same referent by the HSp. This is the focus of chapter 9.

Another area that was not examined in this study was how the structuring of information in a narrative, such as the marking of new and given information, could affect the nouns used. That is, it was noticed that the HSp sometimes used more general nouns (e.g. *girl*) when first introducing referents, before using more specific terms (e.g. *Cinderella*) once the referent had been established as given information. In contrast, some of the PWA (e.g. IB and HB) continued to use such general terms throughout their narratives, regardless of whether the referent already constituted given information. This would be an interesting area for future research and could also include analysis of pronoun use. Some difference was also seen between nouns that refer directly to a referent and those that describe a referent from another character's perspective. For example, Cinderella was often termed *Cinderella* when referred to directly but was referred to using the noun *girl* when the speaker was describing her from the prince's perspective, that is, as an unknown girl. It would be interesting to examine these differences more closely in PWA and HSp.

These observations have potential methodological implications and suggest that research into frequency effects also needs to consider any potential influence of context-specific frequencies, since these could have a greater effect than general frequency on certain items in a given context, depending on the language that the individual speaker has been exposed to. In turn, the findings also have clinical implications since while general frequency of words is taken into account in some clinical tests, any context-specific frequency is not. These issues will be returned to in the general discussion (chapter 11).

8.6. Conclusion

In conclusion, for most of the PWA in this study, the nouns produced were mainly ones used by the HSp and, in fact, the majority were those that were most frequent in the healthy speaker narratives, that is, with the highest context-specific frequency. This supports the prediction of constructivist, usage-based theory that constructions are highly linked to their context of usage and thus can be subject to context-specific frequency effects. The nouns of one participant, however, did not show any such effects and instead, her productions seemed to be more affected by general frequency. This may reflect a lower level of familiarity on the part of this speaker with the particular context (the Cinderella story) and suggests that in such cases, general frequency may be more influential. These findings have implications for aphasia assessment and therapy, which typically consider general but not context-specific frequency effects.

9. Errors with grammatical number of nouns

9.1. Introduction

Chapter 8 examined the nouns produced in the Cinderella narratives. However, this focused on noun *lemmas* without considering whether these were produced with the ‘correct’ grammatical number for the context. In fact, pluralisation errors were observed in some cases, that is, the plural being used when the singular was expected from the narrative or linguistic context. These errors were initially noticed when speakers referred to the glass slipper that Cinderella lost on leaving the ball, for instance:

> *and one (.) one (2.5) one (.) shoes*
>
> (Case IB reported on the PATSy database, Lum et al. 2012)

In this example, the noun’s singular is required by both the narrative and linguistic context (the loss of one slipper and the preceding quantifier *one*, respectively), and the latter suggests that the singular was intended; yet the plural was produced. Such errors are interesting for models of inflection, and particularly in distinguishing rule-based and constructivist, usage-based accounts. The main models will now be summarised, focusing on their implications for noun inflection, before reviewing the relevant literature on this in aphasia.

There are three main approaches to inflection in the psycholinguistic literature. Firstly, ‘full-listing’ theories take the stance that ‘morphologically-complex’ items, such as inflected forms, are simply stored and processed as wholes, that is, regular and irregular singulars and plurals all have separate representations (e.g. Butterworth, 1983). A contrasting group of models have adopted a ‘decompositional’, rule-based approach, proposing that while singulars and *irregular* plurals are stored as wholes, *regular* plurals are stored decompositionally and are composed of the stem plus plural morpheme via application of a rule (e.g. Marcus, 1995; Pinker, 1999). This proposed rule acts as a default that applies when memory of stored whole pluralized forms is not accessed and therefore only applies to regular, not irregular, plurals. Finally, an alternative group of theories combine the approaches of the other two. These still propose that singulars and irregular plurals are stored and processed as wholes. However, they state that *regular* plurals can be processed either as wholes or as morphologically-decomposed representations (e.g. Baayen, Dijkstra & Schreuder, 1997; Schreuder & Baayen, 1995).

Constructivist, usage-based theory is arguably compatible to some extent with this third approach. It too predicts that singulars are stored and retrieved as wholes, and that regular plurals can either be retrieved as wholes (especially if they are more frequent and entrenched as plurals), or created by combining the singular (stem) with the plural. Note, though, that this latter process does not require a default rule. Rather, it can be achieved by unification of the singular with a partially-filled plural construction (e.g. [N] *s*), if the speaker in question has a productive construction of this kind. If they do not, their regular plurals should be limited to those already encountered and stored as wholes. Irregular plurals, which differ from the singular in less predictable ways (e.g. vowel changes to the stem), can also simply be retrieved if they have already been encountered and stored. If they have not, the plural may be formed by analogy with any similar irregular nouns for which the speaker does have a stored plural (see also Ambridge & Lieven (2011) for a more detailed overview of this approach to inflection).

In the context of aphasia, research on inflection has largely focused on verbs, especially in relation to speakers with agrammatism (e.g. Bastiaanse, Rispens, & van Zonneveld, 2000; Faroqi-Shah & Thompson, 2004; 2007; see also chapter 10), who are typically characterised as showing a lack or reduction of inflection (e.g. Saffran, Berndt & Schwartz, 1989). Analyses of noun inflection often form part of wider studies that also investigate verbs, to assess inflection accuracy between, or overall across, the two classes (e.g. Shapiro & Caramazza, 2003; Tsapkini, Jerema & Kehayia, 2002). Of the noun examinations, some have offered evidence in favour of the decompositional, dual-route approach by reporting ‘selective deficits’ for either regular or irregular inflection. For example, Miozzo (2003) tested the ability of AW, a speaker with anomia, to produce noun plurals (and past simple and past participle forms of verbs) when presented with the noun singulars (and verb stems). The results revealed a dissociation, with AW responding more accurately on regular than irregular forms. Such a dissociation was also reported by Miozzo, Fischer-Baum and Postman (2010), but with the pattern reversed. This study examined the ability of another speaker with aphasia[40], JP, to produce noun singulars and plurals in picture naming and a word elicitation task. While JP showed preserved production of noun stems and irregularly inflected nouns, his *regular* inflections of both nouns and pseudonouns was impaired, with singulars and plurals being similarly affected. Both this study and Miozzo (2003) argued that such dissociations indicate that regular and irregular plurals are accessed via separate mechanisms and that the findings therefore fit dual-mechanism, words-and-rules accounts. In contrast, the results would pose difficulties, it was concluded, for connectionist models, which do not distinguish between regular and irregular inflection mechanisms.

There are, however, a number of problems with this argument (and with the methods used in the studies; see below). Firstly, the default rule posited for regular noun inflection in decompositional approaches should apply ‘across the board’. Therefore, an impairment with this mechanism should affect all nouns supposedly subject to that process, but this was not the case, at least in Miozzo et al. (2010). While JP was reported to show a deficit with regular noun inflection, he in fact correctly inflected a substantial number of regulars (0.84 in picture naming; 0.77 in noun elicitation; 0.74 in pseudonoun elicitation), which contradicts the idea that the

[40] No type was assigned for JP’s aphasia, but this appears to be non-fluent, as his “spontaneous speech was severely reduced showing the distinctive pattern of agrammatism” (Miozzo et al., 2010, p.2429).

mechanism applies across the board[41]. Instead, JP's ability to correctly inflect at some times but not others fits the unevenness predicted by constructivist, usage-based theory (see again section 2.3). In addition, JP's errors with regular nouns included pluralisation errors of the kind noted for IB above (e.g. *brooms* instead of *broom*; Miozzo et al., 2010, p.2431), and these are particularly problematic for the proposal of rule-application. JP is reported to have no impairment with noun stems and therefore it should be easier for him to produce the (uninflected) singular than the plural, which would require addition of the suffix via rule application. However, this is contradicted by the pluralization errors, in which he in fact produced the supposedly more complex form over the singular. This finding is more compatible with approaches that propose that at least some regular plurals are stored as wholes.

This proposed whole-form storage of some regular plurals also has implications for predictions regarding frequency effects on the retrieval of the different forms. Since in decompositional approaches, only stems and irregular plurals are stored, only these are expected to show frequency effects; regular plurals are computed online each time they are produced and should therefore not be subject to frequency effects. In contrast, if some regular plurals are stored as wholes, as the constructivist, usage-based approach predicts, these stored plurals should be subject to frequency effects, along with irregular plurals and singulars.

Noun frequency was taken into account by Miozzo (2003), who matched the regular and irregular nouns for lemma frequency, but if these frequencies were taken (as those for verbs were) from Francis and Kucera (1982), these are *written* frequencies and are therefore less appropriate for use in relation to the language tests used in the study, which required spoken responses to spoken stimuli. Another study, by Wilson et al. (2014), investigated the effects of frequency as well as regularity on the

[41] In Miozzo (2003), AW, who was reported to have an impairment with irregular but not regular plurals also in fact made an error with a regular plural (error proportion: 0.05). This also seems to contradict the idea that rule application is default, as she should be able to inflect all regular nouns correctly if she can inflect any noun of this kind. However, no information is provided regarding the nature of this one error, which limits analysis in this instance.

ability of patients with primary progressive aphasia (PPA) to inflect nouns (and verbs). In all three types of PPA examined, scores were higher for regulars than irregulars and for high- versus low-frequency nouns, although a specific deficit for inflecting low-frequency, irregular forms was only associated with one of the PPA variants (semantic PPA). However, the findings were mainly based on the grouped results for nouns and verbs together. Also, since this study was interested in 'pure' number errors, responses in which a different word was produced (e.g. *kid→children*) were excluded. Since some of these also involved 'inflection' errors, some tokens in which the incorrect grammatical number had been used were not examined. It would be interesting to investigate all such tokens with erroneous number.

Importantly, though, there is also little consideration, either in Wilson et al.'s study or in those by Miozzo and colleagues, of each noun's singular and plural frequencies individually, or of the relations between these frequencies, that is, the noun's 'dominance'. From a constructivist, usage-based view, nouns that are more frequent in the singular than the plural (singular-dominant) should be more likely to be produced in their singular form. In contrast, those that are more frequent as plurals (plural-dominant) should be more likely to be produced in this form. Consequently, a noun's dominance could affect which of its forms is retrieved, and thus impact on the inflection accuracy recorded.

The effects of dominance have been investigated, however, by Biedermann, Lorenz, Beyersmann & Nickels (2012). They examined noun production and comprehension in two participants with fluent aphasia, FME and DRS, using picture naming and written and spoken word-to-picture matching, and reported mixed findings for the two speakers. FME's responses on the production and comprehension tests revealed no significant difference between singular-dominant singulars and plurals or between plural-dominant singulars and plurals. For DRS, however, although there was no significant difference between plural-dominant singulars and plurals (with accuracy in fact being greater for singulars), in the singular-dominant condition, she performed significantly better on singulars. These findings held in both the production and comprehension tasks. Similar results to those of DRS were also found for a group of 38 unimpaired speakers and two participants with fluent aphasia by Biedermann, Beyersmann, Mason and Nickels (2013). Using spoken picture naming, this study again found no difference between plural-dominant singulars and plurals, but in the singular-dominant condition, singulars were responded to more quickly and were less error-prone than plurals. From this, it was concluded that plural-dominant plurals may be stored differently from singular-dominant plurals, and that the findings fit a model of the type proposed by Levelt, Roelofs and Meyer (1999; see Figure 9.1), in which plural-dominant plurals (and all singulars) are stored as wholes, whereas singular-dominant plurals are accessed decompositionally.

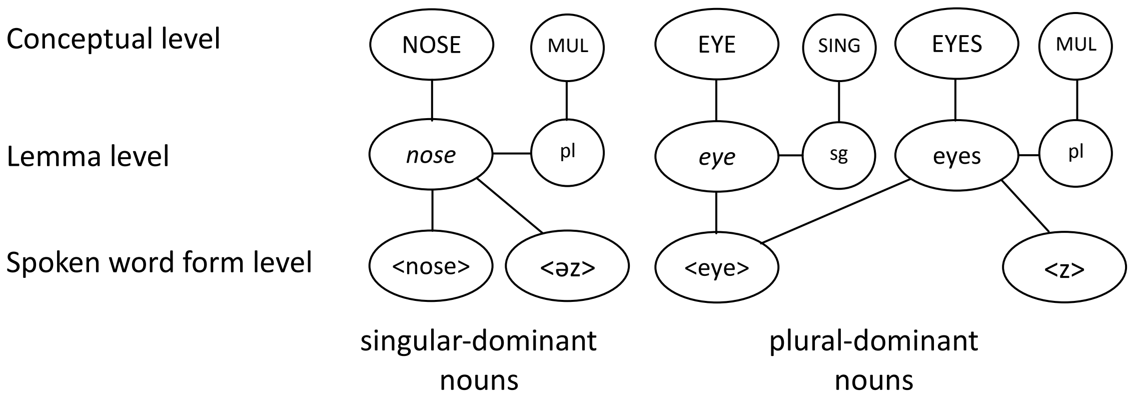


Figure 9.1. Levelt, Roelofs and Meyer's (1999) "Possible representations of plural morphology for singular-dominant nouns […] and for plural dominant nouns […]" (p.13). Reproduced from Levelt et al. (1999, p.13) (see also Biedermann et al., 2012, p.987).

In both these studies by Biedermann and colleagues, though, there are considerations with the frequencies used, which were lemma and word form frequencies from the CELEX corpus (Baayen, Piepenbrock, & van Rijn, 1993). Firstly, the English frequencies in this corpus are from British English speakers, but it is unclear whether the studies' participants were also speakers of British English (the research was conducted while the main author was based at an Australian university). If they were not, this could lessen the fit between the retrieved frequency levels and the participants' familiarity levels with the test items. In addition, the frequencies used were based on both the spoken and written frequencies from the corpus. There is an argument here for separating the frequencies in the two modalities, that is, using only spoken frequencies for tasks involving spoken production and auditory comprehension and using written frequencies for those involving written production and comprehension.

In any case, all of the research found in the literature on grammatical number errors in aphasia in relation to noun dominance examines these quantitatively using experimental testing. No studies appear to investigate this area in more spontaneous speech of PWA, and specifically, no research seems to consider the errors from a constructivist, usage-based approach. If such an account holds true, the more frequent form of the noun should be more likely to be produced than the less frequent form. Therefore, it is predicted that the errors will involve production of the more frequent form. In this case, though, errors should also be expected in both directions: if the plural is more frequent, then a pluralization error might be expected. However, if the singular is more frequent, then retrieval of this form in place of the plural (referred to hereafter as a 'singularisation error') may occur. In addition to this, none of the existing studies appear to investigate a speaker's repeated uses of the same noun, which could help to make predictions regarding the constructions these individuals have at their disposal.

The present study therefore examines all errors with grammatical number in the current data, to investigate any relationship with frequency, the direction of errors, and the speakers' flexibility with the nouns involved in the errors. In doing so, it provides both quantitative and qualitative analyses of such errors in a more spontaneous speech context.

9.2. Aims

The study investigated the following research questions:

(1) Do the errors suggest any relationship with frequency (noun dominance)? Are the forms produced in the errors more or less frequent than the forms expected?

(2) In which direction are the errors made? Do these involve singularisation or pluralisation?

(3) What levels of flexibility do speakers show throughout the narrative with the nouns produced in the errors?

9.3. Considerations regarding frequency calculations

As an added component to the study, it was decided to make three different frequency comparisons in case these affected which of a noun's forms was more frequent overall. The constructions of interest in this study were those of the nouns' singular and plural forms. Therefore, frequency values can be retrieved simply by searching for the noun's singular and plural. However, for regular nouns there are several other forms of the noun that share a common phonological form with the plural (see Table 9.1).

Table 9.1. Examples of noun forms with the same phonological form as the plural

<table>
<tr><th>Item</th><th>Orthographic form</th><th>Phonological form</th></tr>
<tr><td>plural</td><td>girls</td><td rowspan="5">[gɜːlz]</td></tr>
<tr><td>singular possessive</td><td rowspan="3">girl’s</td></tr>
<tr><td>contracted singular + copula</td></tr>
<tr><td>contracted singular + auxiliary has</td></tr>
<tr><td>plural possessive</td><td>girls’</td></tr>
</table>

As well as sharing the same phonological form as the plural, these forms also share a substantial amount of semantic content with this (since they are all forms of the same noun). Therefore, it might be expected that these forms, too, receive some activation when the noun lemma is accessed and their frequencies could thus influence whether or not the phonological form of the plural is the one produced. With this in mind, a second frequency comparison can be made, between the singular versus any form of the noun with the same phonological form as the plural, in case this changes the overall frequency relations between the two phonological forms.

A further consideration is that there may also be homophones of the singular and plural forms of some nouns (items that differ in meaning but share the same phonological form, such as *maid*/ *made* or *feet*/ *feat*). Since these are phonologically identical to one form of a target noun, it could be that their frequency values also affect which form is produced. Consequently, a third comparison can investigate the total frequency of any words with identical phonological forms to the singular versus the total frequency of any words with identical phonological forms to the plural, to establish whether this affects which phonological form of the noun is more frequent overall (see 9.4.3. for a summary of these comparisons).

9.4. Method

9.4.1. Participants

This study examined the narratives from all twelve PWA (see chapter 5 for participant profiles). The twelve healthy speaker narratives were also examined for points of comparison.

9.4.2. Noun extraction and coding

Following the procedures in Appendix X, all noun tokens were identified in each narrative, noting the target nouns of any produced as paraphasias. All tokens were then coded for grammatical number and 'correctness' of grammatical number following the same protocol. In brief, the grammatical number of each token was classified as correct or incorrect (based on its appropriateness for the narrative/ linguistic context). To accommodate the difficulties involved in interpreting aphasic speech, a further 'unclassified' category was included for tokens whose correctness of grammatical number could not be ascertained and were therefore potential errors. These procedures were tested and found to be reliable within and between raters (see Appendix XI)[42].

Decisions were then made to exclude the following from the data after noun coding:

(i) neologisms, defined here as nonwords that are not approximations of recognisable target words, that is, those productions "…with no, or only remote (fewer than 50% of phonemes in common), relation to the target" (Boyle, 2014, p.970);

(ii) tokens whose grammatical number could not be determined (for example, because the noun was unfinished and it was therefore unknown whether

[42] Points c (iv-v) and d (v) of Appendix X were additions following the reliability tests.

the token would have been a singular or plural);

(iii) tokens that had also been produced by the interviewer in the turn immediately preceding that containing the PWA's token. For example, *day* was excluded from the BK's tokens in the following:

R: what happened the next day

BK: ah yeah ((cough)) ok [ðə] the next **day**…

(iv) tokens that were prompted by the interviewer writing down a word for the participant (the coding scheme only identified certain tokens of *Cinderella* in IB's narrative as falling into this category).

9.4.3. Retrieval of frequency values

Frequencies were retrieved from the Spoken BNC (Davies, 2004-) to enable the three comparisons described in 9.3, as follows:

1) The singular (e.g. *girl*) versus the plural (*girls*).
2) The singular versus all forms of the noun that share the same phonological form with the plural, that is:

- the plural	*girls*
- the singular possessive - the singular plus contracted copula *is* - the singular plus contracted auxiliary *has*	} *girl's*
- the plural possessive	*girls'*

(This calculation was only conducted for regular nouns, as the plural of irregulars does not share the same phonological form as the possessive or contracted forms mentioned.)

3) The frequencies in 2) plus those of all homophones of the singular or plural forms, that is the total frequencies of items with the same phonological form as the singular versus the total frequencies of all items with the same phonological form as the plural (see Appendix XVI for all homophones examined).

In all cases, the frequencies of any phonemic paraphasias were taken to be those of the target word. For other paraphasias in which a different (but real) word was produced, the frequency used was that of the produced word.

For each comparison, it was determined which form was the more frequent and by what ratio. Finally it was noted whether the more frequent form was the one produced by the participant in each token.

9.5. Results

9.5.1. Overview of noun tokens

In total, 750 tokens were analysed from the healthy speakers (HSp) and 404 from the PWA. Focusing on the latter, the number of tokens analysed per participant and the proportions of these accounted for by each noun form is shown in Figure 9.2. In all twelve participant cases, the majority of tokens were count nouns. Only seven participants produced any mass nouns and token numbers of these were generally relatively low. Of the count nouns, most were regular (indeed, five participants produced no irregulars) and, in turn, the regulars were mainly singulars, except in the cases of IB, who produced equal numbers of singulars and plurals, and KP, who produced more plurals. All participants produced at least one regular singular and one regular plural, and all participants except KP, TH and IB produced both forms of at least one noun. There was no obvious link between the types and grammatical numbers of nouns produced and aphasia severity, although the majority of the participants who produced no mass nouns (four of the five) were speakers with non-fluent aphasia.

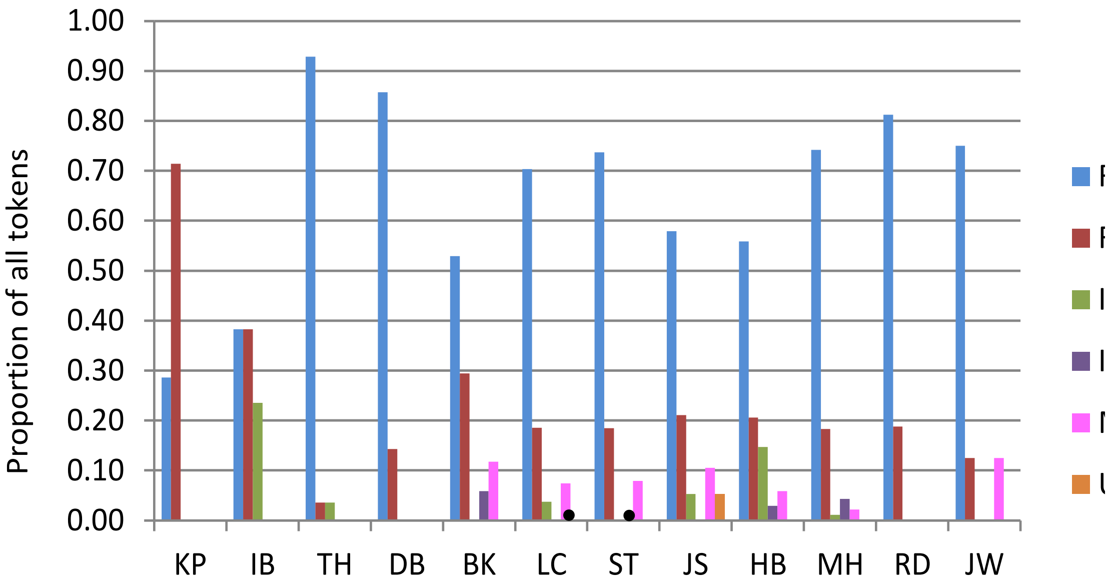


Figure 9.2. Proportions of token types produced by each participant

Key to Figure 9.2: Reg.=regular; Sing.=singular; Plur.=plural; Irreg.=irregular; Unclass.=unclassified[43]

Further assessment of the forms produced shows that participants used both the dominant and non-dominant forms of nouns, that is, their tokens included both the more frequent and the less frequent forms of nouns (see Figure 9.3). However, the

[43] There was only one unclassified token (for JS) which was '*the off*'. This was identified as a noun as it followed the definite article and had a meaning that appeared to correspond to '*departure*' (seeming to refer to the ugly sisters' departure for the ball). However, it was not clear whether this item has any plural and it was therefore left unclassified.

exception to this was that KP, the speaker with the most limited expressive language, only produced the dominant (more frequent) form of the nouns he used.

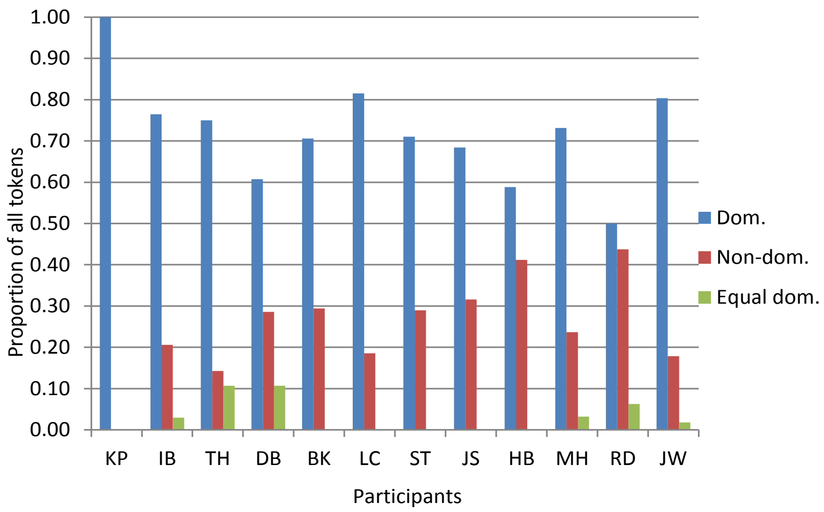


Figure 9.3. Proportion of dominant, non-dominant and equal dominant forms used by each participant.

Key to Figure 9.3. dom.=dominance.

9.5.2. Error rate

Overall, the rate of errors with grammatical number was low, both in the HSp and the PWA. In the total tokens from the healthy narratives, there was only a single error, by speaker N1 (mean HSp error rate = 0.00). The rate amongst the PWA was higher (0.03), but on closer inspection, the errors were in fact only produced by half of the twelve participants (see Table 9.2).[44] This can also be seen in Figure 9.4, which shows the participants from left to right in increasing order of their WAB

[44] It was not possible to statistically test the individual results against the mean error rate for the healthy speakers, as this requires the standard deviation of the healthy group results to be a positive value and this was not the case since the error rate was 0 for all but one of the healthy speakers (standard deviation = 0).

fluency rating (Kertesz, 1982). Although the two participants with the highest fluency rating, RD and JW, also made errors, the results suggest that errors might be more likely in the participants with more limited expressive language and may decrease as fluency rating increases. Consequently, the relationship between WAB fluency rating and number of errors was examined using the non-parametric Kendall's tau correlation, as this was most appropriate for the small sample size. Results indicate a moderate but non-significant correlation between fluency rating and number of errors (τ =-.303, p (one-tailed) =.112).

Although the overall error rate reported here is low, it is worth noting that there were also further tokens which were judged to be potential errors but were difficult to *confirm* as errors. These were tokens that were placed in the category of tokens whose correctness of grammatical number could not be determined (see again section 4 of the coding protocol, Appendix X). In total, 25 tokens (0.06 of all tokens analysed) were placed in this category. All were produced by the same participants who made the errors, with the exception that some unclassified tokens were also noted for LC and JS. The analysis from here forth, however, focuses on the (more certain) errors.

Table 9.2: Number of errors produced by each participant, ordered by WAB fluency rating (Kertesz, 1982), lowest rating first.

Participant	Noun tokens	Number of errors	Proportion of errors
KP	18	3	0.17
IB	34	4	0.12
TH	28	2	0.07
DB	28	0	0.00
BK	17	1	0.06
LC	27	0	0.00
ST	38	0	0.00
JS	19	0	0.00

HB	34	0	0.00
MH	93	0	0.00
RD	16	1	0.06
JW	56	1	0.02

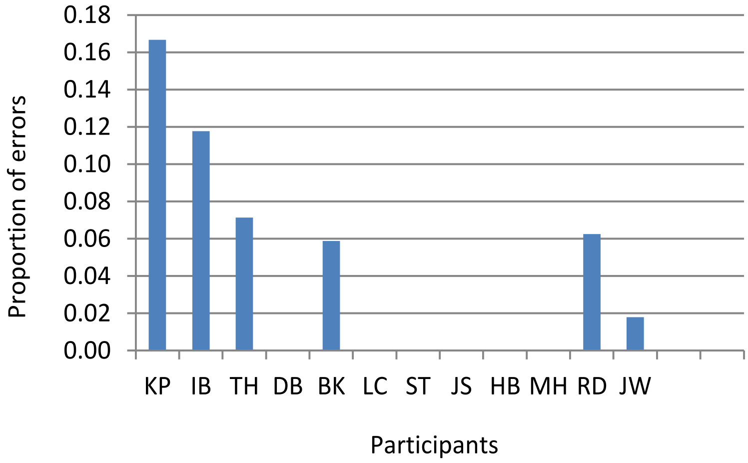


Figure 9.4. Error proportions per PWA

9.5.3. Relationship with frequency

9.5.3.1. Results of different frequency comparisons

In nearly all cases, the different frequency comparisons did not change which form of a noun was the more frequent. Only three nouns proved exceptions to this, accounting for five of the 404 tokens, across four participants (Table 9.3). None of these nouns were involved in the errors (or 'potential errors') found in the data. Therefore, when the more frequent form is referred to from here onwards, this applies to all of the three frequency comparisons unless stated.

Table 9.3: Nouns whose more frequent form was affected by the different frequency calculations

Noun	No. tokens; speaker in parentheses	More freq. Calc. 1	More freq. Calc. 2	More freq. Calc. 3
LEG	1 (JW)	sing.	plur.	plur.
FOOT	2 (JS; BK)	sing.	sing.	plur.
TAILOR	2 (HB)	sing.	plur.	sing.

Key to Table 9.3: No.=number; freq.=frequency; calc.=calculation; sing.=singular; plur.=plural.

9.5.3.2. Relationship of frequency to errors

Details of the errors produced by the healthy speaker (N1) and each PWA are provided in Table 9.4. (see Appendix XVII, Table XVII.i for a more detailed version including transcriptions of the forms produced). All of these involved regular nouns and in all cases, the form produced was more frequent than that expected, regardless of error direction.

9.5.4. Direction of errors

The direction of errors can also be seen in Table 9.4. Here, two participant groups can be identified: those producing pluralisation errors (five participants) and those producing singularisation errors (one participant). No participants made errors in both directions.

Table 9.4: Noun number errors produced by each participant

Pluralisation errors					
Part.	No. errors	Target	Error	Singular frequency	Plural frequency
N1	1	slipper	slippers	16	**61**
KP	3	slipper	slippers	16	**61**
IB	4	shoe	shoes	157	**552**
BK	1	slipper	slippers	16	**61**
RD	1	shoe	shoes	157	**552**
JW	1	shoe	shoes	157	**552**
Singularisation errors					
Part.	No. errors	Target	Error	Singular frequency	Plural frequency
TH	2	stepsons/ sons[45]	stepson/ son	**1** **731**	0 134
		stepdaughters[46] /daughters	stepdaughter/ daughter	**1** **553**	0 86

Key to Table 9.4:

PWA listed in order of WAB fluency rating (Kertesz, 1982), lowest rating first; Part.=participant; Frequencies shown are for the singular and plural only (those of frequency comparison 1, section 9.4.3) Bold denotes frequency of erroneous form.

[45] The exact production of this token was */s/ st-ep (1.3) /sː/son no (.) daughter*. Since *son* was produced quite separately from *step*, the frequencies of both *stepson* and *son* were considered.
[46] This token, too, was produced within the utterance */s/ st-ep (1.3) /sː/son no (.) daughter*., in which *daughter* was produced in relative isolation from *step*. Therefore the frequencies of both *daughter* and *stepdaughter* were considered.

9.5.5. Participants' overall flexibility with the nouns involved in the errors

With regard to the participants' flexibility throughout the narrative with the nouns involved in the errors, the one speaker whose error involved singularisation (TH) only produced the noun concerned in the singular form. Of the five participants whose errors involved pluralisation, two (KP and IB) only produced the noun concerned in one form (the plural). However, the remaining three speakers (BK, RD and JW) produced the affected nouns in both the singular and plural, and in doing so, used the noun at least once with the correct grammatical number. In all three cases, the erroneous usage was the first production of the noun, with the correct productions then following later in the narrative (see Appendix XVII, Table XVII.ii for participants' total productions of the nouns involved in the errors).

9.6. Discussion

9.6.1. Tokens analysed

There were some similarities in the proportions of different noun types and forms across the PWA. The majority of tokens in most participant cases were regular singulars, followed by regular plurals. There were few productions of irregulars and mass nouns. These similarities are likely to reflect the fact that many of the key referents in the Cinderella story are usually referred to using regular singulars (e.g. *Cinderella*, *fairy godmother*, *prince*, *pumpkin*, *stage coach*, *ball*, *clock*, *glass slipper*, *castle/ palace*) compared with a smaller number requiring regular plurals (e.g. *ugly sisters*, *horses*, *stairs/steps*, *chores*) and relatively few possible irregular or mass nouns (e.g. *mice*, *housework*). The proportions of each form could also be affected by a multitude of other factors, however, relating to the individual speaker. For example, if the person has problems in retrieving a token that happens to be a regular singular, any paraphasias they retrieve instead may be more likely to also be regular singulars, since they are likely to share properties with the target noun. Multiple paraphasias could thus increase the proportion of tokens of this noun form. The proportions could also be affected by which words participants produce as incomplete tokens, as the grammatical number might be difficult to establish in these cases and the tokens would therefore be excluded. Finally, pragmatic factors, such as which words a speaker chooses to repeat for emphasis, could also affect token proportions.

9.6.2. Error rate

The rate of errors with grammatical number was low, both for the HSp and the PWA. It is important to reiterate the difficulties in identifying errors with grammatical number in some PWA's narratives, though (see 9.6.6), which might mean that the error rate for these speakers was in fact higher than reported. Nevertheless, the grouped error rate for the PWA was considerably higher than that of the HSp. However, closer analysis revealed that errors were actually only made by half the PWA. There was some indication that such errors might be more likely in - but not limited to- people with more limited expressive language (as measured by the WAB fluency ratings, Kertesz, 1982). This could be accounted for within constructivist, usage-based theory, since speakers with more impaired expressive language would be expected to have access to fewer constructions, and these are likely to be limited to those that are more frequent and item-based. Therefore, if the noun's plural is frequent enough, the scenario could arise that a speaker has access only to the plural as a 'fixed' whole without access to the singular as an independent item. Alternatively, a speaker could have both the singular and plural forms of a noun as stored wholes, with the plural being more likely to be retrieved as this is more frequent. Both these situations could result in a pluralisation error.

A different scenario could be that the speaker only has the noun's singular, and not the plural, as a stored whole, and also has no productive plural construction that could be unified with the singular to create the plural. This is more likely if the noun is relatively infrequent in the plural and therefore no plural form has been encountered enough to be entrenched as a whole. This situation could lead to a singularisation error.

9.6.3. Frequency relationship

As expected, the results did suggest a relationship between form frequency (dominance) and error production: in all errors, the form produced was more frequent than the expected form, including in pluralisations of regular nouns. These findings support constructivist, usage-based theory rather than rule-based approaches: only in the former would regular plurals be expected to show frequency effects. The more frequent form should be more entrenched, meaning that it should be more easily retrieved. This should make it a more likely candidate for production by PWA than the less frequent form.

To some degree, the study provides insight into the interaction between general and context-specific frequency effects on the errors (see again chapter 8), as the expected forms were defined by two healthy speakers' (the researcher and a second rater's) judgements regarding which grammatical forms would be expected in the narrative context. The grammatical numbers that were deemed by these two speakers to be expected were also the same as those used in all but one of the 750 healthy speaker tokens, meaning that the coding judgements appear to be robust in representing typical expectations for the grammatical numbers that are frequent in that context. This context-specific frequency is likely to interact with general frequency. For instance, *sister* is more frequent in the Cinderella story as a plural than a singular (because of the two ugly sisters). However, it has a higher general frequency (in the Spoken BNC, Davies, 2004-) in the singular (634) than the plural (167), and it is likely that these general and context-specific frequencies will compete with each other. The results indicate that the PWA generally used the grammatical numbers that are frequent in the specific context of this story, but that when they did not, there was an influence of general frequency.

9.6.4. Direction of errors

The implication of constructivist, usage-based theory that errors should be found in both directions is also supported by the results: both singularisation and pluralisation errors were observed. However, this finding should be viewed tentatively due to the low number of singularisation errors and difficulties in identifying errors in this direction.

A particular challenge is that when a picture of multiple items is used as a prompt, it is not always clear whether the participant has attended to all of these items or just one. If the latter is true, then a production of the noun's singular could not be regarded as a linguistic error. In relation to this, it is important to acknowledge a factor which could influence stroke survivors' production of a singular when a plural is expected from visual stimuli. This factor is 'hemispatial (visual) neglect', "…a syndrome of attention deficit that frequently occurs after unilateral damage, such as from stroke", causing those affected to be "unaware of, or unresponsive to, information in the side opposite their damage..." (Jelsone-Swain, Smith & Baylis, 2012, p.1). An individual with left neglect, for example, may "…omit to read the left half of each sentence or even the left side of every word printed anywhere on the page; still another may fail to copy detail on the left side of a drawing…" (Mesulam, 1999, p. 1326). This phenomenon was a consideration in the two of the 'potential errors', by LC and TH, involving the production *mouse*. The picture book viewed by LC during, and by TH prior to, the narrative task showed two mice, but one of these was positioned towards the left of the page, appearing less prominent than the other. It may be, therefore, that only one mouse was attended to by these participants. Furthermore, the fact that LC and TH reported no significant visual impairments is irrelevant to the possibility of hemispatial neglect, as this can occur when primary sensory or motor deficits are absent (e.g. Mesulam, 1999). However, it has been reported that individuals with such neglect may still unconsciously process information in the neglected visual space (e.g. Cappelletti & Cipolotti, 2006; Marshall & Halligan, 1988), so unconscious processing of the second mouse could still have occurred. More importantly, it is unlikely that hemispatial neglect could account for TH's identified singularisation errors which made reference to the ugly sisters, that is, prominent characters that are entrenched in the Cinderella story as occurring in a pair and for which the speaker is less likely to need the visual prompt to recall. It was therefore tentatively concluded that errors did occur in both directions in the current data.

9.6.5. Participants' overall flexibility with the nouns involved in the errors and proposed constructions available to these speakers.

As regards the error-producing participants' flexibility throughout the narrative with the nouns involved in the errors, there were again two groups: those who only produced the noun in the form used in the error and those who produced both singular and plural forms. In those who produced both forms, the erroneous form was always the first token of the noun, before the correct form was used in later productions. It is plausible that when first accessing the noun, the more frequent and entrenched form is retrieved over the less frequent form. This retrieval may then facilitate retrieval of the less frequent (but similar) form, since the two forms share various properties and activation of one should therefore spread to the other. However, in two of the three participants who used both forms, JW and RD, other factors are also likely to have influenced the shift to the correct production. JW only began referring to the slipper (correctly) as a singular item after the PATSy database interviewer had referred to it using the singular. RD produced the correct (singular) form, *shoe*, as a self-correction immediately after first using the noun *boot* for the same referent. The singular-to-plural ratio for *boot* (regardless of frequency comparison) is approximately equal (1:1.2) and therefore the retrieval of this noun in the singular rather than the plural may have occurred relatively easily. (This could have been less likely for the singular of shoe, for which the singular-to-plural ratio is 1:3.5 or 1:3.3, depending on the frequency calculation used.) It is possible that RD's production of *boot* as a singular, then primed the grammatical number of *shoe*, either by activating other singular forms or perhaps by making RD more aware of the singular being required.

From the types of errors made and the participants' flexibility throughout the narrative with the nouns used in the errors, predictions can be made regarding the constructions available to these speakers (summarised in Table 9.5). TH produced singularisation errors and did not produce the plural of the nouns concerned. This shows that she could access the singular, but suggests that she could not access either a stored whole-form plural or a productive plural construction to combine with the singular. In contrast, KP and IB made pluralisation errors and did not produce the singular of the nouns concerned. This suggests that while they could access the stored plurals of these nouns, they could not access the singulars. It is unknown if they could access a schematic plural construction that they could use with any singulars that they could access. Lastly, RD, BK and JW made pluralisation errors and also produced both the singular and plural forms of the nouns concerned. These findings firstly demonstrate that these speakers can access the singular of the nouns. The pluralisation errors suggest that they can also access the plural as a stored whole, because of its retrieval over the singular in these instances. It is not possible to predict, though, whether these participants have access to a schematic plural construction.

Table 9.5. Proposed constructions available to each error-producing participant in producing the noun concerned.

Part.	Error	Forms of the noun used	Proposed constructions/ productivity		
			singular	whole-form plural	productive plural Cx
TH	singularisation	singular	✓	X	X
KP	pluralisation	plural	X	✓	Unknown
IB	pluralisation	plural	X	✓	Unknown
RD	pluralisation	singular & plural	✓	✓	Unknown
BK	pluralisation	singular & plural	✓	✓	Unknown
JW	pluralisation	singular & plural	✓	✓	Unknown

Key to Table 9.5. Part.=participant; Cx=construction; ✓=participant could access the item; X=participant could not access to the item.

9.6.6. Other factors affecting error production

A key consideration is that while all errors involved production of the noun's more frequent form, suggesting that PWA can access frequent forms more easily, the participants did not use the dominant form in every noun token produced. One of the error-producing participants, KP, did only produce nouns in their more frequent form, though. This result is interesting as KP has greatest impairment level of all the twelve PWA and this could further indicate some correlation between level of impairment and reliance on more frequent noun forms. However, the other speakers all produced the less frequent form of a noun at least once. Therefore, while form frequency can offer some explanation for the errors made, it alone does not allow errors to be predicted. A multitude of other, competing factors are likely to affect error production and some of these will now be highlighted for future consideration.

Firstly, the current study investigated whether the form produced in the errors was more frequent, by any extent, than the form expected. It did not consider the ratio between the singular and plural frequencies and whether a form must reach a certain frequency margin over the other in order to 'win out' and be retrieved. For example, it could be that a noun is more frequent in the singular but the ratio of this to the plural is actually approximately equal, and that the dominance of the singular is insufficient to affect which form is retrieved. Evidence has been offered both for (e.g. Alegre & Gordon, 1999, for inflected forms) and against (e.g. Arnon & Snider, 2010, for multiword sequences) such thresholds in frequency effects on retrieval by healthy speakers. It would be interesting to assess this in relation to the grammatical number errors.

As well as word form frequency, another potential factor influencing error production is the effect of the n-gram frequencies in the string in which the noun is produced. Frequency effects can occur for items larger than words (e.g. Arnon & Clark, 2011; Bannard & Matthews, 2008; Bybee & Scheibmann, 1999) and this is a central prediction of constructivist, usage-based theory. The frequency of the n-gram in which the noun occurs could compete with the noun's word frequency in influencing whether it is retrieved in singular or plural form. For instance, n-gram frequency but not word frequency would predict the singular form *finger* used by RD as follows:

he puts a ring on her finger

That is, FINGER has a higher word frequency in the plural, but it is more frequent in the singular in the substrings *her finge*r, *on her finger*, *ring on her finger* and *a ring on her finger* (there are no corpus entries for the singular or plural in the n-grams beyond this size). This is an interesting area for future research. However, such studies would require careful consideration of what constitutes an n-gram in some aphasic speech, because words occurring in succession can be frequently separated by pauses and audible hesitation tokens, and self-corrections can lead to unusual word combinations.

Apart from these considerations regarding frequency, it is possible that the semantic properties of nouns could also influence which form they are produced in, as some semantic similarities were observed across the errors. The low number of singularisation errors did not allow analysis of any shared semantic features, but it is worth mentioning, that the one error (*stepson/daughter*) and also five of the seven 'potential errors' in this direction (*godson*, 2 x *girlfriend*, *stepson* and *stepwoman*) did all relate to kinship. However, these were all by the same participant (TH) and appeared to all be attempts at the same referent. Therefore, it is unsurprising that they shared common semantic properties and this cannot be taken as evidence of a common semantic link. Most pluralization errors, however, involved the same two nouns: *shoes* and *slippers*, all tokens of which referred to Cinderella's lost slipper. This was also true of the one (pluralization) error by a healthy speaker, involving *slippers*. It is unsurprising that errors in this direction were made with these particular nouns, as not only are their linguistic forms more frequent as plurals, but the physical objects which they refer to are encountered in the world more often in pairs, perhaps additionally increasing their conceptual entrenchment as a plural item. It is worth noting that the fact that the healthy speaker's error involved the same production as many of those by the PWA suggests that grammatical number errors by PWA, as thought to be the case for other errors (cf. Dell, et al., 1997), are not qualitatively different from those made by healthy speakers, but these generally occur at a higher rate in PWA.

Another potential factor influencing the errors is possible priming from the interviewer's language, which was a particular consideration for the five PATSy database narratives, as these sometimes included substantial input of this kind. Efforts were made to reduce such priming by excluding noun tokens if the noun had also been produced by the interviewer in the turn immediately preceding that of the PWA's token. However, it is uncertain whether nouns produced by the interviewer earlier than this could still have an effect. In BK's case, though, at least, the error was apparently unaffected by the interviewer's productions of the same noun in a section of verbal summary provided to BK before the task. In this alone, the interviewer makes seven references to the slipper as a singular item and never refers to it in the plural. It therefore seems unlikely that such input influenced BK's later erroneous pluralisation of this noun.

As well as priming from the interviewer, there are also various possibilities for self-priming by the participant. These include the priming of grammatical number from nouns that are then self-corrected (see again RD's production of *boot*, section 9.6.5.), as well as potential priming from the preceding token of the same noun or simply the preceding noun token of any kind. It could also be that grammatical number is primed by the narrative generally including a larger number of nouns in one form than in the other. An example of this is that TH's singularisation errors involved references to the ugly sisters and the use of the singular for these characters could be affected by the fact that most main characters in the story appear as (singular) individuals. However, such priming for the singular could not be posited for the other error-producing participants, who all made pluralisation errors.

9.6.7. Limitations/ methodological considerations

As an initial examination of the errors from a constructivist, usage-based perspective, this study has a number of limitations and raises both theoretical and methodological questions for future research in this area.

Firstly, there are considerations relating to frequency calculations (in addition to the general limitations of using corpus frequencies; see section 11.2). The study included the added element of investigating three different frequency comparisons to assess any impact of these on the nouns' dominance. However, a further frequency comparison would also be useful when adopting a constructivist, usage-based approach. Some of the comparisons used counted the singular possessive and contracted singular forms in the plural frequency, as they shared a common phonological form with the plural. However, these forms could be viewed as being composed of the singular unified with the possessive *'s* or contracted *is* or *has*), in which case, it could be argued that they should be added to the singular (rather than plural) frequency count. With hindsight, this would in fact be more in line with approaches centring on constructions, as constructions are pairings of form *and* meaning. Therefore the *construction* frequency of the singular should include any corpus entry where the singular form is used with the singular meaning and only plural forms that are paired with the plural meaning should be counted in the plural frequency.

Another important methodological consideration relates to the difficulties described above (9.6.4) in ascertaining whether a grammatical number error had indeed been made. Such coding difficulties may be more likely in more spontaneous speech tasks, for instance narratives and conversation, where the target word is often less certain. However, such problems could also arise in experimental testing such as picture naming, especially if the target is a plural but it is unclear whether the participant has attended to more than one of the multiple items displayed in a picture.

More generally, it would also be beneficial in future research to increase participant numbers and, particularly, to include a higher number of participants with each aphasia type/severity. This would allow investigation of any link between error production and certain aphasia profiles. It would be especially interesting to examine any relationship between aphasia severity and reliance on dominant forms of nouns in general, given that the most severely impaired speaker in the current study (KP) *only* produced these more frequent forms. Moreover, it would be useful to examine longer speech samples, which should include more noun tokens and thus allow greater opportunity for error production, although this is somewhat limited by the time needed to analyse spontaneous speech. It would also be interesting to extend these analyses to other spontaneous speech samples, such as conversation data, as well as probing error production more deeply using targeted experimental testing.

9.6.8. Theoretical implications

The findings of this study present difficulties for the idea of rule-application proposed by decompositional approaches. Firstly, the pluralisation errors, in particular, point away from rule-based approaches. The implication of rule-application is that the singular is retrieved (and inflected) in order for the plural to be 'computed'. Thus, if a speaker can produce the plural, they should be able to produce the singular when intended. However, this is contradicted by the production instead of the plural, which should be more difficult according to decompositional models. Admittedly, it could be tempting to question whether a rule-based system is in place, but that brain damage has resulted in the rule for pluralization being 'stuck on' or 'stuck off', that is, becoming uninhibited in pluralisation errors and inhibited in singularisation errors. Indeed, the fact that all participants only produced errors in one direction might appear to support this. However, this is challenged by the finding that all error-producing participants produced both regular singulars and plurals and produced both forms of at least one noun (three even did so for the nouns involved in the errors). This contradicts any hypothesis that they can only produce singulars or plurals.

Finally, in decompositional approaches, regular plurals should not demonstrate frequency effects since these are supposedly created online rather than stored as wholes. However, this too is countered by the finding of a frequency relationship with the errors, that also held for regular plurals. That is, the pluralisation errors all involved regular plurals that had a higher frequency than their respective singulars.

In sum, these findings better fit with approaches, such as constructivist, usage-based theory, that assumes whole-form processing of at least some regular plurals and also predicts frequency effects for regular and irregular forms. In addition, this approach is particularly suited to explaining the unevenness in participants' ability to produce regular plurals in some instances but not others.

9.6.9. Clinical implications

The findings of this study also have implications for aphasiology and thus for clinical practice. Firstly, they provide further support for the claim that items traditionally viewed as 'complex morphological forms', such as regular plurals, can be stored as wholes and are consequently subject to the same frequency effects as other items stored in this way. It would be useful to consider such effects when assessing and treating speakers for proposed inflection deficits.

In addition, the findings suggest a need for caution in descriptions of aphasia, specifically agrammatism. This syndrome is typically characterised as including a lack or reduction of inflections, but in the current study, at least one participant with agrammatic aphasia (IB) demonstrated the opposite - extraneous inflections- in her errors. Rather than stating that inflection is absent or reduced in agrammatism, it may be more accurate to state that inflection errors can manifest as a lack of, or extraneous, marking, and that for nouns at least, these errors can occur in speakers with various aphasia types and severities. Future research might find that these errors are, however, more apparent in speakers with more limited expressive language, as the current findings hint and as would be predicted by a constructivist, usage-based approach.

In addition, the study revealed unevenness within each speaker's productions: the error-producing participants did not consistently make errors with nouns or even with the nouns involved in the errors. This links to a wider need for aphasia research to move away from 'all-or-nothing' characterisations of participants' capabilities with specific items or linguistic features, which are arguably a result of adopting rule-based approaches. The current research instead highlights the need to consider unevenness within individual speakers' productions and the potential value of constructivist, usage-based theory in accounting for this.

9.7. Conclusion

The main contribution of this study has been to provide an in-depth analysis of grammatical number errors by PWA in more spontaneous speech, and specifically, to characterise these from a constructivist, usage-based perspective. The findings indicate that frequency appears to affect such error production, including errors involving regular plurals. This supports the constructivist, usage-based prediction that both regular and irregular plurals should be subject to frequency effects (not just irregular plurals, as predicted by rule-based approaches). More frequent forms should be more likely candidates for production by PWA as these items should be more entrenched, making them easier to retrieve. Furthermore, the prediction of constructivist, usage-based theory that errors should occur in both directions (involving production of the singular as well as the plural) is also confirmed. Overall, the findings are problematic for decompositional, rule-based approaches and can be better accounted for by models that can accommodate whole-form storage of at least some regular plurals. It is argued that constructivist, usage-based theory, with its ability to also explain unevenness within a speaker's productions, would be particularly suitable as a theoretical framework for future research in this area.

10. Verb case studies

10.1. Introduction

Verbs commonly present challenges for people with aphasia (PWA) (e.g. Links, Hurkmans, & Bastiaanse, 2010). Much research in this area has focused on the differences between verb and noun retrieval and a reported ‘double dissociation’ between these words classes: some people being significantly better at noun than verb production and others revealing the opposite pattern (e.g. Berndt, R., & Zingeser, 1991; Chen & Bates, 1998; Glosser, Saykin, Sperling, & O’ Connor, 1994). In particular, verb impairments in the face of relative preservation of nouns, have been associated with Broca’s agrammatic aphasia, manifesting in reduced verb numbers, a lack of ‘inflections’ and omission of auxiliaries by many speakers with this syndrome (e.g. Saffran, Berndt & Schwartz, 1989). In contrast, comparative preservation of verbs over nouns has been linked with (the fluent) anomic and Wernicke’s aphasias (see Druks, 2002, for an overview). This double dissociation has been viewed as an effect of grammatical class, with research into verbs in aphasia mainly focusing on these as single words. This has also been the case in therapy studies targeting verbs, “…with relatively limited consideration of the role of the verb in sentence production” (Whitworth, Webster & Howard, 2014, p.196). However, it has also been noted that sentence production is often disrupted in Broca’s agrammatic aphasia, whilst remaining relatively intact in anomia. As a result, a growing body of research attributes verb production impairments to a syntactic deficit and examines the potential role of verbs in sentence production. However, this research has several limitations.

Firstly, because of the proposed association of verb impairments with Broca’s agrammatic aphasia, most studies have focused *only* on this aphasia type (e.g. Bastiaanse & Grodzinsky, 2000; Bastiaanse & van Zonneveld, 2004; Faroqi-Shah & Thompson, 2004; Thompson et al., 2012; Thompson et al., 2013). However, this is problematic because verb impairments are not invariably linked with non-fluent aphasia: speakers with anomic aphasia, for example, have been reported with such impairments (e.g. Sloan Berndt, Mitchum, Haendiges, & Sandson, 1997). It is therefore not the case that verb impairments are limited to Broca's aphasia or indeed any of the non-fluent aphasias. Studies have begun to examine verbs in fluent aphasia, but these are still relatively few in number and mainly examine Wernicke's and anomic aphasia (e.g. Bastiaanse, 2011; Edwards & Tucker, 2006). There appears to be little research on verbs in other fluent aphasias, such as conduction or transcortical sensory aphasia.

In addition, there has been research on proposed differences in impairments with inflection in fluent versus non-fluent aphasias, classified as paragrammatism and agrammatism, respectively. Paragrammatism has been characterised as the disturbance of expressive language by 'syntactic' errors that disrupt word order, morphological features and syntactic structure (Kleist, 1914, as cited by Butterworth & Howard, 1987). As Butterworth and Howard (1987) explain, "it is distinguished from "agrammatism" in that paragrammatism presents confused and erroneous syntax and morphology instead of an absence of grammatical structure, omission of grammatical particles and "telegraphic" style in speech" (p.2). However, this distinction has also subsequently been questioned, for example because of considerable overlap in the nature of productions by speakers with these supposedly distinct syndromes (e.g. Goodglass & Mayer, 1958; Goodglass & Hunt, 1958). In fact, Goodglass and Hunt (1958) argue that the only measure by which speakers with paragrammatism can be distinguished from those with agrammatism is sentence length, with the sentences of speakers with agrammatism typically being much shorter. There is therefore a need to explore verbs more fully across the various aphasia 'types' and severities, preferably including comparisons across these types rather than examining them separately.

Secondly, this research has largely been underpinned by the theoretical framework of Universal Grammar (UG) (e.g. Chomsky, 1986) and this theory cannot easily account for certain observations in aphasic data (see again section 2.5.1). In the UG approach, verbs, still treated as single words, contain syntactic information that specifies the argument structure of a sentence (e.g. Druks, 2002) and also must complete complex operations (verb movement) during sentence production (e.g. Bastiaanse, Rispens & van Zonneveld, 2000). In addition, verbs must also undergo inflection for tense and agreement as necessary in a given sentence. It is these complex processes, according to the UG-based research that contribute to difficulties with verb retrieval in aphasia (e.g. Bastiaanse et al., 2000). However, this argument does not fit easily with the observation that there is unevenness (see again Ambridge & Lieven, 2015) *within* individuals, both in their ability to produce some verbs over others and in their correct inflection of some but not all of these. Bastiaanse et al. (2000) argue that such differences in verb retrieval and inflection can result from the variation in the operations the verb concerned must undergo within the respective sentence. In a sentence completion task, they found that Dutch speakers with Broca's agrammatic aphasia were better able to retrieve the correct verb, and to correctly inflect it, for verbs in final position in embedded clauses than they were for those in second position in matrix clauses. This, they argued, was because (in a UG approach) Dutch matrix clauses but not embedded clauses involve movement of the verb from its 'base generated position', making inflection more difficult for verbs in second position.

However, this finding could have resulted from the task procedure employed. The participants were shown pictures, one at a time, depicting an action. The sentence for completion, describing the picture, was written beneath it with the missing verb replaced by an ellipsis symbol. The sentence was read out to the participants (who could not read it themselves) by the examiner who hummed three syllables for the ellipsis, and subsequently, the participant had to verbally produce the verb. Test items included verbs in matrix clauses (verb second) and embedded clauses (verb final), examples of which, provided by Bastiaanse et al. (2000, p.180), are as follows:

(matrix)	(embedded)
het meisje … een boek	*ik zie dat de jongen op de ijsbaan …*
the girl (3 hums) a book	I see that the boy on the ice rink …
	[I see that the boy (3 hums) on the ice rink]

There are several potential problems with this procedure, but most importantly, that the position of the missing verb could have affected retrieval without verb movement being posited. In the verb-final sentences, the verb to be added came directly after the examiner's prompt, that is, immediately after the context which preceded that verb in the sentence. Contrastingly, in the verb-second position, the participant heard the rest of the sentence after the position of the missing verb and then had to think back to where the ellipsis was. Consequently, it is more likely that the verb in final position could be primed by the preceding sentential context, for instance through frequency or semantic association effects. In fact, while the study stated that verbs were matched for frequency, it did not specify that the frequencies of inflected verb forms or of these in the n-grams in which they were produced was considered. Such research therefore does not convincingly demonstrate that verb retrieval and inflection problems, or the unevenness of these within speakers, can be attributed to the verb's involvement in the proposed syntactic operations. A more convincing explanation can arguably be provided by effects of frequency and collocation, within a constructivist, usage-based account.

Although there have not been constructivist-based analyses of verb usage in aphasia, the literature on acquisition within this theoretical perspective provides some guidelines on how such a perspective could provide important insights. In the constructivist approach, language is acquired from the input in constructions of various sizes and levels of schematicity, beginning with single word and item-based constructions, before generalizations are made over these to form more schematic abstractions (e.g. Ambridge & Lieven, 2011; Tomasello, 2003). However, since the input is uneven, with some items being more frequent than others, language is also acquired in an uneven manner (Ambridge & Lieven, 2015; see also Dąbrowska, 2004). Accordingly, verbs are initially acquired in an uneven, 'piecemeal' fashion, with each one developing in its own time-scale rather than full mastery of a verb or grammatical structure being achieved outright (e.g. Tomasello, 1992). This unevenness manifests not only in the fact that some verbs are acquired before others, but also, for example, in correct marking being demonstrated for certain verbs (and in certain utterances) but not others: as Matthews, Lieven, Theakston and Tomasello (2005) summarise, studies of spontaneous speech show that "…children's use of grammatical markers of all kinds is often restricted to specific lexical items…", as opposed to full generalization of a marker being achieved outright across verbs (p.122). This view of verb acquisition raises questions regarding verbs in aphasia, namely, which verbs remain accessible and with what level of productivity, and how this might be influenced by the input.

Central to the constructivist, usage-based approach is the idea that items of all sizes are constructions (form-meaning pairings), and therefore constructions of all sizes and levels of schematicity should be stored in the same manner, as whole-forms. That is, no difference is proposed in the storage and retrieval of single lexis versus lengthy multi-word or fully schematic constructions. Since "aphasia negatively affects lexical diversity…" (Groenewold, Bastiaanse & Huiskes, 2013, p.550), it should also affect the diversity of the constructions larger than words. That is, people with fewer words should also have fewer constructions of all kinds. It is also predicted that the constructions that are preserved should be affected by frequency. Those that are more frequent and acquired earlier, particularly as lexically-specific items, should be more entrenched than the less frequent or the more schematic constructions that are acquired later through the process of generalisation. This could mean the former are easier to access, making them more likely candidates for production in aphasic speech. It is therefore predicted that the PWA with more limited expressive language (that is, a lower WAB fluency rating, see again section 4.2.4) should have fewer constructions and these will be more limited to single words and lexically-specific wholes. In contrast, the PWA with greater expressive capabilities should have a wider range of constructions, including more items with a higher degree of schematicity. The view adopted is therefore that rather than having ‘all or nothing’ of a certain word class or grammatical marker, the ability of PWA to produce verbs and well-formed verb strings should differ by degree.

Specific predictions can also be made for verbs and the utterances they are produced in (hereafter referred to as ‘strings’). As regards the verbs themselves, firstly, the *number* of verbs produced would be predicted to vary along a continuum, with the individuals with fewer expressive language capabilities having the least verbs at their disposal, in accordance with much past research. This might manifest in a smaller proportion of verb *tokens*, although not necessarily, as a small number of lemmas produced many times could also lead to high token numbers. There would, however, be an expected difference in the diversity of lemmas used, with this increasing with greater expressive language capability. Secondly, the lemmas preserved are likely to be those that are more frequent in spoken English as these should be more entrenched and easier to retrieve. This tendency to use more frequent verbs may be particularly noticeable in the participants with the most limited expressive language, who should have the fewest lemmas at their disposal. In addition, the flexibility of lemma form, in terms of marking for tense and agreement, should also vary across PWA. Again, those with the most restricted expressive language would be expected to show less diversity of lemma forms. This is firstly because they are predicted to have fewer lexical forms at their disposal generally, which should limit the number of any verbs they might have for whole-form retrieval. Secondly, they may have less morpheme productivity, meaning they are less likely to be able to *create* verb forms productively by combining a morphemic construction with a verb stem.

The ability to produce verb strings should also vary across the participant continuum, with the mean length of string predicted to increase with greater expressive language capability. The most impaired participants, who have fewer productive/ schematic constructions may rely more on forms that are retrieved as wholes and as the length of such lexically-specific sequences is likely to be limited, so too is the mean length of string for these participants. In contrast, participants with greater expressive language capability, who should have more productive constructions, should be better able to create novel utterances and rely less on whole-form retrieval, which should make them more capable of creating longer utterances. It could also allow them to produce more complex utterances containing multiple verbs and therefore the mean number of verbs per string should also increase with greater expressive language capability.

Also, as the number and flexibility of available constructions varies across the continuum, so too should the participants' chance of success in creating well-formed novel utterances. The more impaired participants might rely more on whole-form retrieval. Items that are retrieved as wholes should be produced fluently and without errors as they do not require combination of constructions. However, if these more impaired individuals do attempt novel utterances, there is less chance that these will be semantically or syntactically well-formed. This is because if there are fewer verb forms available and the participant retrieves an alternative item that 'wins out' amongst the available verbs/ verb forms, there is a likelihood that this firstly may not be semantically specific to the message intended and/or, secondly, may not be the appropriately marked form for the context, then appearing as an inflection error. Such errors could also occur in the speech of the less impaired participants, but as they are predicted to have more verbs and verb forms at their disposal, they are more likely to insert one that is semantically more appropriate and correctly marked, or at least be able to correct insertions that are not. Errors caused by erroneous insertions could involve items of various sizes (for example words, phrases, longer sequences), but if these insertions are larger than single words, they are more likely to be lexically-specific in the more impaired participants. As the individuals with greater expressive capabilities should also have access to larger, more schematic items, there is potential for erroneous insertion or combination of these more schematic constructions, resulting in larger-scale ‘syntactic’ blends. These predictions across the continuum are summarised in Figure 10.1.

Limited expressive language	**Greater expressive language**
Verbs: • Fewer lemmas, more restricted to the most frequent • Less flexibility of verb form • Less flexibility of constructional context of production	Verbs: • More lemmas, less restricted to the most frequent • More flexibility of verb form • More flexibility of constructional context of production
Verb strings: • Fewer unique strings • Shorter mean length of string • More reliance on lexically-specific/ item-based constructions • Less success in creating novel utterances • More inflection errors	Verb strings: • Higher number of unique strings • Longer mean length of string • More flexibility/ schematicity of constructions • More success in creating novel utterances • More blending errors

Figure 10.1. Predictions for verbs and verb strings across the continuum of expressive language capability.

10.2. Aims

This study uses a constructivist, usage-based approach to investigate the verbs and verb strings produced in spoken narratives by PWA, employing quantitative and qualitative analyses to examine the following:

1. Verbs
    a. The number of verbs produced, both in terms of the proportion of verb tokens per narrative and the diversity of lemmas used
    b. The frequency of the lemmas in UK spoken English
    c. Which lemmas are used and in which forms and constructional contexts

2. Verb strings
    a. The mean length of strings
    b. The mean number of verbs per string, as a measure of string complexity
    c. The well-formedness and fluency of verb strings and any link between these characteristics and string frequency in spoken English
    d. Which strings are likely to have been retrieved as wholes or assembled as novel utterances
    e. Which constructions participants might have accessed to produce the strings
    f. Which errors are made in the verb strings

10.3. Method

10.3.1. Data

The data in this study was from the narratives produced by six of the PWA. Data from the twelve healthy participants was also included in certain analyses for points of comparison.

Table 10.1: Participant details ordered by WAB fluency rating (Kertesz, 1982)

Part.	Gen.	Age at testing	Hand.	Previous employ.	TPO (y:m)[47]	Aphasia type	Fluency rating (WAB)
KP	M	50	R	Industrial labourer	2:8	Global	2
TH	F	51	R	Business professional	17:0 1:9	Broca's agram.	4
DB [pilot case]	F	61	R	Retail assistant	2:6	Broca's agram.[48]	4[49]
ST	M	65	R	Salesman	2:5	Transcort. motor	6
HB	F	81	R	Teacher; care worker	4:0	Wernicke's	7
MH	M	69	R	Professional	5:0	Anomia	8

[47] Each time period listed corresponds to one stroke (where several time points are listed, this indicates that the participant has suffered more than one stroke).
[48] The aphasia type listed for DB is that stated on the PATSy database (Lum et al., 2012).
[49] The WAB fluency rating listed for DB is that stated on the PATSy database (Lum et al., 2012).

Key to Table 10.1: Part.=participant; Gen.=gender; Hand.=handedness; TPO=time post onset of aphasia; class.= classification; WAB= Western Aphasia Battery (Kertesz, 1982); F = female; M = male; R = right; NF = non-fluent; F = fluent; agram.=agrammatic; transcort.=transcortical.

The six PWA included five of the recruited participants (KP, TH, ST, HB and MH) and one PATSY database participant (DB; Lum et al., 2012) (see summary of participant details repeated in Table 10.1; full profiles given in chapter 5). Most analyses focus, however, on the recruited participants only. These were selected from the total of seven recruited participants because there was most consistency in the data collection process for these five participants, in terms of the stimuli present during narrative production: four did not view the picture book at all during the task and the fifth (KP), who viewed the book after some time into the task, produced almost the same language with the book as he did without it. These participants contrast with the other two recruited participants, who required the book almost from the start and whose narratives more resembled picture description. The PATSy participant, DB, was initially used as a pilot case for the constructional analysis, and was selected for this purpose as her verbs were mainly restricted to particular utterances and suggested unevenness of productivity, thus being of interest for constructivist theory. Since the stimuli present during DB's narrative production were considerably different to those in the other aphasic and healthy narratives (there was substantial spoken input from the researcher as well as DB viewing pictures of the story), her data is excluded from the quantitative analyses that make direct comparisons across participants. However, DB's verbs remain interesting for the qualitative analysis of constructions and are therefore included in those sections (10.4.1.3.1 & 10.4.2.2.1).

10.3.2. Data extraction

There were two main stages of data extraction from the narratives prior to analysis:

i. Verb and verb subtype tokens.

   All verbs were extracted and judged for inclusion in the analysis using the protocol in Appendix XVIII. In brief, each production of a verb was included as one token with the following exception: if a verb was produced more than once in the same form as part of repeated attempts at the same utterance, the repeated verb was only counted once (see Appendix XVIII for full details). Using the same protocol, all included verbs were then classified into one of five subcategories: lexical, lexical phrasal, main auxiliary, modal auxiliary or unclassified. The protocol used for these procedures was also tested and found to be reliable within and across raters (see Appendix XIX).

ii. Verb strings

   The string that each verb occurred in was extracted using the procedure developed and tested for reliability in chapter 7. In short, a verb string included any arguments and adjuncts of the verb and any clauses joined to the verb's clause by subordination (see Appendix IX for full protocol).

10.3.3. Analysis

In accordance with the study aims, both quantitative and qualitative analyses were conducted, firstly on the individual verbs and secondly on the verb strings. The methods for these two sections will now be discussed separately.

10.3.3.1.Verbs

10.3.3.1.1. Number of verbs produced

To assess verb numbers, the following were calculated for each participant with aphasia and as an average across the 12 healthy speakers (HSp):

1. Proportion of verb and verb subtype tokens in each narrative
2. Type-token ratio (TTR); range of verb and verb subtype lemmas used, as 'raw' numbers and per 100 words.

The verb proportions and TTRs for each of the PWA were statistically assessed against those of the healthy group using the 'SINGLIMS.EXE' computer program (see Crawford & Garthwaite, 2002; program accessed from Crawford, n.d) which implements a modified t-test[50] to measure any significant difference from the healthy mean.

10.3.3.1.2. Frequency of lemmas

The frequency rank in UK spoken English of all verb lemmas used by each PWA were retrieved from the Spoken British National Corpus (Davies, 2004-).

10.3.3.1.3. Lemmas, lemma forms and their constructional contexts of production

For each person with aphasia, a qualitative analysis was conducted of the following:

i. The lemmas used
ii. The range of forms of each lemma produced

[50] This is a t-test adapted for use in comparing single case data to that of control groups of a relatively modest size (see Crawford & Howell, 1998).

iii. The diversity of constructional combinations the forms of each lemma were produced in.

10.3.3.2. Verb strings

10.3.3.2.1. Number of strings

The number of string tokens and types (unique strings) was calculated for each PWA and as an average across the healthy group.

10.3.3.2.2. Mean length of string (in words)

The number of words per string were counted for each PWA and as an average across the HSp, using the criteria for identifying words in the total word count (see again Appendix XIV). However, an exception to this was that if an item was self-corrected or replaced with a clarified version, only the corrected or clarified version was counted. Therefore, the preceding attempts and also any words used to signal an error (such as *no*) were excluded. For example, the words in bold in the following strings would be those counted.

Self-correction: ***She went off to*** *the funeral no* ***the party***

Clarification: *In the book* ***in that book there are two daughters***

This decision was taken because the number of corrections or clarifications produced by some participants could have skewed the mean length of string, by increasing the number of words when the syntactic structure of the utterance was relatively short.

There was also one instance when a participant began a string but halted this because of word-finding difficulties and began a new one, but then remembered the problematic word and therefore resumed production of the halted string. In this case, the short start of the new string was excluded and the words in both parts of the original string (shown in bold below) were counted:

> ***there was*** *(2.1) [ɜf] (.) a little ((clears throat)) (.)* ***a little*** *(3.5) but [ð-ᵊ] (.) [ɪ] [ɪᵊ] it (1.5) [əm]* ***pumpkin***

10.3.3.2.3. Mean number of verbs per string

The mean number of verbs per string was calculated as a measure of string complexity since a higher number of verbs would imply either that the string had multiple clauses or employed more complex structures requiring multiple verbs (such as auxiliary + lexical combinations, that is those involving modality, progressives or passives). To calculate the mean verbs per string, all verbs in each string were counted. Again though, in the case of repetitions (that were not for effect), only the final production of the verb was counted, as follows (counted verbs in bold):

> *I will I* ***will have*** *to to to* ***trace***

Also, if several verbs were produced within self-corrections or clarifications, only the final corrected or clarified verb was counted, as follows (counted verbs in bold):

> I **will** need erm **have** to erm **try** it on

Again, these exclusions were made because such repeated or corrected verb productions could positively skew the mean number of verbs per string.

10.3.3.2.4. String well-formedness, fluency and frequency

The strings produced by each PWA were coded for well-formedness and fluency according to the following criteria.

Coding of strings as well-formed

Strings were coded as well-formed if the sequence of lexis was syntactically and semantically possible in conventional spoken English (regardless of whether this was interrupted by pauses or audible hesitation tokens). This is not to say that the string is complete as an utterance or semantically appropriate for the message attempted, rather that the sequence of words present is syntactically and semantically possible. In deciding this, the following additional criteria were adhered to:

i. Any phonemic paraphasias were regarded as their target word.
ii. In the event of self-corrections, the corrected version was the one taken into account in deciding whether the string was syntactically and semantically possible in conventional English.

iii. Presence of neologisms in a string rendered the string ill-formed. However, in cases when an item was incomplete at the end of an abandoned string, it was occasionally unclear whether this would have been a neologism. For example,

two glamourous ladies and Cinderella are all ***[kɒnˀ]***

In these instances, if the rest of the string before the incomplete item was well-formed according to the above definition, the string was coded as well-formed (again, it is emphasised that a string did not have to be completed to be counted as well-formed).

Coding of strings as ‘fluent’

Strings were coded as fluent if they were produced without interruption once the first word had been produced. This was decided using the following criteria:

i. The following were classed as interruptions to a string:

   a. Audible hesitation tokens or pauses after the first word, with the exception of a maximum of a micropause (0.5 - 1.0 seconds) in positions that are deemed natural for pausing in healthy speech, such as between clauses, as follows:

      what he said was (.) now listen everybody

   b. Phonemic errors and neologisms. For instance, the following string would not be classed as fluent:

      *it **[pœtəd]** her perfectly*

      However, any variation from standard English pronunciation that was deemed to be due to a participants’ accent or part of a consistent pattern of pronunciation of individual phonemes in the participants’ speech was not classed as an interruption.

   c. Successive repetitions of an item in a string, other than for effect:
      *they **look look** her down*

ii. The following were *not* classed as interruptions:

   a. False starts on the first word of the string or on any incomplete and unidentifiable last item of an unfinished string. For example, *[ð-^{ə}] [ðɛ^{əb}] that was it*

they were [k] [k] ***[kɒn^{ʔ}]***

b. Incomplete items at the end of an unfinished string, for which it was unclear whether the item would have been neologistic:

two glamourous ladies and Cinderella are all ***[kɒn^{ʔ}]***

<u>Frequency of strings in UK spoken English</u>

The frequency of each string was retrieved from the Spoken BNC (Davies, 2004-). In the event that a string was not grammatically well-formed, and it therefore seemed inevitable that the corpus frequency would be zero, frequencies were also retrieved for 'grammaticalised' forms of the string, created by adding or substituting elements (such as omitted or 'incorrect' inflections or determiners) to render the string grammatical without changing its meaning (cf. 'morpheme restoration', Menn, 2010). In some instances, several options existed to do this. For example, when adding an omitted determiner, there may be several determiners that could plausibly fit with the string. In such cases, several 'grammaticalised' versions were tested, using items that seemed most plausible in the string given the narrative context. For instance:

Original string:	*it's ball*
'Grammaticalised' versions:	*it's a ball*
	it's the ball
	it's his ball
	it's the prince's ball

A full list of the 'grammaticalised' versions tested is provided in Appendix XX.

<u>10.3.3.2.5. Structure of verb strings</u>

The structure of the strings was predicted on the basis of string well-formedness, fluency and frequency. In some participant cases, there was unevenness in the how well-formed and fluently produced the strings were. In these cases, if the strings that were well-formed and fluently produced also had a relatively high string frequency, it could be proposed that these were more likely to have been retrieved as lexically-specific wholes. This is because multiword items that are more frequent should be more likely to be stored and retrieved as wholes and such items should thus also be more likely to be wellformed and fluently produced, as no combination of separate components should be required. By the same reasoning, strings that were not well-formed or fluently produced and also had relatively low frequencies, were predicted to have been attempts at assembling utterances by combining constructions, and in these instances, the abstract structure of the string was considered. For example:

Dandini came SUBJ $V_{Intrans}$

(string produced by TH, see section 10.4.2.2.3)

However, in some participants (those with greater expressive capabilities) it was not possible to predict in this way which strings had been retrieved versus assembled, as the majority of their strings were well-formed and/or fluent and these qualities did not seem to be linked to string frequency. In these cases, only the abstract structures of strings were analysed.

10.3.3.2.6. Error analysis

All errors that had led to a speaker's strings being classed as ill-formed were identified in these (ill-formed) strings and classified into the following error types:

i. Incorrect verb marking
ii. Word omission
iii. Semantically ill-fitting word
iv. Insertion of semantically ill-fitting phrase
v. Blend. Blends were defined as the combination of sections of multiple utterances, including 'splice' blends, involving the splicing of one sentence part onto the end of another sentence part, and 'substitution blends', involving the substitution of one part of a sentence by part of another (Fay, 1982).
vi. Neologism. These were defined as nonwords that are not approximations of recognisable target words, that is, those productions "…with no, or only remote (fewer than 50% of phonemes in common), relation to the target" (Boyle, 2014, p.970).

In the case of word omissions and insertion of ill-fitting words, the word's grammatical category was also noted.

10.4. Results

10.4.1. Verbs

10.4.1.1. Number of verbs produced

In order to assess whether the number of verbs produced by individual participants differed significantly from the healthy group mean, a t-test modified for use with modest-sized control groups was used (Crawford & Garthwaite, 2002; see section 10.3.3.1.1.). Given the known difficulties of PWA in producing verbs, it was predicted that the participants would produce fewer verbs as compared to the healthy group mean and, as such, a one-tailed test was employed.

Similar to the total words per narrative (Figure 10.2), the proportion of verb tokens corresponded approximately with participants' WAB fluency ratings (Figure 10.3). The most impaired participants, KP and TH, both produced significantly fewer tokens of verbs overall and of all subtypes, with the exception that TH's low score for modal auxiliaries was not significant (see Table 10.2 for full statistical test results). Towards the middle of the participant group was ST, whose proportions of verbs and lexical verbs were significantly below the healthy group, but no such difference was found for his auxiliaries overall, either auxiliary subgroup or phrasal verbs. Finally, towards the other end of the continuum were the two least impaired participants, MH and HB. MH, whose total word production was significantly higher than the healthy mean, showed no variation from this group in his verb or verb subtype proportions, with his scores in fact being identical to the healthy mean in all but one case (lexical verbs). In contrast, HB, whose total word count did not differ significantly from the healthy group, produced significantly higher proportions of verbs overall, lexical verbs and main auxiliaries (no difference was found for auxiliaries overall, modal auxiliaries or phrasal verbs).

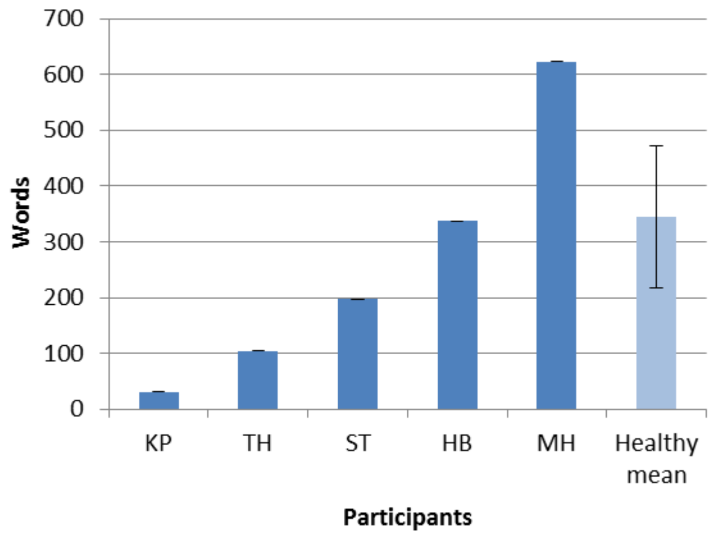


Figure 10.2. Total words in narrative

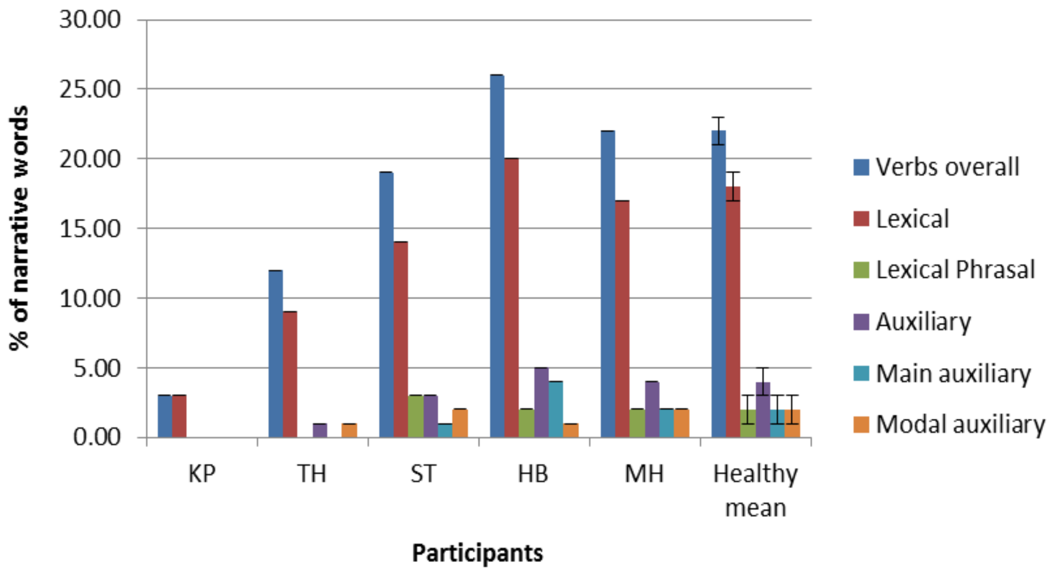


Figure 10.3: Number of verb and verb subtype tokens produced by each participant, as a percentage of total narrative words

Another notable observation across the participants concerns differences in the production of phrasal verbs and main auxiliaries. The three least impaired participants (and all HSp) produced at least one token of each of these subtypes (usually more), whereas the two most impaired, KP and TH, did not produce any.

Table 10.2: Proportions of verbs and verb subtypes produced (PWA listed in ascending order of fluency rating (WAB; Kertesz, 1982))

Participant		Total words	Amount produced, as proportion of total words						
			Verbs	All lexical	Lexical phrasal	All auxiliary	Main auxiliary	Modal auxiliary	Unclassifed[51]
Healthy	mean	344.50	0.22	0.18	0.02	0.04	0.02	0.02	0.00
	SD	126.73	0.01	0.01	0.01	0.01	0.01	0.01	0.00
	range	104 - 548	0.19 - 0.24	0.16 - 0.20	0.00 - 0.04	0.02 - 0.05	0.01 - 0.04	0.00 - 0.03	0.00 - 0.00
KP	prop	31	0.03	0.03	0.00	0.00	0.00	0.00	0.00
	t-value	-2.377 *	-18.255 ***	-14.412 ***	-1.922 *	-3.843 ***	-1.922 *	-1.922 *	
TH	prop	104	0.12	0.09	0.00	0.01	0.00	0.01	0.02
	t-value	-1.823 *	-9.608 ***	-8.647 ***	-1.922 *	-2.882 **	-1.922 *	-0.961	
ST	prop	197	0.19	0.14	0.03	0.03	0.01	0.02	0.02
	t-value	-1.118	-2.882 **	-3.843 ***	0.961	-0.961	-0.961	0.000	
HB	prop	337	0.26	0.20	0.02	0.05	0.04	0.01	0.01
	t-value	-0.057	3.843 ***	1.922 *	0.000	0.961	1.922 *	-0.961	
MH	prop	623	0.22	0.17	0.02	0.04	0.02	0.02	0.01
	t-value	2.111 *	0.000	-0.961	0.000	0.000	0.000	0.000	

Key to Table 10.2: SD= standard deviation; prop.=proportion. Significance levels for t-values (one-tailed; df=11): *** p≤0.001; ** p≤0.01; * p≤0.05.

[51] It was not possible to calculate t-values for the unclassified tokens because the standard deviation of the healthy group must be above 0 and this was not the case here.

Turning to the lemma diversity demonstrated by each participant, this was first assessed by calculating the type-token ratios (TTRs) for verbs overall and for the lexical and auxiliary subtypes. The same modified t-test was then used to assess any differences in the individual participants' lemma diversity from the healthy group mean (see again 10.3.3.1.1.). Again, a one-tailed test was employed, as it was predicted that the verb impairments commonly reported in aphasia would result in participants producing a smaller variety of lemmas. The TTRs for KP's verbs and lexical verbs, and TH's auxiliaries could not be calculated because there was only one token in each of these cases. Of all the other TTRs, none were significantly different from the healthy mean. Therefore, the TTRs are not discussed further here, but the results are included for information in Table 10.3.

Further analyses were then conducted to assess both the raw number of different lemmas used and the number of different lemmas used per 100 words. In terms of the raw number of lemmas (see Figure 10.4), the participants again fell along the same continuum, whereby the range of lemmas used increased with greater expressive capability, and this pattern holds true both for verbs overall and all subtypes. Again, the lack of phrasal verbs and main auxiliaries in the two most impaired speakers is noticeable here. The three least impaired participants (ST, HB & MH) each produced between four and ten different phrasals, that is, either equal to or above the healthy mean (four). Of these three speakers, the two with the greater expressive ability (HB & MH) also used more main auxiliaries than the healthy group (2.42), and the third individual (ST) also still used one. These figures contrast with those of the two most impaired speakers (KP & TH), who used no lemmas of either subtype.

Table 10.3.Type-token ratios (TTRs) of verbs and verb subtypes produced by each participant

		All verbs	Lexical	Auxiliary
Healthy	Token mean	76.33	63.00	13.25
	SD	28.68	24.84	5.10
	range	23 - 132	20 - 110	3 - 22
	Types mean	41.33	35.75	5.50
	SD	11.81	10.75	1.66
	range	18 - 57	15 - 51	3 - 8
	TTR mean	0.57	0.60	0.46
	SD	0.10	0.10	0.18
	range	0.39 - 0.78	0.41 - 0.75	0.29 - 1.00
KP	Tokens	1	1	0
	Types	1	1	0
	TTR	1.00	1.00	N/A
		t=4.131 ***	t=3.843 ***	
TH	Tokens	12	9	1
	Types	7	6	1
	TTR	0.58	0.67	1.00
		t=0.096	t=0.673	t=2.882 **
ST	Tokens	37	28	5
	Types	19	16	3
	TTR	0.51	0.57	0.60
		t=-0.576	t=-0.288	t=0.747
MH	Tokens	135	105	24
	Types	54	47	7
	TTR	0.40	0.45	0.29
		t=-1.633	t=-1.441	t=-0.907
HB	Tokens	88	70	16
	Types	39	33	6
	TTR	0.44	0.47	0.38
		t=-1.249	t=-1.249	t=-0.427

Key to Table 10.3: Significance levels for t values (one-tailed; df=11): *** p≤0.001; ** p≤0.01; * p≤0.05.

Statistical significance calculated using using the 'SINGLIMS.EXE' computer program (see Crawford & Garthwaite, 2002; program accessed from Crawford, n.d).

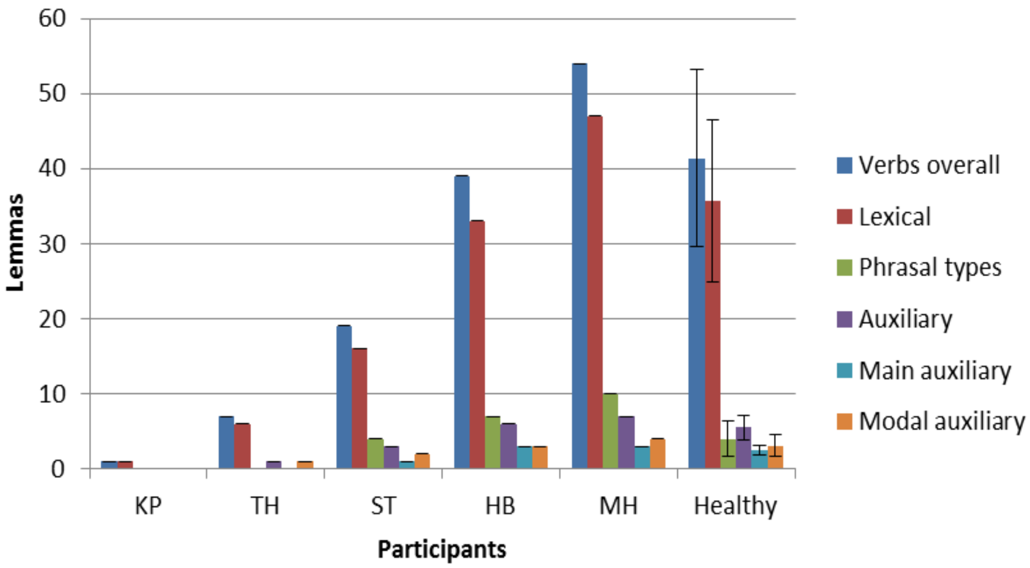


Figure 10.4 Number of verb and verb subtype lemmas used by each participant

The number of different lemmas produced per 100 words also followed a similar pattern (Figure 10.5), with the figures generally increasing with greater expressive capability, both for verbs and all subtypes except modal auxiliaries (which rose from the most impaired to the middle of the participant continuum and then fell again from the middle to the least impaired). The main exception to this general pattern, though, was MH's lemma numbers, which for verbs overall and all subtypes were below those of the two speakers with the next highest WAB fluency ratings (ST and HB). His result for modal auxiliaries was even below that of TH.

An additional finding is that the results for phrasal verbs, auxiliaries and both auxiliary subtypes were actually higher than the healthy mean in the case of several PWA (the three least impaired PWA in the case of phrasals; the two least impaired for auxiliaries and main auxiliaries; and all PWA except KP for modal auxiliaries.

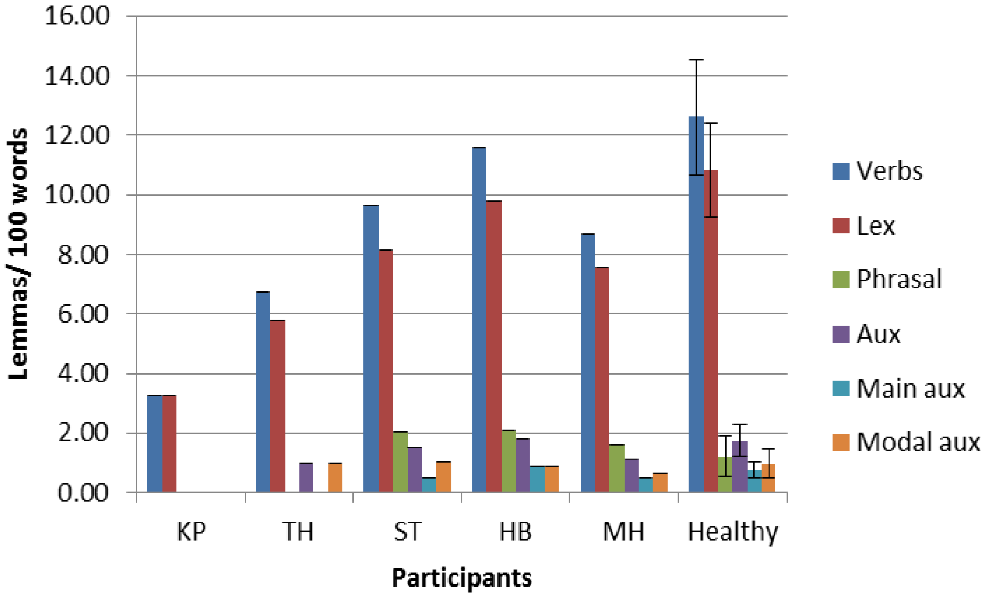


Figure 10.5. Number of different verb and verb subtype lemmas per 100 words

10.4.1.2. Frequency of lemmas

The PWA were again found to fall along the same continuum in terms of the frequency of their lemmas. Figure 10.6 shows the frequency ranks in the Spoken BNC (Davies, 2004-) of all lemmas used by each of the HSp and the PWA. It should be noted that this only shows the first 1000 most frequent verbs, and while the lemmas produced by the PWA were all within the top 1000, 13 of those used by the HSp (between 1-4 lemmas for seven of the HSp) were outside this limit. As the Oxford Dictionary (2014) lists 31,769 entries for English verbs, and the lemmas used by the speakers in this study were almost all within the first 1000 most frequent in the Spoken BNC (Davies, 2004-), it could be said that there is a frequency effect on the lemmas of all 17 (healthy and aphasic) speakers. However, this varies across the PWA group, again according to expressive language capability (WAB fluency rating). The spread of lemma frequency ranks for the participants with the greatest expressive language (MH, HB and ST) does not differ noticeably from that of the HSp. However, the spread does decrease with fluency across all five PWA, with the lemmas used by the most impaired speakers (KP and TH) being limited to the most frequent ones (all within the top 175).[52]

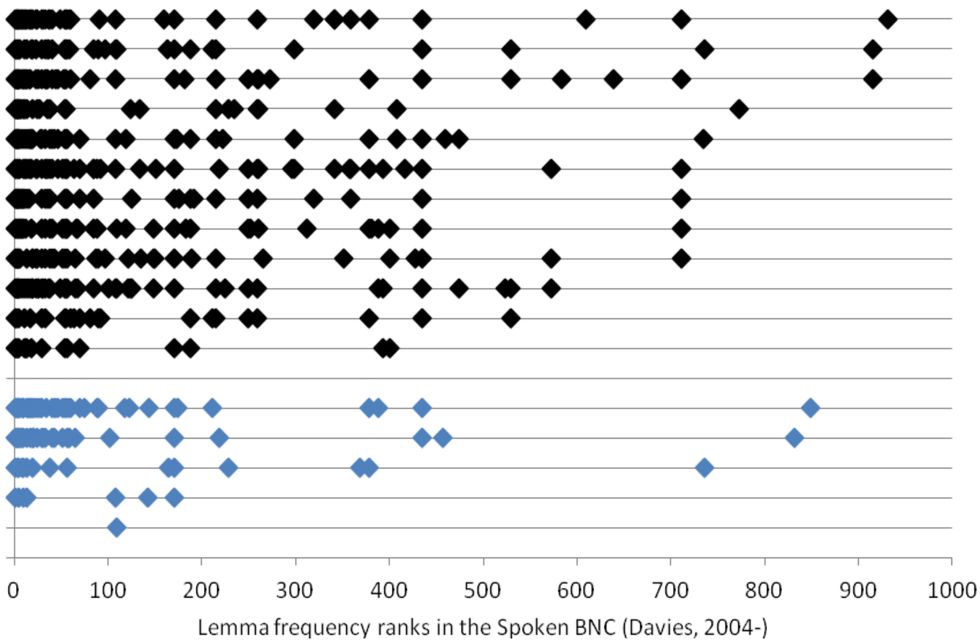


Figure 10.6. Lemma frequency ranks of verbs produced by the HSp and PWA

Key to Figure 10.6. Each horizontal line represents one speaker;

Black markers represent lemmas used by HSp (1 marker = 1 lemma);

Blue markers represent lemmas used by PWA;

HSp listed in order of spread of lemma frequencies; PWA ordered by WAB fluency rating [Kertesz, 1982]).

10.4.1.3. Qualitative analysis of verbs (lemmas, lemma forms and constructional contexts of production)

[52] It is notable that the results for DB, who is also one of the participants with more limited expressive language, showed a similar pattern to those of KP and SH, with six of her seven lemmas being within the top 10 most frequent. The seventh lemma was, however, less frequent, being beyond the top 1000.

10.4.1.3.1. DB (pilot case)

DB's verbs are summarised in Table 10.4. In her 37 tokens, she used seven lemmas, including five lexical verbs and two main auxiliaries. She also produced an additional token of another lemma, FIT, but as this was in response to a direct prompt from the PATSy interviewer, it was excluded from this central analysis of DB's verbs. However, since this production is interesting for theories of verb retrieval in aphasia, it is discussed separately in the latter part of section 10.4.2.2.1.

Table 10.4: Summary of verbs produced by DB

Lexical		
BE [53]	14	
KNOW	8	
GET	2	
GO	2	
PRANCE	1	
Lexical Phrasal		
0		
Auxiliary		
Main		**Modal**
DO	9	0
HAVE	1	
Unclassified		
0		
Total tokens		37

In terms of the forms of each lemma used (Table 10.5), several verbs were only produced once or twice, which limits the analysis of their flexibility. However, there

[53] All DB's tokens of BE were in the form *it's* (see Table 10.5 below), which can in fact contain a contracted form of lexical BE (e.g. *it's a boy*), auxiliary BE (e.g. *it's snowing*) or even auxiliary HAVE (e.g. *it's gone*). However, all DB's tokens of *it's* were classed as lexical BE due to their distribution, occurring almost always before a noun, noun phrase or adjective, and never with any accompanying lexical verb.

were a greater number of tokens of the remaining three verbs, BE, DO and KNOW, and these are of most interest in examining productivity.

Table 10.5: Verb tokens produced by DB (ordered by number of tokens per lemma)

Verb	Token	Verb string
BE_{Lex}	*it's*	***it's*** *a story*
	it's	***it's*** *[wn] one time*
	it's	***it's*** *glass [glæsɪpɜː] glass slipper*
	it's	***it's it's*** *[glɛs] [gˡɛsɪpə]*
	it's	***it's*** *erm (2.0) glass [zɪpə]*
	it's	***it's*** *[ᵊ] [sɪlə] [sɪlə] (1.3) it's [sɪldə] (.) [ɛlɛ]* [INT] *[ɛlə]*
	it's	***it's*** *ball*
	it's	***it's it's*** *er pairy (.) [gɒdᵊnəðə] [gɒdnə]*
	it's	***[ɪzp] it's*** *erm (4.5)* ***[ɪz]*** *[pʴaɪz]*
	it's	***[ɪz] it's*** *[pʴaɪz]*
	[ɪz] [it's][54]	***[ɪz]*** *[pæl] [plænʔᶿ] palace*
	it's	***it's*** *erm (1.8) pretty*
	it's	***it's*** *erm (1.0) no*
	it's	***it's***
DO_{Aux}	*don't*	*I* ***don't*** *know*
	don't	*I* ***don't*** *know*
	don't	*I* ***don't*** *know*
	don't	*I* ***don't*** *know*
	don't	*I* ***don't*** *know*
	don't	*I* ***don't*** *know*
	don't	*I* ***don't*** *know*

[54] The form of BE here may seem ambiguous as, in its transcribed form at least, it resembles *is*. However, on listening to the audio recording and comparing this with other attempts at *it's* (see the strings listed for the two tokens above this one, also Table 10.3), this was regarded as another token of this same form.

	don't	*I **don't** know*
	don't	***don't** ge(t) erm (1.2) **don't** get erm ball*
KNOW	*know*	*I don't **know***
	know	*I don't **know***
	know	*I don't **know***
	know	*I don't **know***
	know	*I don't **know***
	know	*I don't **know***
	know	*I don't **know***
	know	*I don't **know***
GO	*gone*	*all **gone***
	gone	*all **gone***
GET	*get*	*don't **ge(t)** erm (1.2) don't **get** erm ball*
	got	*you've **got** a glass [zɪpə]*
HAVE$_{Aux}$	*you've*	***you've** got a glass [zɪpə]*
PRANCE	*[pænsɪn]* *[prancing]*	*[p] erm **[pænsɪn]** [bauʔt]*

<u>Key to Table 10.5:</u> [INT] = interjection by interviewer.

Beginning with lexical BE, this was very limited in form, with all 14 tokens produced as *it's*. There was no indication that DB could use BE outside this item and given the frequency of *it's* in UK spoken English (68629, Spoken BNC [Kertesz, 1982]), it is likely that she retrieves this item as an unanalysed whole without having productive use of BE. The other two verbs, KNOW and auxiliary DO, were also limited in form, only ever being produced as *know* and *don't*, and occurring almost always together in the phrase *I don't know*. KNOW occurred exclusively in this sequence and DO was used in it in all but one instance, suggesting that for DB, these verbs are strongly linked with this phrase. It is particularly interesting, too, that when DB attempts to use DO in a different sequence, she again produces this same one form (*don't*), despite this not being appropriately marked for the utterance attempted. The string in question, *don't ge(t) erm (1.2) don't get erm ball*, was produced when DB was trying to explain that Cinderella was crying because she was not allowed to go to the ball:

	R:	why's she crying
		(1.5)
→	Pa:	**don't** ge(t) erm *(1.2)* **don't** get erm ball
		(1.2)
	R:	right (.) someone's saying to cinderella she can't go to the ball
	Pa:	yeah mmm

When compared with DB's use of DO in *I don't know*, this utterance shows unevenness of verb productivity since there is no agreement between the verb form (*don't*) and implied third-person subject (Cinderella), whereas subject-verb agreement is indeed achieved in her productions of *I don't know*. It is predicted that *I don't know* is a lexically-specific sequence here with the *don't* 'fixed' within it. It is therefore likely that DB has *I don't know* and then separately either a single lexical item *don't* or possibly a partially-filled [*don't get* [N]] schema. In any case, it seems that DB can only produce a limited number of forms of DO - perhaps even just this one-, rather than having full productivity of this verb.

In summary, DB produced relatively few lemmas that showed little variation in form and were often restricted to particular constructional contexts. There was very little evidence that she could use these productively to create well-formed novel utterances.

10.4.1.3.2. KP

The participant with the most limited expressive language (and most severe aphasia overall), KP, represents an extreme case among the six participants in terms of the number of verbs in his narrative. He produced only one token, which was of the lexical verb WEAR in the form *wearing* (see Tables 10.6 and 10.7). This very low number of tokens suggests that KP has only a limited repertoire of verbs at his disposal and itself indicates unevenness in his language, as he was able to produce this one verb but did not use any others.

Table 10.6: Verb produced by KP

Lexical	
WEAR 1	
Lexical Phrasal	
0	
Auxiliary	
Main	**Modal**
0	0
Unclassified	
0	
Total tokens	1

Table 10.7: Verb tokens produced by KP

Verb	No. tokens	Token	Verb string
WEAR	1	*[weənɹɪn]* [wearing]	***[weənɹɪn]*** *it*

10.4.1.3.3. TH

Similarly to DB and KP, TH, who is also non-fluent, produced relatively few verbs. In her 12 tokens, she used seven different lemmas: six lexical verbs and one modal auxiliary (see Table 10.8). In addition, there were two unclassified instances of BE, that is, tokens whose production context did not allow them to be confirmed as lexical or auxiliary. Therefore, TH may also have used auxiliary BE, but this could not be ascertained. What is striking about TH's lemmas, though, is that they are all intransitive (this fits with the finding that her verb strings are mainly limited to a basic intransitive pattern (see section 10.4.2.2.3).

Table 10.8: Summary of TH's verbs

Lexical			
COME	3		
BE	2		
EXPLAIN	1		
FALL	1		
FIT	1		
GO	1		
Lexical Phrasal			
0			
Auxiliary			
Main		**Modal**	
0		CAN	1
Unclassified			
BE	2		
Total tokens		12	

As regards the forms used (Table 10.9), TH produced most of the verbs only once. However, for two lemmas, COME and BE, there were three and four tokens, respectively, if the unclassified and lexical tokens of BE are grouped. For each of these verbs, TH used two different forms (*came*, *coming; that's*, *is*), which might at first suggest some productivity, especially with COME, produced with different tense and aspect across the tokens. In both cases, though, TH could only have these lexically-specific forms rather than flexible use of the verbs. Indeed, there is some suggestion that she does not have fully productive use of COME, as she does not produce this in an appropriate form in the following string:

> *princess er no prince (1.4) prince (.) erm (.) coming*

This seems to be a basic intransitive utterance and would therefore require either *comes* or *came* (although it is possible, too, that the utterance is in fact a progressive intransitive (e.g. *prince is coming*) that is lacking the auxiliary).

It also seems likely that TH can only access the two forms of BE as lexically-specific forms. She only produces lexical BE in the form *that's,* within the sequence *that's it*. While she does produce *is* separately in the unclassified BE tokens, given the frequencies of *that's* (45112), *that's it* (2302) and *is* (103463) in the Spoken BNC (Davies, 2004-), it is likely that she simply has *that's* or *that's it* and *is* as lexically-specific wholes, rather than full productivity of BE. Therefore, as was the case for the other two participants with relatively limited expressive language, TH's verbs are not only restricted in number and lemma diversity, but also in productivity of form.

Table 10.9: Verbs tokens produced by TH (ordered by number of tokens per lemma)

Verb	Token	Verb string
COME	*came*	*god (1.2) daughter (.) erm (1.2) erm (3.6) cinderella (.) herm (1.4)* ***came*** *erm (1.8) as well erm (1.6) castle*
	came	*then erm (2.6) erm (3.1) Dandini ((laugh)) ʰerm (.)* ***came***
	coming	*princess er no prince (1.4) prince (.) erm (.)* ***coming***
BE $_{Lex}$	*that's*	***that's*** *it*
	that's	***that's*** *it [m]really*
BE Unclassified	*is*	*[s] s-tepson [ᵊ-s] (1.1) [ᵊ-s] (1.6) [ᵊ-]s-tep (3.5) woman [INT] erm (1.9) erm (1.3)* ***is*** *erm (.) castle*
	is	*ᵊ-Cinderella er* ***is*** *erm beautiful (.) erm dress*
EXPLAIN	*explain*	*I can't* ***explain***
FALL	*falls*	*[s] [p]slipper (.) erm (.) erm (1.1)* ***falls***
FIT	*fits*	*it* ***fits***
GO	*go*	*then erm (2.9) err (1.5) (one two three four five six seven eight nine ten eleven) twelve o'clock (.) erm (.) [ʔ]* ***go*** *because er Cinderella (.) erm (3.3) [kʊ] erm (.) not very (.) not very good*
CAN	*can't*	*I* ***can't*** *explain*

Key to Table 10.9: [INT] = interjection by interviewer.

To summarise, similarly to the other participants with more impaired expressive language, TH uses only a small number of verbs, but in her case these are all intransitive. Again, the verbs are limited in form with several appearing to be item-based, and there indications that she may not have fully productive use of certain verbs.

10.4.1.3.4. ST

Further along the continuum of expressive language capability, towards the middle of the participant group, ST produced both a higher proportion of verb tokens and demonstrated a greater diversity of lemmas than the participants with greater impairment of expressive language. In his 37 tokens, ST used 19 lemmas, of which 16 were lexical verbs, including four phrasals, and three were auxiliaries: one main and two modals (Table 10.10).

Table 10.10: Summary of ST's verbs

Lexical			
BE	6	GO	1
FIT	3	LEAD	1
COME	2	PRESENT	1
CROWN	2	SCUM/SCRUB	1
GET	2	STRIKE	1
MAKE	2	STUDY	1
Lexical Phrasal			
LEAVE BEHIND	2	REEL OUT	1
GO OFF	1	TURN AWAY	1
Auxiliary			
Main		**Modal**	
BE	2	WILL	2
		CAN	1
Unclassified			
BE	4		
Total tokens		37	

In terms of the forms used (Table 10.11), ST produced most verbs only once, but for eight of the lemmas he produced more tokens. For four of these (COME, MAKE, WILL and FIT), the verb form did not vary across tokens (2 x *comes*, 2 x *makes*, 2 x *will*, 3 x *fits*), but more variation was observed for the other four (CROWN, GET, LEAVE BEHIND and lexical BE). The first three of these were each produced in two forms (*crown*, *crowned*; *gets*, *got*; *leave behind*, *leaves behind*), possibly revealing some flexibility with these verbs. However, it is with the remaining verb, lexical BE, that most variation was observed. This was produced in at least five different forms (*it's*, *be*, *was*, *he's* and *that's*), and if the lexical, auxiliary and unclassified tokens of BE are pooled, the forms also include *are* and *is*, totalling seven overall. ST therefore shows much greater productivity with BE, although technically there is only confirmed variation amongst the lexical and unclassified tokens, leaving it unclear if he can vary BE as an auxiliary.

<u>Table 10.11: Verbs tokens produced by ST (ordered by number of tokens per lemma)</u>

Verb	Token	Verb string
BE_{Lex}	*be*	*[ðɪᵍðᵊðɪsk] [ðɪsk] (.) [ðɪsk^ˀ] (1.2) the (5.7) ((tut?)) (.) the shoe that (1.2) fits the [ðᵊᵇ] [ðᵊ] the (1.1) erm (3.5) the[s] (1.0) the the the shoe that [^ ʰf] (.) fits the (.) [aə] (.) [ᵊ ʰ] (3.1) youngest of the[ᵇ] (1.4) pair (.) will* ***be*** *queen*
	it's	*[ɪ]* ***it's*** *(1.4) erm (1.0) [daʊnɒnən] her [hæz] and knees (.) erm [skumɪŋ] on the floors*
	it's	***[iz] [iz]*** *erm (2.8) [^ ʰ] (.) [ə] [ə] [^ ʰ] (1.1) ((tut)) (.) erm a message (.) to the [k] (1.4) [ə] run of the mill (.) [g] [gæːˀ]*
	he's	*the king (1.5) erm (5.4) erm (.)* ***he-[is]*** *erm (1.4) not (1.0) sure of the time*
	was	*<u>i</u>t* ***was*** *(1.5) [ᵘʷ] went [tᶞbaːti]*

	that's	***that’s** it*
BE$_{Unclass}$	*are*	*[tə] two[l] (1.3) [ˡə] [ə]glamourous erm (4.2 including tut) erm (3.7) ladies and Cinderella (.) erm [^{æ}]er er **are** all (1.5) [kɒn^{ʔ}]*
	is	*[ð^{ɨg}] [ð^{ɪg}] the king **is** (1.4) erm (2.0) [ɹ] erm (.) leads the horse and the [k] the queen (.) back to (.) the (2.1) the castle*
	he's	***he’s** [hɜ]*
	it's	***iːt’s***
FIT	*fits*	*[ðɪ^{g}ð^{ə}ðɪsk] [ðɪsk] (.) [ðɪsk^{ʌʔ}] (1.2) the (5.7) ((tut?)) (.) the shoe that (1.2) **fits** the [ð^{əb}] [ð^{ə}] the (1.1) erm (3.5) the[s] (1.0) the the the shoe that [$^{ʌ\ hf}$] (.) **fits** the (.) [aə] (.) [$^{ə\ h}$] (3.1) youngest of the[^{b}] (1.4) pair (.) will be queen*
	fits	*[ɛ] [e:ˈ] anybody (.) erm (1.7) who the [stɪfə] (.) **fits** is [kɹ] crown (.) is (1.8) crowned [kˈ] (1.2) the queen*
	fits	*i-it (.) **fits***
COME	*comes*	*the[^{g}] the (1.2) princess (1.0) erm (2.0) turns away (.) and (1.0) **comes** out the (2.2) the ball and (.) erm (.) [ə] [ɜː] as [^{ð}] the clock [staɪpz] midnight*
	comes	*he [kɪʊmz] he **comes** and (2.2) erm (7.2) erm (1.4) [n neɪkz^{œ}n] a [nɒʔ] (.) a note*
CROWN	*crown*	*[ɛ] [e:ˈ] anybody (.) erm (1.7) who the [stɪfə] (.) fits is [kɹ] **crown** (.) is (1.8) crowned [kˈ] (1.2) the queen*
	crowned	*[ɛ] [e:ˈ] anybody (.) erm (1.7) who the [stɪfə] (.) fits is [kɹ] crown (.) is (1.8) **crowned** [kˈ] (1.2) the queen*
GET	*gets*	*cinderella (1.7) [gɪʔs] **gets** (.) [ð^{ə}] the (4.2) the (.) [^{g}] the (3.0) the [vɛɹ] the [vɛɹi gəʊ^{wˡ}dmʊðə]*
	got	*she (.) **got** (1.0) erm (1.7) erm (2.4) presented to the king and all [ð^{ʊ}ɛst] of it*
MAKE	*makes*	***makes** a [st]*

	[neɪkzᶮn] *[makes]*	*he [kɪʊmz] he comes and (2.2) erm (7.2) erm (1.4) [n* ***neɪkzᶮn****] a [nɒʔ] (.) a note*
LEAVE BEHIND	*leaves… behind*	*she [ɹ]* ***leaves*** *a slipper* ***behind***
	leave… behind	*[ᶞ] [ᶞ] they go [ɑːtəᶞᵊ] (.) the funeral erm the the party (.) and* ***leave*** *(.) [s]cinderella* ***behind***
BE_{Aux}	*is*	*[ɛ] [eːˈ] anybody (.) erm (1.7) who the [stɪfə] (.) fits* ***is*** *[kɹ] crown (.) is (1.8) crowned [kˈ] (1.2) the queen*
	is	*[ɛ] [eːˈ] anybody (.) erm (1.7) who the [stɪfə] (.) fits is [kɹ] crown (.)* ***is*** *(1.8) crowned [kˈ] (1.2) the queen*
WILL	*will*	*[ðɪᵍðᵊðɪsk] [ðɪsk] (.) [ðɪskʌˀ] (1.2) the (5.7) ((tut?)) (.) the shoe that (1.2) fits the [ðᵊᵇ] [ðᵊ] the (1.1) erm (3.5) the[s] (1.0) the the the shoe that [ʌ ʰf] (.) fits the (.) [aə] (.) [ᵊ ʰ] (3.1) youngest of the[ᵇ] (1.4) pair (.)* ***will*** *be queen*
	will	*the girls (.) that [i-****wˈɵl****]*
GO	*went*	*i̱t was (1.5) [ᵊʷ]* ***went*** *[tᶞbaːti]*
LEAD	*leads*	*[ðˈᵍ] [ðˈᵍ] the king is (1.4) erm (2.0) [ɹ] erm (.)* ***leads*** *the horse and the [k] the queen (.) back to (.) the (2.1) the castle*
PRESENT	*presented*	*she (.) got (1.0) erm (1.7) erm (2.4)* ***presented*** *to the king and all [ðᵘɛst] of it*
SCUM/ SCRUB	*[skumɪŋ] [scumming/ scrubbing]*	*[ɪ] it's (1.4) erm (1.0) [daʊnɒnən] her [hæz] and knees (.) erm* ***[skumɪŋ]*** *on the floors*
STRIKE	*[staɪpz] [strikes]*	*the[ᵍ] the (1.2) princess (1.0) erm (2.0) turns away (.) and (1.0) comes out the (2.2) the ball and (.) erm (.) [ə] [ɜː] as [ᶞ] the clock* ***[staɪpz]*** *midnight*
STUDY	*study*	*[ð] [ð] they* ***study*** *it*
GO OFF	*go off*	*[ᶞ] [ᶞ] they* ***go*** *[****a****ːtəᶞᵊ] (.) the funeral erm the the party (.)*

		and leave (.) [s]cinderella behind
REEL OUT	*out reels*	*[æ] [ɑ]* ***out reels*** *a erm (4.8) erm (.) [ᵊ] [ᵊ] [ᶟ ʰ] (1.3) [ð] [ð] [ᵈ]the landed gentry*
TURN AWAY	*turns away*	*the[ᶢ] the (1.2) princess (1.0) erm (2.0)* ***turns away*** *(.) and (1.0) comes out the (2.2) the ball and (.) erm (.) [ə] [ɜː] as [ᶞ] the clock [staɪpz] midnight*
CAN	*can*	*he[ᶢ] (3.6) he* ***can*** *[gˈᵊ] [gˈ]*

In summary, ST not only produced more verb tokens and used a greater range of lemmas than the more impaired participants, but he also demonstrated a greater diversity of the forms in which some of these were produced.

10.4.1.3.5. HB

HB, who has greater expressive language capability than ST, again showed an increase in the number of verb tokens and range of lemmas used. She produced 87 tokens, using 39 lemmas, of which 33 were lexical, including seven phrasals, and six were auxiliaries: three main and three modals (Table 10.12).

Table 10.12: Summary of HB's verbs

Lexical					
BE	13	LIKE	2	REMEMBER	1
COME	6	SIT	2	RUB	1
LOOK	6	DANCE	1	SEW	1
GET	3	FIND	1	SHOW	1
GO	3	HELP	1	TRY	1
HAVE	2	KNOW	1	TURN	1
SAY	3	LAUGH	1		
TAKE	3	LET	1		
DO	2	MAKE	1		
FIT	2	PUT	1		
Lexical Phrasal					
GO ROUND	2	MISS OUT	1		
GO OFF	1	SEND OUT	1		
GO OUT	1	TRY ON	1		
MAKE INTO	1				
Auxiliary					
Main		**Modal**			
DO	8	WILL	2		
BE	3	CAN	1		
HAVE	1	MUST	1		
Unclassified					
BE	1				
HAVE	1				

Total tokens	87

HB also showed considerably more flexibility in the forms she produced of each verb (Table 10.13). For the sake of space, only the lemmas for which she produced more than five tokens are shown in Table 10.13 (see Appendix XXI for full details of all tokens). There were 16 lemmas for which HB produced multiple tokens, and of these, 12 (all except TAKE, LIKE, SIT and WILL) showed variation of the verb form used. This diversity is, of course, easier to assess in the lemmas with most tokens, but is again particularly noticeable for the verb BE. HB used eight different forms of *lexical* BE alone (*'s* [interpreted as *it's*], *are*, *be*, *he's*, *is*, *that's*, *they're* and *was*), and if the auxiliary and unclassified tokens are considered, she also produced *she's* and *you're* (and a more definite production of *it's*), totalling ten forms of BE overall.

Table 10.13: Verbs tokens produced by HB (ordered by number of tokens per lemma)

Verb	Token	Verb string
BE_{Lex}	*'s [it's]*	***'s** too big for them*
	are	*the two girls [n] **are** big*
	be	*you're going to **be** the tailor now (.) because you've got it right*
	he's	***he's** glad*
	is	***is** that right*
	they're	***they're** they look look her down*
	that's	***that's**[w] when the thing*
	that's	*then (1.7) **that's** when [^{l}] the[^{n}] man went out looking out with this man for the farmer to look for him*
	was	*[faː^{l}] goes round to say (that??) everybody must try to find who this (.) had this child **was**[k] who came*
	was	*I don't know what it **was***
	was	*he **was** at he **was** at this thing sewing [ɪnð] [wəð] this erm a man*

	was	*he **was** fond of her*
	was	*he **was** rather [ϑɔːhəv]-*
DO	*didn't*	*he **didn’t** like the other girls*
	does	***does** she show the [tɜːᵊzəz] to the men*
	doesn't	*it **doesn’t** fit [ᵊ ˢᵊ]*
	did	***did** she come*
	did	*what **did** I do with the have the [ϑəsəsː]*
	don't	*I **don’t** know what it was*
	don't	***don’t** like her at all*
	don't	*I **don’t** remember what comes next*
COME	*came*	*[fɑːˡ] goes round to say (that?) everybody must try to find who this (.) had this child was[k] who **came***
	come	*did she **come***
	comes	*she **comes** home[ᵊ] (.) and puts the (.) puts the shoe on her*
	comes	*that’s[w] when the thing **comes***
	comes	*I don’t remember what **comes** next*
	comes	*she **comes** (.) in*
LOOK	*looked*	***looked** like a tomato*
	look	*then (1.7) that’s when [ˡ] the[ⁿ] man went out looking out with this man for the farmer to **look** for him*
	look	*they’re they **look look** her down*
	looking	*he sits there **looking** [ə-və]very sad*
	looking	*she sits **looking** at him*
	looking	*then (1.7) that’s when [ˡ] the[ⁿ] man went out **looking** out with this man for the farmer to look for him*

In summary, HB produced considerably more verb tokens and used a wider range of lemmas than the participants with more limited expressive language. In addition, she produced these verbs in a greater variety of forms and constructional combinations, suggesting that she has much greater flexibility in the use of her verbs than was the case for the more impaired speakers.

10.4.1.3.6. MH

Furthest along the continuum, MH, who presented with the least impaired expressive language, produced the highest number of verb tokens and the widest range of lemmas of all the PWA (see Table 10.14). In his 135 tokens, he used 51 lemmas, comprising 34 lexical verbs, including ten phrasals, and seven auxiliaries: three main and four modal.

Table 10.14: Summary of MH's verbs

Lexical					
BE	18	SHOW	2	LOOK	1
SAY	17	SIT	2	LOSE	1
GO	6	THINK	2	MEAN	1
COME	4	TRACE	2	NEED	1
HAVE	4	CHANGE	1	PASS	1
WANT	4	DANCE	1	REMEMBER	1
CLEAN	2	END	1	RUN	1
FETCH	2	FEEL	1	STAND	1
FORGET	2	FIT	1	START	1
GET	2	HEAR	1	STRIKE	1
GIVE	2	INCLUDE	1		
LIVE	2	LISTEN	1		
Lexical Phrasal					
TRY ON	2	GO BY	1		
COME BACK	1	GO ROUND	1		
GET BACK	1	PUT ON	1		
GET INTO	1	SIT IN	1		
GO ALONG	1	THINK OF	1		
Auxiliary					
Main		**Modal**			
BE	4	WILL	9		

DO	4	CAN	2	
HAVE	2	COULD	2	
		MUST	1	
Unclassified				
BE	5			
HAVE	1			
Total tokens				135

Again, the forms of these lemmas were also relatively varied (see Table 10.15 for those with more than five tokens; full list included in Appendix XXII). Of the 23 lemmas that were produced more than once, eleven were used in at least two different forms. Again, though, the flexibility of form is most noticeable in the verb with the greatest number of tokens, lexical BE, produced in eight forms (*are*, *be*, *is*, *it's*, *there's*, *was*, *were*, *what's*). If the auxiliary and unclassified tokens of BE are also considered, a ninth form, *I'm*, was also used. However, for some lemmas with multiple tokens, MH does make repeated use of a small number of verb forms. For example, the verb WILL, produced nine times, was limited to only two forms, *I'll* and *will*. Similarly, of the 17 tokens of SAY, 14 took the form *said*.

Table 10.15: Verbs tokens produced by MH (ordered by number of tokens per lemma)

Verb	Token	Verb string
BE_{Lex}	*are*	*[ɪ] in the book [ᵊ] [ə'] in that book there are two (1.1) daughters (.) [ϑɹ] three daughters*
	be	*every [ᵐ] woman of certain ages will be (1.4) has to go along*
	is	*[t] the [fɹɪnz] says (.) is there ((emotion)) [INT] (4.4) is there anybody else at this at this house*
	is	*he said oh (4.5) my (1.7) that is a princess that I want*
	is	*if if I can only think of what it is*
	is	<u>*this is a story*</u>
	it's	*[ɪ] [ɪ] it's (.) a big [ϑ] [ð] big [sɜːkᵊləˇ] thing*

	there's	*they said (.) well there's only [^{ð}] the little[^{d}] (.) [s] (.) [m] [s] [mː]maid*
	was	*[ð-^{ə}] [ðε^{əb}] that was it*
	was	*[^{ðʉjβæ}]her job (.) was (1.0) the same day after day after day*
	was	*[ʋɐt] he said was (.) now listen everybody*
	was	*there was (2.1) [ɜf] (.) a little ((clears throat)) (.) a little (3.5) but [ð-^{ə}] (.) [ɪ] [ɪ^{ə}] it (1.5) [əm] pumpkin a pumpkin*
	was	*it was [^{v}]really about (3.4) cleaning the floors (.) and[sk] and everything connected with (.) [ð] the floors*
	was	*in the one I heard (.) it was [sɛndəɹɛlə] and three daughters*
	were	*[^{ð}] there were (.) [ɛ'] there were two or three (.) [mː] - [(3.1) I want to say maids but I don't really think maids for that]*
	were	*[ð]they were busy cleaning the house*
	were	*they were so excited [ð] [ð^{əs}] the two or the three (1.0) that they (.) they [kʊ^{ʔɜnɜndt}] couldn't get (.) into it hard enough*
	what's	*the prince the prince [^{ə}]says (2.2) said (1.5) [h] ^{ʊ}what's the matter [t] Cinderella*
SAY	*said*	*[ʋɐt] he said was (.) now listen everybody*
	said	*they said (.) [d] [d] [d] (.) don't worry about the ball*
	said	*they he said (.)[æ] I [w] [^{ʊ} w] (1.0) er [kæ^{ə}] I will have to [t] (1.5) I will have to (1.8) to to trace*
	said	*[ʃ'] [ʃ] she said (2.5) [s ^{ə} ^{dʒ}] (.) [ʃ] (.) six (.) I will (1.2) [ð] (2.0) I will (1.3) [ð] the six little mice [s]will change to six beautiful horses*
	said	*all of a sudden (1.2) she [^{ə}s] [^{ə}w^{ʊ} ^{ə}] [ðs] [ə] said (.) [^{w}]because [^{ð}] the clock was starting to [t] strike twelve*
	said	*Cinderella said (.) [^{ə}]er I'm (.) want to [gɛ$^{əʊ v}$] go to the ball (.) but (5.0 including emotion) I want to go to the ball*
	said	*he said oh (4.5) my (1.7) that is a princess that I want*

	said	*it came [t] to pass (.) that the prince said (.) he was going round all the? (1.6) ladies in the [INT] neighbourhood*
	said	*she said (1.5) [dᵊ] (.) [ᵊᵊᵘw] is [ɪʔ] [ðᵊ] [ᶞ] (.) I must get back [ᵈ] before the [pɹɪn]*
	said	*they (.) said fetch cinder [ɛl] cinderella up the stairs (1.1) [t] [f] [v] [vɹɒm] the (.) [n] dirty dishes and what not down below*
	said	*they said (.) well there's only [ᶞ] the little[ᵈ] (.) [s] (.) [m] [s] [mː]maid*
	said	*they said (1.0) [ɪ] [ɪ] [i] if you [k] [ʔgʔ] can (.) please try this on*
	said	*they said ((emotion))*
	said	*the prince the prince [ᵊ]says (2.2) said (1.5) [h] ᵘwhat's the matter [t] Cinderella*
	say	*I want to say maids*
	says	*[t] the [fɹɪnz] says (.) is there ((emotion)) [INT] (4.4) is there anybody else at this at this house*
	says	*the prince the prince [ᵊ]says (2.2) said (1.5) [h] ᵘwhat's the matter [t] Cinderella*
WILL	*I'll*	*I'll come back to that one*
	I'll	*I'll remember it later on*
	will	*[ʃ'] [ʃ] she said (2.5) [s ᵊ ᵈʒ] (.) [ʃ] (.) six (.) I will (1.2) [ð] (2.0) I will (1.3) [ð] the six little mice [s]will change to six beautiful horses*
	will	*it will (.) [vɪl] will be (.) [tʃ] [ᵈʒ] [d] also-*
	will	*they he said (.) [æ] I [w] [ᵘ w] (1.0) er [kæᵊ] I will have to [t] (1.5) I will have to (1.8) to to trace*
	will	*every [ᵐ] woman of certain ages will be (1.4) has to go along*
	will	*I will (.) ((blows nose?)) (1.2) need to [j]*
	will	*[ʃ'] [ʃ] she said (2.5) [s ᵊ ᵈʒ] (.) [ʃ] (.) six (.) I will (1.2) [ð] (2.0) I will (1.3) [ð] the six little mice [s]will change to six beautiful horses*
	will	*I will tell the story of cinderella*

GO	*go*	*Cinderella said (.) [ᵊ]er I'm (.) want to [gɛᵊʊᵛ] go to the ball (.) but (5.0 including emotion) I want to go to the ball*
	go	*Cinderella said (.) [ᵊ]er I'm (.) want to [gɛᵊʊᵛ] go to the ball (.) but (5.0 including emotion) I want to go to the ball*
	going	*it shows her going up the hill*
	going to	*the prince is going to [ʰˀʉˡᵗ] give a (2.8) give a [kaⁿˀ] [əgᵊ] [ⁿ] [not a concert but a]*
	went	*they went and [fɛksd] cinderella up to the (1.0) [INT] (2.2) [d] up to the stairs*
	went	*it went to the [pʊʔ] to the [hᵓ] [hɒᵊl]*
$BE_{Unclass}$	*be*	*it will (.) [vɪl] will be (.) [tʃ] [ᵈʒ] [d] also-*
	I'm	*Cinderella said (.) [ᵊ]er I'm (.) want to [gɛᵊʊᵛ] go to the ball (.)but (5.0 including emotion) I want to go to the ball*
	is	*she said (1.5) [dᵊ] (.) [ᵌᵊᵘw] is [ɪʔ] [ðᵊ] [ᶞ] (.) I must get back [ᵈ] before the [pɹɪn]*
	was	*the house was-*
	was	*one day (1.7) it [wᵊ] (1.2) it was[ⁿ]*

Key to Table 10.15: [INT] = interjection by interviewer.

Overall, MH therefore not only produced the greatest number of lemmas, but he also showed a comparatively high degree of flexibility in the forms of these that he produced. While he did make repeated use of some forms (e.g. *said*), he also seemed more able to use his verbs successfully in producing novel utterances.

10.4.1.3.7. Summary of verb lemmas, forms and constructional contexts

In summary, the five recruited PWA not only fall along a continuum in terms of their number of verb tokens and range of lemmas, but also do so with regard to the diversity of forms and constructional contexts these are produced in, with all of these increasing with greater expressive language capability. The PATSy database (pilot) participant, DB (non-fluent), also fits with this continuum. DB's WAB fluency rating is 4, which is equal to that of TH (also non-fluent) and both participants used the same number of lemmas (seven). DB's token number was, in fact, identical to that of the speaker with the next greatest level of expressive language, ST, but this was due to DB's repeated use of the 'verb-heavy' items *I don't know* and *it's*, leading to increased token (but not lemma) numbers. In addition, DB's level of form flexibility was similar to that of TH, in that there was little evidence that she could vary her verb forms flexibly and use these in creating well-formed novel utterances. Thus, this pilot case supports the notion, as found for the recruited participants, of a continuum of verb productivity corresponding with expressive language capability (WAB fluency rating).

10.4.2. Verb strings

10.4.2.1. Number, length and complexity of strings

The results of all quantitative analyses of strings again generally followed a similar pattern to the findings for verbs. Firstly, the number of strings increased with greater expressive capability across the PWA (Figure 10.7). In the two least impaired PWA, these numbers were in fact substantially higher than the healthy mean. The ratio of strings to words (Figure 10.8) also increased with greater expressive language capability across the PWA except in MH’s case. The ratio of words to strings for MH (the least impaired speaker) was actually equal to that of TH (the second most impaired). The proportion of narrative words that fell within verb strings also generally increased with greater expressive language capability (see Figure 10.9), with the exception that the result for HB, the second least impaired participant, was slightly higher than that of MH (the least impaired). The mean length of string in words also followed the same pattern of increasing with greater expressive language across the PWA (Figure 10.10), except in ST’s case, where the mean string length was higher than that of the next more able speaker, HB. Finally, the mean number of verbs, used here as an indication of string complexity, also increased with greater expressive language across the PWA (Figure 10.11).

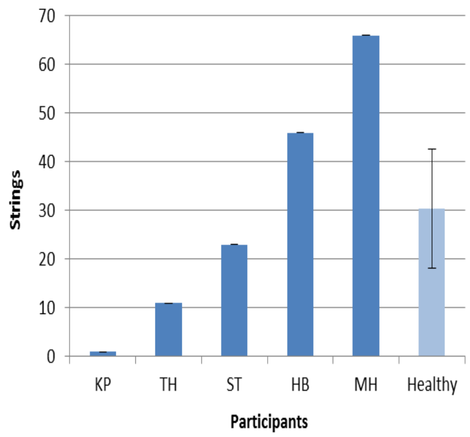


Figure 10.7. Number of verb strings per narrative

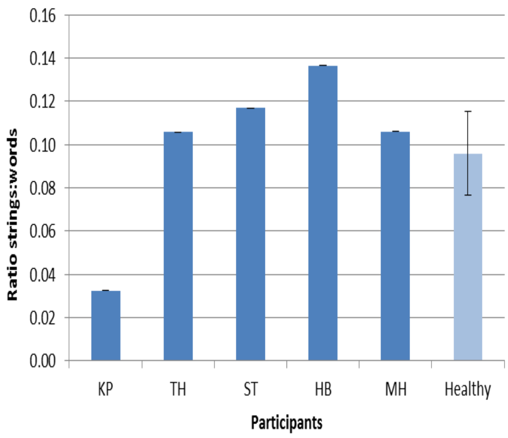


Figure 10.8. Ratio of strings to words

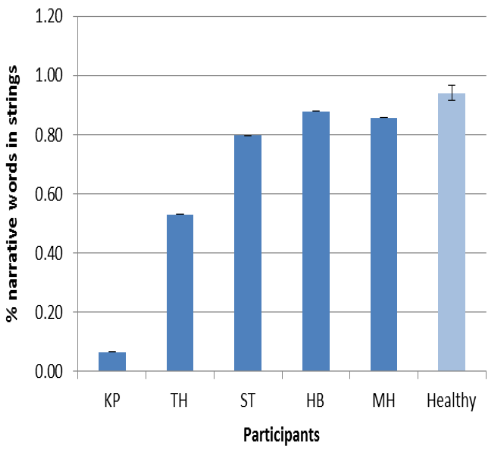


Figure 10.9. Percentage of narrative words that fall within strings

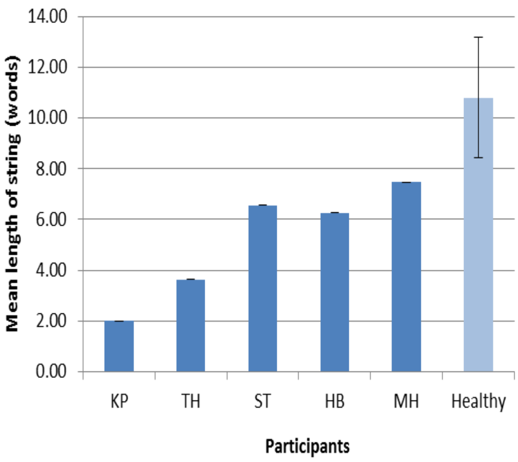


Figure 10.10. Mean length of string in words

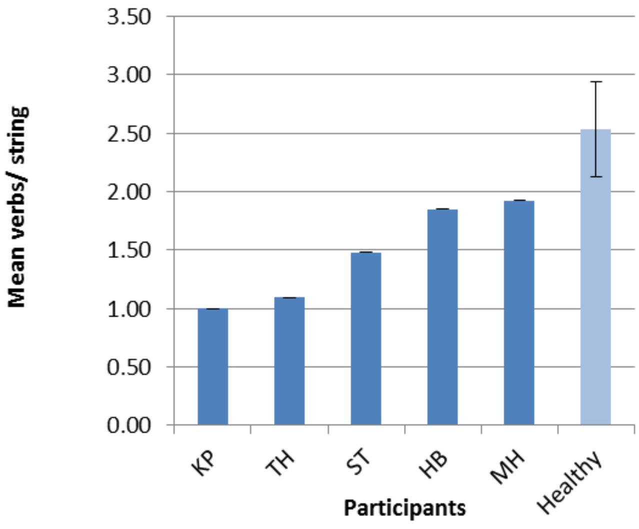


Figure 10.11. Mean number of verbs per string

10.4.2.2. Qualitative analysis of strings: string well-formedness, fluency and frequency, and constructions used in string production

10.4.2.2.1. DB

DB's 37 verb tokens were produced across 27 strings (see Table 10.16). A first observation is that there is unevenness in which strings are well-formed and/ or fluent. The first eleven strings in Table 10.16 are indeed both well-formed and fluent, but this is not so for the remaining 14.

Table 10.16: Verb strings produced by DB, ordered by well-formedness then fluency then frequency.

Ref no.	**String (as produced)**	**Well-formed**	**Fluent**	**Exact string freq.**	**Gram. string freq.**
1	it's	✓	✓	68629	68629
2	I don't know	✓	✓	7004	7004
3	I don't know	✓	✓	7004	7004
4	I don't know	✓	✓	7004	7004
5	I don't know	✓	✓	7004	7004
6	I don't know	✓	✓	7004	7004
7	I don't know	✓	✓	7004	7004
8	I don't know	✓	✓	7004	7004
9	I don't know	✓	✓	7004	7004
10	all gone	✓	✓	118	118
11	all gone	✓	✓	118	118
12	it's a story	✓	✓	2	2
13	it's erm *(1.0)* no	✓	X	381	381
14	it's erm *(1.8)* pretty	✓	X	102	102
15	it's [ᵊ] [sɪlə] [sɪlə] *(1.3)* it's [sɪldə] (.) [ɛlɛ] [INT] [ɛlə]	✓	X	1	1
16	you've got a glass [zɪpə]	✓	X	0	0
17	it's [wn] one time	✓	X	0	0
18	[p] erm [pænsɪn] [bauʔt]	✓	X	0[55]	0
19	it's ball	X	✓	0	2
20	[ɪzp] it's erm (4.5) [ɪz] [pʴaɪz]	X	X	0	2
21	[ɪz] it's [pʴaɪz]	X	X	0	2
22	don't ge(t) erm *(1.2)* don't get	X	X	0	0

[55] Form tested: *prancing about*.

	erm ball				
23	it’s it’s er pairy (.) [gɒdᵊnəðə] [gɒdnə]	X	X	0	0
24	[ɪz] [pæl] [plænʔᶿ] palace	X	X	0	0
25	it’s it’s [glɛs] [gˡɛsɪpə]	X	X	0	0
26	it’s erm *(2.0)* glass [zɪpə]	X	X	0	0
27	it’s glass [glæsɪpɜː] glass slipper	X	X	0	0

Key to Table 10.16. Freq. = frequency (Spoken BNC, Davies, 2004-); Gram. = ‘grammaticalised’; [INT] = interjection by interviewer.

This difference can be linked to the frequencies of these strings as wholes. The well-formed and fluent strings all have entries in the spoken BNC, while this is mainly not the case for those that are ill-formed and/or disfluent, even when a ‘grammaticalised’ version of these is tested (see again Appendix XX for sequences examined). It could therefore be hypothesised that DB is able to produce the well-formed and fluent strings as such because it is more likely that she has encountered these previously and now stores and retrieves them as wholes. In contrast, she is less likely to have encountered and stored the other strings as wholes and these could instead be examples of DB attempting to create novel utterances and having noticeably less success. Main exceptions to this proposal, however, are strings 13 and 14 (*it’s erm (1.0) no* and *it’s erm (1.8) pretty*), which are well-formed and have rather substantial frequency counts in the corpus, yet it is still argued, for three reasons, that these strings are likely to have been assembled rather than retrieved as wholes. Firstly, they are both interrupted (by an audible hesitation token and a pause each), making it less likely that the sequence of lexis has been retrieved as one continuous item. Secondly, the two strings would fit the general pattern of DB employing a partially-filled [*it’s* UTTERANCE] schema to create novel strings, as proposed below (this section). Finally, for string 13, the corpus frequency count is unlikely to reflect the word sequence as used by DB. In DB’s usage, *no* was used to communicate that Cinderella was not allowed to go to the ball, as follows:

→

	R:	<u>who's</u> who's crying
		(1.5)
	Pa:	[sɪləɛnᵈ] [sɪndᵊɹɛn]
	R:	<u>why</u>
		(1.3)
→	Pa:	oh **it's** erm *(1.0)* **no**
		(3.6)
	R:	why's she crying
		(1.5)
	Pa:	don't ge(t) erm *(1.2)* don't get erm ball
		(1.2)
	R:	right (.) someones saying to cinderella she can't go to the <u>ball</u>
	Pa:	<u>yeah</u> <u>mmm</u>

However, the corpus frequency for the sequence *it's no* mainly comprises entries where *no* is used as a quantifier, for example, *it's no good/use*. None of the entries are likely to match DB's usage of the string, meaning she is unlikely to have this sequence as a whole form that is paired with the function for which she used it here.

With regards to the constructions DB may have accessed to produce the strings, these seem rather limited, as all can be accounted for by a small number of item-based constructions. As indicated, at least ten strings (eight of *I don't know* and two of *all gone*), could have been retrieved entirely as wholes. In the case of *I don't know*, whole-form retrieval is likely, firstly because of the frequency of this phrase as a whole (7004). Secondly, the way this phrase is used by DB suggests it sometimes functions as a single item. *I don't know* was produced by DB in response to general prompt questions from the PATSy interviewer about what happened in the story. However, the phrase appears to have two functions in DB's speech (see Table 10.17). Sometimes, it seems to convey its compositional meaning of the speaker not knowing something (or the words to relay this). Here, it is produced more slowly with a sense of completion and either nothing or a pause following it within the turn as if DB indeed has no ready answer. This is also indicated by other suggestions of difficulty such as audible hesitation tokens and tuts or sighs preceding *I don't know*. Contrastingly, it is at other times produced more quickly with a sense of urgency to progress to another item (*it's ball* and *exciting*), which proceeds unimpeded by pauses or audible hesitation tokens, and, importantly, gives an appropriate answer to the interviewer's question. Here, the phrase therefore arguably does not convey its compositional meaning of the speaker not knowing something, but rather functions as a single-item filler that helps to initiate speech and enables DB to hold the 'conversational floor'[56], allowing her more time to retrieve the necessary content word. Furthermore, as the production that follows is usually a relatively substantive content item that conveys the main point of the utterance, the listener comes to expect this main point immediately after the filler *I don't know* in DB's speech. Thus, the phrase also serves to focus the subsequent information (compare *it's* below). This frequent use of *I don't know* as a filler in addition to its compositional function should mean that the phrase will become ever more entrenched, and is likely to be retrieved as a whole regardless of which one of the two functions it is fulfilling.

A final reason for judging *I don't know* to be a lexically-filled string is that if it employed a fully schematic host construction, this would presumably need to involve a subject-predicate construction to successfully link the subject *I* with the verb phrase *don't know*. However, it is questionable whether DB has access to such a construction because she omits the obligatory subject elsewhere, in the string *don't get ball*, despite previously demonstrating her capability to produce the subject in question, *Cinderella*.

[56] Although the task here was a narrative (usually involving one speaker), there was arguably still some cause for DB to hold the 'conversational floor' because of the substantial spoken input from the interviewer in this pilot case.

Table 10.17. DB's tokens of *I don't know*, listed in order of production.

Token of *I don't know* (shown within DB's respective turn)	Duration of *I don't know* (secs.)[57]	Proposed function
(1.6) ***I don't know*** *it's ball*	0.59	Filler
(4.5) ***I don't know*** *exciting*	0.53	Filler
(2.5) erm (.) ((tut)) (3.7) ***I don't know***	0.65	Compositional
(2.7) errr ((sigh)) (1.2) ***I don't know*** *(2.0) [ɪz] [pæl] [plænʔᶿ] palace (1.1) yeah*	0.64	Compositional
(4.1) ***I don't know***	0.69	Compositional
(13.4) ***I don't know*** *(1.2)*	0.813	Compositional
(7.6) ***I don't know*** *(5.2)*	0.772	Compositional
erm (2.4) ***I don't know*** *(2.4)* [end of narrative]	0.785	Compositional

In the case of the other proposed lexically-specific item, *all gone*, the two tokens of this string occurred in almost immediate succession when DB repeated the phrase for emphasis. In this context, the repeated item would not be expected to vary, meaning it is difficult to judge DB's flexibility with this form. However, *all gone* is again a relatively frequent collocation and is also noted as a lexically-specific item acquired as an early frozen phrase in child language (e.g. Braine, 1971). It is therefore a likely candidate for whole-form retrieval here.

The 'assembled' strings too can be accounted for by only a small number of item-based constructions (see Table 10.18). Most strikingly, the majority (13/16) employ a partially-filled construction of the kind [*it's* UTTERANCE], in which the utterance slot can seemingly be filled by items of any category. Here, it hosts a bare noun six times, a complete or partial noun phrase[58] five times, an adjective once and the

[57] Measured using the audio software *Audacity 2.0.5*.
[58] The term 'noun phrase' is used here for ease of reference. However, this is not to assume that DB has any such abstract phrasal category, and this is in fact questionable due to her uneven use of obligatory determiners following *it's* (see strings in Table 10.18). 'Partial

particle *no* (signifying that Cinderella was not allowed to go to the ball, as above) once, as well as occurring once with nothing following it, in an abandoned utterance. Like *I don't know*, *it's* seems to function here as a filler that helps DB to initiate speech and hold the conversational floor, whilst also focusing the relatively substantive utterance that follows.

Table 10.18. DB's assembled strings

Ref no.	Verb string (lexis only)	Proposed structure
1	*it's [sɪldə] (.) [ɛlɛ]*	[*it's* UTT] + N
2	*it's ball*	[*it's* UTT] + N
3	*it's pairy (.) [gɒdᵊnəðə]*	[*it's* UTT] + N
4	*it's [pʴaɪz]*	[*it's* UTT] + N
5	*it's [pʴaɪz]*	[*it's* UTT] + N
6	*[ɪz] palace*	[*it's* UTT] + N
7	*it's a story*	[*it's* UTT] + NP
8	*it's one time*	[*it's* UTT] + NP
9	it's glass slipper	[*it's* UTT] + NP
10	it's [gˡɛsɪpə]	[*it's* UTT] + NP
11	it's glass [zɪpə]	[*it's* UTT] + NP
12	*it's pretty*	[*it's* UTT] + Adj
13	*it's no*	[*it's* UTT] + *no*
14	*you've got a glass [zɪpə]*	[*you've got a*] + [*glass slipper*]
15	*don't get ball*	[*don't get*] + [*ball*]

The remaining assembled strings could also have been produced by combining a small number of lexically-specific items. That is, string 14 could be a combination of *you've got a* and *glass slipper*. The first part, *you've got a*, is relatively frequent and also the obligatory determiner, while here produced, is absent from many of DB's other strings (such as the [*it's* UTTERANCE] structures), including some where the item following *it's* is *glass slipper*. This suggests that DB does not have fully productive use of determiners and can only produce *a* in certain sequences. Since

noun phrases', here, are those from which an obligatory part of a noun phrase is missing, such as the determiner in *it's glass slipper*.

she does not produce it preceding *glass slipper* in her other strings, it is proposed to be stored here within the sequence *you've got a*. Whilst the other component of the string, *glass slipper*, is infrequent in the corpus, it is frequent in the context of the Cinderella story (see again chapter 8 for discussion of context-specific frequency effects).

Similarly, string 15 could have been assembled using the lexically specific items *don't get* and *ball*. As explained above, DB does not seem to have access to DO as a fully productive verb and it is likely that *don't*, at least, is lexically-specific. Given the frequency of *don't get* (866), it is also possible that this is a whole item too. Since *don't* is used with two lexical verbs (*know* and *get*) and these occur in the same place immediately after *don't*, it might be predicted that their position is a schematic slot for lexical verbs, and that DB thus has a partially-filled construction of the kind [*don't* + VP]. However, it is not proposed that any part of the phrase *I don't know* is schematic, because of the reasons explained above (this section).

<u>Additional verb token, FIT</u>

In addition to the verbs discussed, DB produced a token of a further lemma, FIT, in the form *fitted*. This token was excluded from the main analysis as it was produced in response to a prompt by the interviewer. In fact, DB's production correctly completed this prompt, as follows:

R: *what about the glass slipper [ðə] (5.3) they're trying to see who it (2.7)*

DB: *fitted [fɪtu]*

This is particularly interesting for the question of which constructions DB can access, specifically, whether she has lexical or schematic constructions that she can access only when part of these or associated constructions are provided for her.

This point is addressed in more depth in the discussion for this study (section 10.5.4).

In summary, DB's verbs strings were not only limited in diversity, but their production often relied on whole-form retrieval of fully lexically-specific sequences. In addition, her attempts to produce novel utterances through combining constructions also relied largely on a small number of low-level, item-based schemas, and the resulting strings were considerably less well-formed than those retrieved as wholes.

10.4.2.2.2. KP

KP produced his single verb token in the string *wearing it* (Table 10.19), whilst viewing a picture of Cinderella losing her slipper as she ran from the ball. It is notable, firstly, that this string also demonstrates unevenness in that it is the only production in KP's entire narrative that is clearly a multiword utterance. The rest of his productions are isolated nouns, an adjective, the particles *yes*/*yeah* and *no*/*nah* and the conjunction *and*. The string is produced relatively fluently and seemingly without difficulty once initiated. The production of *wearing* may deviate from standard English in having an extra *[n]* in the first syllable. However, it is difficult to establish whether this is simply a product of the participant's accent, and the string was therefore classed as both well-formed and fluent. In terms of frequency, this string fits the tendency observed for the well-formed and fluent strings produced by DB (who also has relatively limited expressive language), in that there are a number of entries for this sequence in the corpus, and it is therefore proposed that this was a lexically-specific item that was retrieved as a whole.

Table 10.19. Verb string produced by KP.

Ref no.	**String (as produced)**	**Well-formed**	**Fluent**	**Exact string freq.**	**Gram. string freq.**
1	*[weənɹɪn] it*	✓	✓	21	21

Key to Table 10.19. Freq. = frequency; Gram. = 'grammaticalised'.

In summary, the verb string in which KP's one verb token was produced was the only multiword sequence in his narrative, and is likely to be lexically-specific. There was therefore no indication that KP could access any fully or partially schematic constructions to create novel utterances.

10.4.2.2.3. TH

TH produced the 12 tokens across 11 strings (see Table 10.20). As observed for the other most impaired (and non-fluent) participants, there is unevenness regarding which strings are well-formed and/or fluent. Again, this corresponds to a general difference in the string frequencies, that is, the well-formed, fluent strings mainly have corpus entries, whilst the ill-formed, interrupted strings do not (even when 'grammaticalised' forms are tested; see again Appendix XX for sequences examined). Therefore, it can again be hypothesised that the well-formed, fluent strings are retrieved as wholes whereas the unwell-formed, interrupted strings constitute attempts by TH to create novel utterances by combining constructions.

From this, predictions can again be made about the constructions used to produce the strings. Firstly, as indicated, at least four of the strings (1-4, Table 10.20) could simply have been retrieved as lexically-specific wholes, in which case, no host construction would need to be posited. The other seven strings, which are more likely to have been assembled through combining constructions, then appear to use a very limited stock of host structures (Table 10.21). In fact, all but one of the assembled strings (1-6, Table 10.21), employs one of two basic intransitive patterns[59], as follows:

SUBJ $V_{Intrans}$

SUBJ $V_{Intrans}$ N

In the latter of these, the noun is used either as a direct object, *dress* (string 6, Table 10.21) or a directional compliment, *castle* (strings 4 & 5, Table 10.21), but in each

[59] These structures could also account for two of the retrieved strings (1,3 & 4, Table 10.21), if these were in fact assembled by combination, meaning that the patterns are actually present in at least nine of the total eleven strings.

case, the string produced is not well-formed, either because the verb *BE* is semantically and/or syntactically ill-fitting for the utterance or because other obligatory components are missing (e.g. the preposition and determiner preceding *castle*).

TH's reliance on these structures in the 'assembled' strings suggests that they are amongst the only patterns she can access more flexibly for use as host constructions. Note, too, however, that these two structures are not necessarily mutually exclusive, as TH could have assembled the second by concatenating the first with a noun.

Table 10.20. Verb strings produced by TH, ordered by well-formedness then fluency then frequency.

Ref no.	String (as produced)	Well-formed	Fluent	Exact string freq.	Gram. string freq.
1	that's it	✓	✓	2302	2302
2	it fits	✓	✓	44	44
3	I can't explain	✓	✓	10	10
4	that's it [m]really	✓	✓	10	10
5	[s] [p]slipper (.) erm (.) erm (1.1) falls	✓	X	0	0
6	then erm (2.6) erm (3.1) Dandini ((laugh)) herm (.) came	✓	X	0	0
7	[s] s-tepson [ᵊ-s] (1.1) [ᵊ-s] (1.6) [ᵊ-]s-tep (3.5) woman [INT] erm (1.9) erm (1.3) is erm (.) castle	*X*	*X*	0	0
8	god (1.2) daughter (.) erm (1.2) erm (3.6) cinderella (.) herm (1.4) came erm (1.8) as well erm (1.6) castle	*X*	*X*	0	0
9	ᵊ¯Cinderella er is erm beautiful (.) erm dress	*X*	*X*	0	0
10	princess er no prince (1.4) prince (.) erm (.) coming	*X*	*X*	0	0
11	then erm (2.9) err (1.5) (one two three four five six seven eight nine ten eleven) twelve o'clock (.) erm (.) [ʔ] go because er Cinderella (.) erm (3.3) [kʊ] erm (.) not very (.) not very good	*X*	*X*	0	0

Key to Table 10.20. Freq. = frequency; Gram. = 'grammaticalised'; [INT] = interjection by interviewer.

Table 10.21. Structure of TH's assembled strings.

Ref no.	String (lexis only)	Structure
1	slipper falls	SUBJ $V_{Intrans}$
2	prince coming	SUBJ $V_{Intrans}$
3	Dandini came	SUBJ $V_{Intrans}$
4	god daughter Cinderella came as well castle	SUBJ $V_{Intrans}$ COMP
5	stepson step woman is castle	SUBJ $V_{Intrans}$ COMP
6	Cinderella is beautiful dress	SUBJ $V_{Intrans}$ OBJ
7	one two three four five six seven eight nine ten eleven twelve o'clock go because Cinderella not very good	[Time phrase] $V_{Intrans}$ *because* SUB [ADJ P]

In the one other 'assembled' string (7, Table 10.21), in which DB attempted to describe Cinderella having to leave the ball at midnight, the structure may at first appear more complex. However, on closer analysis, this too could be viewed as two crude intransitive structures linked by the conjunction *because*:

twelve o'clock go *because* *Cinderella not very good*

In both instances, though, the transitive structure is incomplete, with no subject in the first case and no verb in the second. If these were indeed attempted intransitive strings, they therefore show unevenness with the other strings that do achieve completeness of this pattern. However, it could be that these were in fact attempts at more complex utterances. This point of the story involves obligation (Cinderella *having* to leave the ball) and a conditional situation (that all the transformed items would return to their original state if Cinderella was not home by midnight). Therefore at least some modals or multiple verb structures would be expected in communicating these points, and this was the case in all healthy speaker narratives, which used either *had to* or *must* plus a lexical verb[60]. It may therefore be that similar structures were attempted by TH but that the only host structure she could retrieve was a basic transitive, which would not be able to accommodate the multiple verbs. This could then also have contributed to difficulties in retrieving verbs associated with the different required structures.

Therefore, in the first part, *twelve o'clock go*, TH may only have succeeded in inserting into the intransitive structure a verb most associated with it, for example an intransitive lexical verb (in this case, *go*), rather than any other verb of the more complex string such as an auxiliary or *had to*. In the second string, her struggle to produce a verb may again be because she could not retrieve a host structure appropriate for constructing a conditional utterance, leading to her eventually continuing the utterance without the verb and producing a frequent lexically-specific item, *not very good*.

To summarise, TH's well-formed and fluently produced strings were those that were more frequent in the corpus and are likely to have been retrieved as wholes. Others, that do not have corpus entries, seem to have been assembled by TH, with noticeably less success, and here, the host structure is almost always limited to a basic intransitive pattern. There is no evidence that TH can access any other schematic constructions.

[60] This includes instances when the HSp were describing Cinderella leaving the ball and also the fairy godmother's warning that Cinderella would have to leave the ball. The HSp used *had to* to relay the former and *must* for the latter.

10.4.2.2.4. ST

ST's 37 verb tokens were produced across 23 strings (see Table 10.22). Again, there is unevenness in that some strings are well-formed and fluent whilst others are not, and those that are both well-formed and fluent are mainly the ones with corpus entries. It is again proposed that these strings, many of which are short incomplete fragments of utterances, are more likely to have been retrieved as wholes and the others assembled by combining constructions. However, in ST's case, whilst string frequency approximately corresponds with string fluency, it does not seem related to well-formedness, unlike in the more impaired participants. Indeed, most of ST's strings (78%) are well-formed, despite 69% of these well-formed strings having no corpus entries.

Table 10.22: Verb strings produced by ST, ordered by well-formedness then fluency then frequency.

Ref no.	String (as produced)	Well-formed	Fluent	Exact string freq.	Gram. string freq.
1	i:t's	✓	✓	68629	68629
2	he's [hɜ]	✓	✓	15207	15207
3	that's it	✓	✓	2302	2302
4	makes a [st]	✓	✓	203	203
5	[ð] [ð] they study it	✓	✓	0	0
6	he[ᶢ] (3.6) he can [gˈᵊ] [gˈ]	✓	X	693	693
7	i-it (.) fits	✓	X	44	44
8	[iz] [iz] erm (2.8) [^ʰ] (.) [ə] [ə] [^ʰ] (1.1) ((tut)) (.) erm a message (.) to the [k] (1.4) [ə] run of the mill (.) [g] [gæ:ˀ]	✓	X	0	0
9	the girls (.) that [i-wˈɵl]	✓	X	0	0
10	they all (1.4) erm (.) [tə] two[l] (1.3) [ˡə] [ə]glamourous erm (4.2 including tut) erm (3.7) ladies and Cinderella (.) erm [ᵆ]er er are all (1.5) [kɒnˀ]	✓	X	0	0

11	[ᶞ] [ᶞ] they go [aːtəᶞᵊ] (.) the funeral erm the the party (.) and leave (.) [s]cinderella behind	✓	X	0	0
12	she (.) got (1.0) erm (1.7) erm (2.4) presented to the king and all [ðᶷεst] of it	✓	X	0	0
13	the king (1.5) erm (5.4) erm (.) he- [is] erm (1.4) not (1.0) sure of the time	✓	X	0	0
14	the[ᶢ] the (1.2) princess (1.0) erm (2.0) turns away (.) and (1.0) comes out the (2.2) the ball and (.) erm (.) [ə] [ɜː] as [ᶞ] the clock [staɪpz] midnight	✓	X	0	0
15	she [ɹ] leaves a slipper behind	✓	X	0	0
16	he [kɪʊmz] he comes and (2.2) erm (7.2) erm (1.4) [n neɪkzꟹn] a [nɒʔ] (.) a note [61]	✓	X	0	0
17	[ε] [e:ˈ] anybody (.) erm (1.7) who the [stɪfə] (.) fits is [kɹ] crown (.) is (1.8) crowned [kˈ] (1.2) the queen	✓	X	0	0
18	[ðᶤᶢ] [ðᶦᶢ] the king is (1.4) erm (2.0) [ɹ] erm (.) leads the horse and the [k] the queen (.) back to (.) the (2.1) the castle	✓	X	0	0
19	[ɪ] it's (1.4) erm (1.0) [daʊnɒnən] her [hæz] and knees (.) erm [skumɪŋ] on the floors	X	X	0	0
20	[æ] [a] out reels a erm (4.8) erm (.) [ᵊ] [ᵊ] [ᶟʰ] (1.3) [ð] [ð] [ᵈ]the landed gentry	X	X	0	0
21	[ðɪᶢðᵊðɪsk] [ðɪsk] (.) [ðɪsk^ˀ] (1.2) the (5.7) ((tut?)) (.) the shoe that (1.2) fits the [ðᵊᵇ] [ðᵊ] the (1.1) erm (3.5) the[s] (1.0) the the the shoe that [^ʰf] (.) fits the (.) [aə] (.) [ᵊʰ] (3.1) youngest of the[ᵇ] (1.4) pair (.) will be queen	X	X	0	0
22	cinderella (1.7) [gɪʔs] gets (.) [ðᵊ] the (4.2) the (.) [ᶢ] the (3.0) the [vεɹ] the [vεɹi gəʊʷˡdmʊðə]	X	X	0	0
23	i̱t was (1.5) [ᶷʷ] went [tᶞbɑːti]	X	X	0	0

[61] The latter part of this string is taken as *makes a note*.

Key to Table 10.22. Freq. = frequency; Gram. = 'grammaticalised'.

In terms of the constructions used to produce these strings, it is therefore proposed that at least strings 1-4 (Table 10.22) are likely to have been retrieved as lexically-specific wholes. It is worth pointing out that whilst these may simply be isolated lexically-specific fragments, they could also be the lexically-specific beginnings of larger, partially-filled constructions that are unfinished because nothing is inserted into the schematic slot that follows. String 4, for instance, *makes a*, is also observed elsewhere in the narrative followed by a noun (*makes a note*, see string 16, Table 10.22), and therefore may be the beginning of a partially-filled [*makes a* N] schema. Also, string 1 consisting only of *it's* could be an instance of a partially-filled [*it's* UTT] construction (see below, this section).

Table 10.23. Structure of ST's 'assembled' strings.

Ref No.	String lexis	Structure
1	it's a message to the run of the mill [gæːˀ]	[*it's* UTT]
2	it's down on her hands and knees [skumɪŋ] on the floors	[*it's* UTT]
3	it was went to the party	[*it was* UTT]
4	it fits	SUBJ $VP_{Intrans}$
5	the king he's not sure of the time	SUBJ $VP_{Intrans}$
6	they study it	SUBJ VP_{Trans}
7	she leaves a slipper behind	SUBJ VP_{Trans}
8	cinderella gets the fairy godmother	SUBJ VP_{Trans}
9	they all two glamourous ladies and Cinderella are all [kɒnˀ]	SUBJ *and* SUBJ $VP_{Intrans}$
10	the king is leads the horse and the queen back to the castle	SUBJ VP_{Trans} -OBJ *and* OBJ
11	the princess turns away and comes out the ball and as the clock strikes midnight	SUBJ $VP_{Intrans}$ *and* $VP_{Intrans}$
12	they go off to the funeral the party and	SUBJ $VP_{Intrans}$ *and* VP_{Trans}

	leave Cinderella behind	
13	he comes and makes a note	SUBJ VP$_{Intrans}$ *and* VP$_{Trans}$
14	the girls that he will	NP with embed. clause
15	the shoe that fits the youngest of the pair will be queen	NP with embed. cl + VP SUB V$_{Aux}$ V$_{Lex}$ OBJ
16	anybody who the slipper fits is crown is crowned the queen	OBJ VP$_{Passive}$
17	she got presented to the king and all the rest of it	OBJ VP$_{Passive}$ *and all the rest of it*
18	out reels a the landed gentry	*out reels a + the landed gentry*

ST's other strings are likely to have been assembled by combining constructions. However, while these are all longer and more varied in structure than those of the more impaired participants, ST still makes repeated use of a limited number of host patterns in these utterances, as shown in Table 10.23.

Firstly, similarly to DB (section 10.4.2.2.1), ST seems to use a partially-filled [*it's* UTTERANCE] schema as a filler that also helps to initiate speech and focus the inserted utterance, which again can include items of various sizes and categories (Table 10.23, strings 1-3). In ST's case, though, a variation of BE (*was*) was also used in place of the *'s*:

> ***it was*** *(1.5) [^{ʊw}] went to the party*

Therefore, his schema could rather be [BE UTT]. However, the frequencies of *it's* and *it was* (68629 and 18890, respectively, Spoken BNC, Davies, 2004-) mean it is quite possible that he accesses these individually as lexically-specific wholes rather than the schema containing BE as a productive element.

Apart from this, several of ST's strings employ simple intransitive and transitive structures in the present tense (Table 10.23, strings 4-8), which he uses with a range of verbs, subjects and objects, suggesting that he has these structures as fully schematic constructions. He also creates some longer, more complex utterances.

However, here ST in fact utilises the same two structures, but elaborates his utterances in two ways.

Firstly, he increases the number of insertions within the subject or object components (Table 10.23, strings 9 & 10):

two subjects:	*they all **two glamourous ladies** and **Cinderella** are all [kɒn$^{?}$]-*
two direct objects:	*the king is leads the **horse** and the **queen** back to the castle*

Secondly, he coordinates tokens of the two structures using the conjunction *and* (Table 10.23, strings 11-13). That is, he either combines two intransitive structures or joins an intransitive and a transitive structure, as follows:

(intrans *and* intrans)	*the princess **turns away** and **comes out the ball** and as the clock [staɪpz] midnight*
(intrans *and* trans)	they **go off** to the funeral the party and **leave** Cinderella **behind**
(intrans *and* trans)	*he **comes** and **makes a note***

In the strings combining an intransitive and transitive structure, it is also interesting that in both instances, the order of the structures is the same. This could indicate that ST has a longer host construction of the kind

[SUBJ-$VP_{Intrans}$ *and* -VP_{Trans}]

However, the schema may also be a more general one that could account for all of these three strings, of the type:

[SUBJ- PRED *and* PRED]

The three remaining strings also show some similarities in structure, namely that they all begin with a noun phrase containing a relative clause. One of these strings is then discontinued, but the other two both continue with a sequence of the kind V_{Aux} V_{Lex} NP:

14. *the girls that he will* NP [rel. cl]

15. *the shoe that fits the youngest of the pair will be queen*
NP [rel. cl] + V_{Aux} V_{Lex} OBJ

16. *anybody who the slipper fits is crown is crowned the queen*
NP [rel. cl] + V_{Aux} V_{Lex} OBJ

String 15 is particlurly interesting as it appears to contain a blend of different utterances, possibly as follows:

the shoe that fits the youngest of the pair will be queen

This results in a non-sensical string, which might traditionally have been described as a syntactic difficulty . However, it can arguably be explained by difficulties with retrieval. This example is analysed in full in section 10.5.2.

Returning to string 16 above, it should be noted that while this shows structural similarities with strings 14 and 15, it is also a passive structure. Since ST also produces a passive with different lexis in string 17, as follows, he might have access to a schematic passive construction:

17. *she got presented to the king and all the rest of it*

OBJ-$VP_{Passive}$ *and all the rest of it*

However, it could also be that ST accessed a more basic item-based construction of the kind [SUBJ *got* UTTERANCE] or [*she got* UTTERANCE] and then slotted in *presented to the king* as a lexically-specific chunk. He then could have concatenated the conjunction *and* and another lexically-specific phrase *all the rest of it*. In fact, the prediction that *presented to the king* was a whole-form sequence that was separate from *she* and *got* is supported by the positioning of pauses and hesitation tokens in ST's production of this string:

she (.) got (1.0) erm (1.7) erm (2.4) presented to the king and all [ðᶹɛst] of it

The remaining string, which appears to describe the king's servant rolling out a scroll (as shown in the picture book) to announce that there would be a ball, also seems likely to consist of two lexically-specific fragments, due to the positioning of pauses within this:

18. *[æ] [a]* ***out reels a*** *erm (4.8) erm (.) [ᵊ] [ᵊ] [ᶟ ʰ] (1.3) [ð] [ð] [ᵈ]****the landed gentry***

In summary, ST seems to make frequent use of lexically-specific chunks and item-based constructions, often 'recycling' a restricted number of patterns (cf. Dąbrowska, 2014; Dąbrowska & Lieven, 2005). He produces some longer strings that appear to be more complex, but in fact, these are still largely based on a relatively small number of host constructions.

10.4.2.2.5. HB

HB produced the 88 verb tokens across 46 strings. A sample of these are shown in Table 10.24 but note that this sample includes the first in a table listed by well-formedness then fluency then frequency. Therefore, this sample is largely restricted to the most well-formed and fluent of HB's strings. A full list of strings is provided in Appendix XXIII and it can be seen that further down the table, a number of strings are neither well-formed or fluent. Once again, there is unevenness between strings that are well-formed and/or fluent and ones that are not. However, again there is an increase in the number of well-formed and fluent strings compared to in the less fluent participants (63% were both well-formed and fluent, 80% were well-formed and 72% were fluent), and there is here no apparent link between string well-formedness/ fluency and string frequency[62]. Of the 29 strings that were both well-formed and fluent, only 24% have corpus entries, suggesting that HB is more able than the more impaired participants to create well-formed novel utterances. In HB's case, there is also no obvious indication of which strings have been retrieved versus assembled. Consequently, it is difficult to predict which constructions HB might have access to and with what level of productivity. It is still useful, though, to make some observations about the structure of her strings.

An initial glance at HB's strings reveals that these are firstly much more varied than those of the more impaired participants. Indeed, much of HB's language is reminiscent of that of healthy speech and, as is the case in healthy speakers, it is not possible to predict how HB has created the strings, since any given utterance can be created in several ways. That is, the same end result can be reached by combining different sets of constructions, and the 'route' taken to create an utterance is likely to depend on the individual speaker's inventory of constructions (Dąbrowska, 2004; see again sections 2.4.3-4).

[62] In HB's case, no 'grammaticalised' versions of strings were tested for frequency since the targets for her ill-formed strings were not sufficiently clear for well-formed versions to be posited.

Table 10.24: Verb strings produced by HB, ordered by well-formedness then fluency then frequency.

Ref no.	String (as produced)	Well-formed	Fluent	Exact string freq.
1	he got -	✓	✓	895
2	is that right	✓	✓	231
3	I don’t know what it was	✓	✓	24
4	it doesn’t fit [^{ə} ^{sə}]	✓	✓	10
5	did she come	✓	✓	9
6	he’s glad	✓	✓	2
7	don’t like her at all	✓	✓	1
8	I don’t remember what comes next	✓	✓	0
9	the girls laugh at her	✓	✓	0
10	er you can’t go with us	✓	✓	0
11	they get all ready to go off	✓	✓	0
12	she sits looking at him	✓	✓	0
13	she says I’ll help you	✓	✓	0
14	she turns [ðəs^{Y}] thing -	✓	✓	0
15	looked like a tomato	✓	✓	0
16	that takes her to the [θ]thing	✓	✓	0
17	the two girls [wɜːnt] first	✓	✓	0
18	I missed him out	✓	✓	0
19	he was dancing with her all evening	✓	✓	0
20	he was fond of her	✓	✓	0
21	he didn’t like the other girls	✓	✓	0
22	they go round everywhere	✓	✓	0
23	’s too big for them	✓	✓	0
24	then he says let-s have that one over there	✓	✓	0
25	it fits beautifully	✓	✓	0
26	I’ll make you (in?)to the(?) tailor	✓	✓	0
27	the girl had it right	✓	✓	0
28	that’s when [^{l}] the[^{n}] man went out looking out with this man for the farmer to look for him	✓	✓	0
29	you’re going to be the tailor now (.) because you’ve got it right	✓	✓	0
30	she comes (.) in	✓	X	23
31	the two girls [n] are big	✓	X	0
32	he sits there looking [ə-və]very sad	✓	X	0

Key to Table 10.24. Freq. = frequency; Gram. = 'grammaticalised'.

However, it is interesting to examine the abstract patterns of HB's strings (Table 10.25). Again, for the sake of space, only a sample of these possible structures are shown, but it can be seen that these are indeed quite varied, certainly in comparison with those used by the participants with greater expressive impairments. As might be expected in any speaker, though, there is repetition of certain patterns, such as [SUBJ Vintrans ADJ] or [SUBJ Vtrans OBJ], used with different lexis, which may indicate that HB has these as fully schematic host constructions. However, as is also likely in unimpaired speakers (see again Dąbrowska, 2004; see again section 2.4.4.), there is also repetition of certain multiword sequences, which may indicate that parts of HB's strings are lexically-specific. These repeated lexical patterns could either be lexically-specific items inserted into a slot of a fully schematic host structure or lexically-specific components of partially-filled schemas. The latter could be proposed, for example, from strings 5 and 6, repeated in (i) and (ii) below, which have common elements in the same position, and could therefore be hosted by a partially-filled schema of the kind [*I don't* V *what* PRED].

(i) ***I don't*** *know* ***what*** *it was*

(ii) ***I don't*** *remember* ***what*** *comes next*

Similarly, two other strings, shown in Appendix XXIII but repeated in iii and iv below, could utilise a partially-filled schema of the kind [*that's when the* N VP].

(iii) ***that's[w] when the*** *thing comes*

(iv) ***that's when [ˈ] the****[ⁿ] man went out looking out with this man for the farmer to look for him*

Finally, of note is the structural nature of some of HB's ill-formed strings, which similarly to one of ST's strings, appear to involve blends of different utterances. For example, the string below seems to involve a combination of two utterances, as shown beneath the string:

HB's string: *they're they look look her down*

they look down on her

+

they put her down

Both of these utterances are relevant to a target utterance describing the ugly sisters behaving negatively towards Cinderella, which seems to have been HB's intended message here. These utterances could thus both have competed for retrieval, with the result that elements of both were produced in combination. A full analysis of such a blending error (by ST) is provided in section 10.5.2.

In summary, HB uses a wider range of lemmas than the less fluent participants and also produces these in a greater variety of forms. In addition, her strings are much more varied in terms of their abstract structures, which are also used relatively flexibly with a range of lexis. Furthermore, HB seems better able to produce novel utterances that are well-formed and generally fluent rather than having to rely on whole-form retrieval of more frequent, lexically-specific items. Some of her strings were ill-formed, however, largely due to blending errors.

Table 10.25. Structure of a sample of HB's strings.

Ref no.	String lexis	Abstract structure
1	*is that right*	V_{Aux} SUBJ ADJ
2	*did she come*	V_{Aux} SUBJ $V_{Intrans}$
3	*does she show the [tɜːᵊzəz] to the men*	V_{Aux} SUBJ V_{Trans} OBJ PP
4	*don't like her at all*	V_{AuxNeg} V_{Trans} OBJ ADV
5	*I don't know what it was*	SUB V_{AuxNeg} V_{Trans} OBJrel.
6	*I don't remember what comes next*	SUB V_{AuxNeg} V_{Trans} OBJrel.
7	*you're going to be the tailor now (.) because you've got it right*	SUBJ V_{Aux} $V_{Intrans}$ $V_{Intrans}$ OBJ timeP CONJ SUBJ V_{Aux} V_{Trans} OBJ ADJ
8	*he was dancing with her all evening*	SUBJ V_{Aux} $V_{IntransProg}$ PP TimeP
9	*I'll make you (in?)to the(?) tailor*	SUBJ V_{Aux} $V_{TransPhras}$ OBJ PP
10	*it doesn't fit [ᵊ ˢᵊ]*	SUBJ V_{AuxNeg} $V_{Intrans}$
11	*er you can't go with us*	SUBJ V_{AuxNeg} $V_{Intrans}$ PP
12	*he didn't like the other girls*	SUBJ V_{AuxNeg} V_{Trans} OBJ
13	*he's glad*	SUBJ $V_{Intrans}$ ADJ
14	*the two girls [n] are big*	SUBJ $V_{Intrans}$ ADJ
15	*'s too big for them*	SUBJ $V_{Intrans}$ ADJ ADJ PP

<u>10.4.2.2.6. MH</u>

MH produced his 135 tokens across 66 strings. A sample of these are shown in Table 10.26 but note again that this sample is largely restricted to the most well-formed and fluent of MH's strings. A full list of his strings, many of which are not so fluent, is provided in Appendix XXIV. Similarly to in HB's case, it is immediately noticeable that the strings are much more varied than those of the more impaired participants, and are often more reminiscent of healthy language in terms of their structure. Also, there is no obvious link between well-formedness and/or fluency and string frequency: 63 of MH's 66 strings were well-formed, with 22 of these also being fluent, but only 12 strings had any entries in the corpus. As such, it is again difficult to predict which strings or elements might have been retrieved versus assembled and, thus, which constructions MH has access to. To give an idea of the variety of constructions MH may use, however, the abstract structures for a sample of his strings are shown in Table 10.27.

<u>Table 10.26: Verb strings produced by MH, ordered by well-formedness then fluency then frequency</u>

Ref no.	**String (as produced)**	**Well-formed**	**Fluent**	**Exact string freq.**
1	[ð'] there is-	✓	✓	4688
2	they said ((emotion))	✓	✓	885
3	[ð-^{ə}] [ðɛ^{əb}] that was it	✓	✓	234
4	[^{æ}]-I've forgotten	✓	✓	142
5	I've forgotten	✓	✓	142
6	the house was-	✓	✓	33
7	<u>this is a story</u>	✓	✓	3
8	if if I can only think of what it is	✓	✓	0
9	I will tell the story of cinderella	✓	✓	0
10	I'll come back to that one	✓	✓	0

11	I'll remember it later on	✓	✓	0
12	I don't really think maids for that	✓	✓	0
13	it didn't include cinderella	✓	✓	0
14	I don't mean trace	✓	✓	0
15	[ð]they were busy cleaning the house	✓	✓	0
16	cinderella got in the coach	✓	✓	0
17	they both lived happily ever after	✓	✓	0
18	she ran downstairs (.) ever so quickly (.) with the result that she lost one shoe ((emotion)) [INT] (1.7) on the stairs	✓	✓	0
19	[ʊɐt] he said was (.) now listen everybody	✓	✓	0
20	it shows her going up the hill	✓	✓	0
21	[ð] they sat Cinderella down	✓	✓	0
22	I want to say maids	✓	✓	0
23	[v] he[ᵛ] [ᵍ] [ᵍ] gave[ᵊᶿ] (.) gave (.) [əv]	✓	X	182
24	[ᶞ] there were (.) [ɛˡ] there were two or three (.) [mː] -	✓	X	6
25	I will (.) ((blows nose?)) (1.2) need to [j]	✓	X	3
26	one day (1.7) it [wᵊ] (1.2) it was[^{n}]	✓	X	2
27	she (.) put it on	✓	X	1
28	[v] when she was standing at the door (.) the prince (5.1) the prince looked at [ᶞ] her	✓	X	0
29	she was sat in at [həʊ] sitting at home (.) feeling very [vɛliˇ] depressed	✓	X	0
30	[ᶞʉʲ³ᵆ]her job (.) was (1.0) the same day after day after day	✓	X	0
31	it was [ᵛ]really about (3.4) cleaning the floors (.) and[sk] and everything connected with (.) [ð] the floors	✓	X	0
32	it came [t] to pass (.) that the prince said (.) he was going round all the (1.6) ladies in the [INT] neighbourhood	✓	X	0

Key to Table 10.26. Freq. = frequency; Gram. = 'grammaticalised'; [INT] = interjection by interviewer.

Table 10.27. Structure of a sample of MH's strings.

Ref no.	String lexis	Abstract structure
1	[v] when she was standing at the door (.) the prince (5.1) the prince looked at [ᵈ] her	[Pron SUBJ V_{Aux} $V_{Intrans}$ PP] SUBJ $V_{Intrans}$ PP
2	[ʊɐt] he said was (.) now listen everybody	Pron SUBJ V_{Trans} $V_{Intrans}$ [Time phrase] $V_{Intrans}$
3	*[ð]they were busy cleaning the house*	SUBJ V_{Aux} ADJ V_{Trans} NP
4	[ᵆ]-I've forgotten	SUBJ V_{Aux} $V_{Intrans}$
5	I've forgotten	SUBJ V_{Aux} $V_{Intrans}$
6	I'll come back to that one	SUBJ V_{Aux} $V_{Intrans}$ PP
7	I will tell the story of cinderella	SUBJ V_{Aux} V_{Trans} NP
8	I don't really think maids for that	SUBJ V_{AuxNeg} Adv V_{Trans} N PP
9	I don't mean trace	SUBJ V_{AuxNeg} V_{Trans}
10	it didn't include cinderella	SUBJ V_{AuxNeg} V_{Trans} N
11	they both lived happily ever after	SUBJ $V_{Intrans}$ ADVP
12	she ran downstairs (.) ever so quickly (.) with the result that she lost one shoe ((emotion)) [INT] (1.7) on the stairs	SUBJ $V_{Intrans}$ ADVP PP[P NP Pron SUBJ VTrans NP PP]
13	this is a story	SUBJ $V_{Intrans}$ NP
14	[ð-ᵊ] [ðɛᵊᵇ] that was it	SUBJ $V_{Intrans}$ Pron
15	it shows her going up the hill	SUBJ V_{Trans} Pron $V_{Intrans}$ PP

Key to Table 10.27: [INT] = interjection by interviewer.

Similarly to the other participants with greater expressive language capability (ST and HB), MH also produced some strings that contained blends. For example, when describing the ball that was to be held by the prince, MH produced the following string, in which the section in bold is arguably not conventional or idiomatic in standard English (there are no entries for this sequence in the Spoken BNC, Davies, 2004-):

Blend: *every [m] woman* ***of certain ages*** *will be (1.4) has to go along*

[*of a certain age*]
+
[*of certain* [N]+plural]

This string appears to be a blend of the two utterances written beneath it. That is, it is arguably more conventional to say *of a certain age*. However, the sequence [*of certain* N] has a higher frequency (27) than [*of a certain* N] (17), and this could have been activated because of common properties with parts of the message or the more conventional utterance. For instance, it shares the words *of* and *certain* as well as a noun in final position. Also, the noun plural could have been activated because the plural form of a noun is relatively frequent after the word *certain*: in 646 of the total instances where *certain* is followed by a noun, this noun is produced with the plural ending. Of the remaining instances, many are also irregular plurals or mass nouns (which can also be linked semantically with the plural). In addition, despite using the singular, *woman*, MH's message actually refers to more than one woman, meaning that the plural could also have been primed through semantic association. Consequently, both the utterances shown above could have been retrieved and combined, resulting in a somewhat unconventional utterance (see also section 10.5.3 for further discussion of this and another blend produced by MH).

In summary, MH, with the greatest expressive language capability, showed the greatest ability to produce a range of well-formed novel utterances. Although, many of his strings were not fluently produced, his utterances more closely resembled those of healthy speakers in terms of their structure.

10.4.2.2.7. String ‘quality’ and error analysis

Table 10.28 Summary of string well-formedness and fluency

Participant	% w-f. & flu.	% w-f.	% flu.	% neither w-f. nor flu.
KP	1.00	1.00	1.00	0.00
TH	0.36	0.55	0.36	0.45
DB	0.25	0.63	0.31	0.31
ST	0.22	0.78	0.22	0.22
HB	0.63	0.80	0.65	0.17
MH	0.33	0.95	0.33	0.05

Key to Table 10.28: w-f.=well-formed; flu.=fluent; pilot case shown in shaded row.

In assessing the number of well-formed and fluent strings per participant with aphasia (Table 10.28), it can be seen that the proportion of strings that were both well-formed and fluent does not show any obvious relationship with expressive language capability (WAB fluency rating). When this is analysed further, however, there is some difference in the pattern between well-formedness and fluency separately.

String fluency shows no obvious correspondence with expressive language capability. However, the proportion of strings that are well-formed increases with WAB fluency rating across all the PWA, with the exception of KP, but his proportion is likely to be skewed by there only being one string. The proportion of strings that were neither well-formed nor fluent also decreased as expressive language capability (WAB fluency rating) increased. Also of note is the high proportion of strings that are both well-formed and fluent in HB’s case. This can be linked to this participant producing a higher proportion of fluent strings.

As regards the errors made in the (ill-formed) strings, there were some differences across the participants (Table 10.29). This was particularly noticeable in the verb marking errors, omissions and blends. The errors with verb marking and omissions were only observed in the two of the more impaired participants, TH and DB, with TH omitting a variety of words but DB's omissions only involving determiners. Blending errors, in contrast, were restricted to the three least impaired speakers, ST, HB and MH. In addition, errors with ill-fitting items were limited to TH and ST, although it is possible that this is due to the fact that only ill-formed strings were analysed for errors. These were defined as strings that contained errors which were not self-corrected. Therefore, it may be that HB and MH also made lexical substitution errors, but that these were self-corrected and therefore not included in the analysis. There was, however, also a difference in the use of neologisms, in that HB was the only participant to produce these

Table 10.29. Error types made in the ill-formed strings by the six PWA

Part.	Mean number of errors per ill-formed string									
	Unique ill-formed strings	Incorrect verb marking	Omission (words)				Ill-fitting item		Blend	Neologism
			det.	prep.	subj.	verb	word (verb)	phrase		
KP	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TH	7	0.29	0.43	0.43	0.14	0.14	0.29	0.14	0.00	0.00
DB	6	0.17	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST	5	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.60	0.00
HB	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.60
MH	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00

Key to Table 10.29. Part.=participant; det.=determiner; prep.=preposition; subj.=subject.

10.5. Discussion

10.5.1. Verbs

The number of verbs, both in terms of token numbers and lemma diversity, generally increased with greater expressive language capability (WAB fluency rating) across the PWA. This was not necessarily predicted for token number as an individual with few lemmas could still produce a high number of tokens if they made repeated use of these. However, despite such repetition occurring in at least one of the more impaired speakers (DB), token numbers were still reduced in the participants with more limited expressive language. The observed increase in lemma diversity with greater fluency was predicted, however, as speakers with greater expressive language should have more lemmas at their disposal. Both the results for token numbers and lemma diversity are in line with previous reports of a paucity of verbs in non-fluent aphasia (mainly agrammatism) and preserved verb numbers in fluent aphasia such as anomia. However, the results also fit with the hypothesis that a greater number of verbs could result from participants with greater expressive capabilities having more constructions at their disposal generally, which is also suggested by the finding that the number of narrative words also increased with fluency rating.

However, some deviation from the pattern of verb numbers increasing with WAB fluency rating was found in the results for the two participants with the highest fluency ratings, HB and MH. Firstly, HB, who has a lower fluency rating than MH, actually produced a higher proportion of verb tokens. This could be interpreted as a drop in MH's result, as HB's figure continues the trend of results begun in the more impaired speakers. However, it could also be viewed as a high result for HB, as her verb proportion is significantly above than the healthy mean. In further examining the results for these two participants, it can be seen that, continuing the pattern of increasing with fluency rating, MH used the greatest number of lemmas, in fact more than the healthy mean. However, his number of different lemmas per 100 words dropped below both the healthy mean and those of ST and HB. This greater lemma range but smaller diversity of lemmas per 100 words likely reflects the fact that MH produced relatively high token numbers for some lemmas. For instance, he particularly made use of direct speech in his narrative, by acting out the words of the characters to narrate the storyline, as in the following example (lexis only, without repetitions):

Cinderella said I want to go to the ball

This direct speech was usually introduced by the reporting verb SAY, which resulted in a relatively high number of tokens of this one verb and thus could have contributed to reduced lemma diversity. It is interesting too that this fits with Groenewold et al.'s (2013) finding that people with anomia used significantly more direct speech in spontaneous speech (personal narratives) than healthy speakers and are more likely to include a reporting verb with this. Groenewold, Bastiaanse, Nickels and Huiskes (2014) argue that such use of direct speech might reflect a strategy to increase listener involvement and focus, but as Groenewold et al. (2013) state, it could also help to reduce the complexity of utterances. It could especially reduce the need to use subordinate clauses involved in indirect speech and the changes to tense required in these. For instance:

Cinderella said ***that*** *she want****ed*** *to go to the ball*

In HB's case, while her token proportions were high compared to MH and the healthy mean, her number of different lemmas both as a raw number and per 100 words fitted the pattern of increasing with fluency rating, both remaining below the healthy mean. This likely reflects the fact that HB, too, produced several tokens of many of her lemmas. The finding that the results for HB's productions sometimes exceeded those of MH, disrupting the general tendency of productions to increase with WAB fluency rating, could also be related to possible problems with the fluency ratings of these particular participants (see below).

In terms of lemma frequency, the hypothesis was that more frequent verbs should be more entrenched and thus easier to retrieve. It was therefore predicted that the PWA would use more frequent lemmas than the HSp and that such a reliance on frequent items would be more noticeable in the participants with the most limited expressive language, who should have the fewest lemmas at their disposal. The results do indeed give some suggestion of a frequency effect on the lemmas used. In fact, for the PWA with greater expressive language capability, the spread of lemmas across the frequency ranks did not obviously differ from that of the HSp. However, this range did decline as fluency rating decreased, with the lemmas used by the most impaired speakers, KP and TH, being much more restricted to the most frequent ones. This therefore supports constructivist, usage-based theory.

As predicted, the flexibility of verbs, in terms of the forms and constructional contexts these were produced in, also increased with WAB fluency rating. The participants with the most limited expressive language were much more restricted in the number of forms they produced per lemma and their production was often limited to the same constructional contexts: mostly, lexically-specific constructions or low level, item-based schemas. In contrast, the less impaired speakers showed much more diversity in the forms and constructional contexts their verbs were produced in. This too fits with the predictions based on constructivist, usage-based theory outlined in section 10.1: that is, that the number and productivity of forms available to speakers, should increase with greater expressive language capabilities.

<u>10.5.2. Verb strings</u>

The number of verb strings also increased with fluency rating across the PWA, and in two cases, HB and MH, exceeded the healthy mean. In MH's case, however, this could be due to this speaker producing a relatively high number of abandoned strings (10/69) which he then restarted as different utterances, or because he used coordinated clauses with separately stated subjects. In addition to this, both the mean length of string in words and the mean number of verbs per string generally increased with greater expressive language capability, with the exception that ST's mean string length was slightly above that of the next speaker with a higher fluency rating, HB. The production of shorter utterances by the speakers with more impaired expressive language, two of whom have Broca's agrammatic aphasia, supports the observation that sentences produced by individuals with agrammatism, are typically shorter (e.g. Goodglass & Hunt, 1958; see again section 8.1). However, rather than indicating a dichotomy between agrammatism and paragrammatism or nonfluent versus fluent speech, the mean length of string generally rose steadily with WAB fluency rating, supporting the idea of a continuum of expressive language capability, as predicted by constructivist, usage-based theory. As speakers' abilities to combine utterances more flexibly increases with greater expressive language capability, so too should the length of utterance they are able to produce, and this is supported by the current data.

The proportion of words falling within strings was also found to rise as fluency rating increased. While this could suggest that more of the narrative is in, or at least resembles, sentences, rather than being isolated words, it should be remembered that the verb strings here do not equate with sentences and do not have to be complete. Indeed, some strings consisted only of a single subject-verb amalgam (*it's*, *he's*). Furthermore, even if the strings are complete utterances, they may not be well-formed in terms of, for example, morpho-syntax, semantics or phonology, so this percentage does not give any assessment of string quality. (It does however indicate the amount of each narrative that was included in the analysis.)

There were also qualitative differences in string production across the PWA. In all six participants (including DB), there was unevenness within each person's strings in terms of the well-formedness and fluency of these, but the difference in well-formedness was especially noticeable in the three most impaired speakers, KP, TH and DB, whose errors tended to remain uncorrected and manifested as disruptions to grammatical well-formedness. In these participants, the strings that were well-formed and fluent were mostly those with some frequency in the corpus, increasing the likelihood that the three PWA have heard these sequences before and now store and retrieve them as single wholes. This would also explain the within speaker unevenness in specific linguistic features such as marking of verbs for tense and agreement. A particular example of this can be seen in TH's strings, where she marks verbs correctly for the third person in some strings, and with apparent ease, whilst not achieving this in other strings. Almost all instances of correct marking are within strings that have entries in the corpus and are proposed to be stored as wholes. This would explain how TH is able to achieve the correct marking in these tokens because items (here strings) that are retrieved as wholes should not require any process of marking individual words within them (Bybee & Scheibmann, 1999). Such an account could also explain how, despite not producing any other verbs (or indeed any other multiword utterances), KP may have been able to produce his one verb with relative ease, and in an well-formed and fluent string, because he has encountered this sequence before and stored it as a single item that he can retrieve as a whole. This could also account for the unevenness in his ability to produce multiword utterances (producing this one but no others) since he is able to produce single words and a multiword item stored as a whole should be no more difficult to retrieve than these (single-word) productions.

The structure of the strings and the proposed constructions used to produce them also became much more varied across the PWA as fluency rating increased. The most impaired speakers relied mainly on lexically-specific and low-level item-based constructions, whilst the less impaired showed much greater diversity in their constructional combinations, suggesting these have a higher degree of schematicity. This also supports the prediction that speakers with greater expressive language capabilities have access to more constructions and greater schematicity of these. In addition, a glance at the strings across participants points to Dąbrowska's (2004) argument that "there are typically different ways of assembling the same utterance…" (p.203) and this can vary across individuals (and probably within individuals on different occasions). For example, TH and ST both produce the utterance *it fits*, but it is proposed that while TH retrieves this as a whole, ST creates it through combining constructions (e.g. *it* + *fits*) (see again sections 10.4.2.2.3 & 10.4.2.2.4).

In this regard, it is also interesting to consider Dąbrowska's (2014) point that speakers are likely to have different tendencies regarding the type and size of items they combine to produce utterances: "Some may prefer larger, more concrete units (and produce fluent though stereotypical utterances) while others may rely on smaller chunks" (p.643). This raises the question of whether such tendencies for language processing and, by association, storage, could affect which items are more likely to remain accessible after brain damage. It may be, for example, that the language of speakers who had preferences before their stroke for combining items with a higher degree of lexically-specificity, would be more likely to be limited to such 'fixed' or item-based productions after impairment. In contrast, individuals who tend to combine longer and more schematic constructions in producing utterances could be more likely to maintain access to such constructions after impairment. Pre-impairment processing and storage preferences could therefore contribute to the language profiles of PWA. Since factors such as speakers' education levels can also affect which constructions they have at their disposal (e.g. Street & Dąbrowska, 2014), it could also be interesting to investigate any relationship between amount of schooling and the constructions that remain accessible to PWA.

Turning to the more restricted constructions used by the more impaired speakers, two particularly interesting examples are DB's use of *I don't know* and the [*it's*/ *it was* UTTERANCE] schema employed by DB and ST. The phrase *I don't know* accounted for almost a third of DB's strings. As well as being well-formed, the phrase was always fluently produced, which coupled with its high frequency in spoken English, suggests that DB stores and retrieves this as a whole. Bybee and Scheibmann (1999) point out that there are two ways to form this phrase, firstly, as a construction retrieved as a whole and, secondly, by combining the individual elements: either *I*, *don't* and *know* or *I don't* and *know*. However, they explain that high-frequency stored units have increased autonomy from related stored items, and can also take on new functions different to the function of the phrase when assembled through combining the individual lexical items. They found that a reduced version of *I don't know* corresponded with "a special discourse function" different to the phrase's compositional meaning (p.584). That is, as well as its lexical (compositional) sense, a pragmatic function was observed, with the phrase "…indicating speaker uncertainty and mitigating polite disagreement in conversation" (Bybee & Scheibmann, 1999, p.587). The current findings were similar. DB also appeared to use *I don't know* in two ways: in its compositional sense to indicate not knowing something, and as a filler that helps to initiate speech and focus the utterance that follows. While detailed phonetic analysis was not conducted, an examination of the duration of DB's productions of *I don't know* revealed that those used as a filler were shorter than those used in their compositional sense. This fits with Bybee and Scheibmann's statement that words that frequently occur together can be bound into single units through chunking, and such stored wholes that are highly frequent develop increasing autonomy and undergo phonetic reduction. This could explain the reduced duration of DB's productions of *I don't know* when used as a filler. However, given that DB otherwise shows difficulties in combining constructions to create well-formed utterances, it is doubtful that she creates *I don't know* through lexical composition when using this in its compositional sense. Instead, she could have the whole-form *I don't know* stored twice, paired with these two meanings, that is, as different lexically-specific constructions.

Also interesting is the [*it's*/*it was* UTT] schema used by DB and ST. Similarly to *I don't know*, *it's*/*it* again acted here as a filler that helped to initiate speech and focus the subsequent utterance. It can be argued that *it's*, in particular, is an efficient choice of word for this combined function. It is semantically appropriate to introduce/ refer to something but, as a pronoun, it has a more general meaning than a noun. Also, the pronoun *it* has a more general meaning than, for example, *he* or *she*, as it is not gender-specific and can also represent abstract as well as concrete nouns (neither of which apply to *he* or *she*). *It's* can therefore cover more ground as it can refer to more items or issues whilst still only consisting of one word. Moreover, it is highly frequent as a lexical item, which should aid its retrieval, thus, making it suitable as a filler at points of word-finding difficulty. Indeed, the efficiency of *it's* in this combined role could explain Menn and Duffield's (2013) identification of "*it's* …." as a common initiator in aphasic speech. It is also interesting that [*it's* UTT] has also been noted as an early item-based schema in child language (e.g. Lieven, Salomo and Tomasello, 2009). This again points to the high frequency and consequent entrenchment of *it's*, as well as the fact that this item precedes relatively diverse categories in the input, which could lead to the initial development of a general utterance slot following *it's*.

In terms of string 'quality', although expressive language capability (fluency rating) did not noticeably correspond to the proportion of strings that were produced fluently, it did show some relation to string well-formedness, with the proportion of well-formed strings increasing with fluency rating. This fits the proposal that the speakers with greater expressive language capability should be better able to produce novel utterances, while the well-formed utterances of the more impaired participants mainly rely on the whole-form retrieval of a limited number of lexically-specific constructions and these speakers have less success in producing well-formed novel utterances.

An error analysis of the ill-formed strings revealed a variety of error types across the participants, but these also varied according to the speakers' levels of expressive language. Notably, errors involving incorrect verb-marking and omission (particularly of determiners) were only produced by the more impaired speakers, while blending errors were limited to the three least impaired speakers. This finding with verb-marking errors supports the prediction that the participants with more limited expressive language should have fewer constructions and less flexibility of these overall. This means there is less chance either of them retrieving a (lexicalised) verb form that is correctly marked for the utterance attempted, or of creating such a verb form through combination of constructions (verb stem + morpheme construction). Reduced number and flexibility of constructions could also explain omission errors as the speaker may not have the item for retrieval either as a single lexical item for insertion or as a lexically-specific part of a larger partially-filled host construction.

The less impaired speakers, in contrast, made more blending errors, whilst the most impaired made none. This was also predicted because speakers with greater expressive language capability should have more constructions overall, including those with greater levels of schematicity. Such larger constructions can be unintentionally retrieved in the same way as single words, which then results in a blend. This could involve the joining of utterances in succession or the integration of utterances within each other if constructions containing schematic slots are combined (cf. Dąbrowska & Lieven, 2005; Dąbrowska, 2014; see again section 2.4.4). Both result in utterances that are ill-formed and are likely to have traditionally been classed as resulting from syntactic deficits, but these can in fact be attributed to problems with retrieval.

Although the error types identified may seem varied in their manifestation, and traditionally might have been viewed as relating to different language components (for example, semantic versus syntactic), under a constructivist approach, they can *all* be accounted for simply by problems with *retrieval*, at different grain-sizes and levels of schematicity. In the omissions, these may result because a speaker simply does not have access to the item or because they only have access to it as part of a fixed whole and cannot use it productively. Alternatively, it could be that more than one item received equal activation, for example, because of approximately equal semantic relevance, item frequency or item-in-construction frequency, meaning no one candidate achieved a sufficient activation margin over the others for retrieval to occur (see again Ambridge & Lieven, 2011; section 2.4.4). Incorrect verb-marking and ill-fitting insertions could also result from a speaker not having access to the appropriate construction and therefore a ‘next-best option’ to convey the message is retrieved. Alternatively, such insertions may be not be at all appropriate to the message intended and rather result from priming, for example, from the preceding context. Their production could, for instance, be primed by both the preceding n-gram lexis or the schematic constructions involved in the utterance. In the participants with greater expressive language capability, larger constructions can also be triggered in this way, resulting in blends.

An example of how such blending errors could occur in this way can be explained with reference to the following string, produced by ST:

Exact production:

the[s] (1.0) the the the shoe that [^ ʰf] (.) fits the (.) [ɑə] (.) [ᵊ ʰ] (3.1) youngest of the[ᵇ] (1.4) pair (.) will be queen

Lexis only (no repetitions):

the shoe that fits the youngest of the pair will be queen

In terms of its abstract syntactic structure, that is, the sequence of units/ slots, the string is well-formed (a possible structure in standard English):

SUBJ [VP]

[NP + embedded relative clause]

However, whilst the items inserted fulfil the syntactic properties required by these slots, they do not fit the semantic requirements. Here, the semantic properties of the first NP (subject) must match those of the V and final NP (object). In this instance, the subject of the verb must be something that can become queen, that is, it should at least be animate and usually a female human. However, this is not the case in ST's production, in which the subject NP position is taken by *the shoe* (*that fits the youngest of the pair*), and thus the requirements of the event-semantics are violated.

The question is, therefore, why *the shoe* should be inserted at this point. A possible explanation is that the slipper is a particularly pertinent part of the story and this may have been one of the main things ST remembered and began to convey. Indeed, this utterance was produced by ST early on in the narrative with most of the preceding storyline then being recounted afterwards. In this case, *the shoe* would be highly relevant to the message ST had in mind.

Also, an observable pattern in ST's speech (in this narrative) is that his utterances often begin with, or consist solely of, a noun phrase, usually starting with the definite article, and it is therefore unsurprising that his message regarding the slipper begins with *the shoe*. This may have been combined with a relative clause in a schema such as [*the* ____ *that* ____], which itself could have resulted from structural priming, since the preceding utterance (although abandoned) had this same structure (*the girls (.) that he will*) and recent activation of an item can increase the likelihood of it being activated again (see again Ambridge & Lieven, 2011).

In addition, rather than ST's whole string involving one host construction, it could be that several host constructions overlap within this. That is, production of earlier parts of the string (lexis or a hosting schematic construction) could activate (and cause retrieval of) a different host or lexically-filled construction which then forms the later part of the string. If it is assumed that *pair* in ST's utterance refers to the girls (Cinderella and her sisters) rather than the shoes[63], it is likely that the embedded noun phrase *the youngest of the pair* signifies a female human to ST. It is possible that this has then activated the latter part of the utterance, *will be queen*, which would usually require a female human subject. That is, ST's constructions could overlap and follow on from each other within the string as follows:

the shoe that fits the youngest of the pair will be queen

It could be that with impaired processing capacity, the noun at the start of this (relatively long) string becomes less activated as the string proceeds, meaning that at the time of beginning the main clause verb phrase (*will be queen*), the first noun would be less prominent in ST's mind than the embedded noun later (immediately prior to the VP). Consequently, ST may proceed with items that match the properties of the second NP rather than the first. Such an analysis demonstrates how blending errors just like the other errors described, could be explained by difficulties with retrieval.

It is also interesting to question to what extent the production of blends may be influenced by a lack of control over production processes and speakers' susceptibility to priming. The issue of control has been raised in previous literature (e.g. Butterworth & Howard, 1987). However, this lack of control over production could be compounded by individual speakers being particularly susceptible to priming, for example through frequency or semantic association effects. For

[63] *Pair* here was taken as refering to the girls as RT had mentioned them in the preceding utterance and *the youngest* is not commonly used to describe a shoe. However, activation of *pair* could also have been primed through semantic association of this form with the noun *shoe*.

instance, there appears to be multiple blending in the following string by HB, as if one component of a string (at whichever level of schematicity) is triggering retrieval of another, which then triggers retrieval of another, and so on:

> *that's when [ˈ] the[^{n}] man went out looking out with this man for the farmer to look for him*

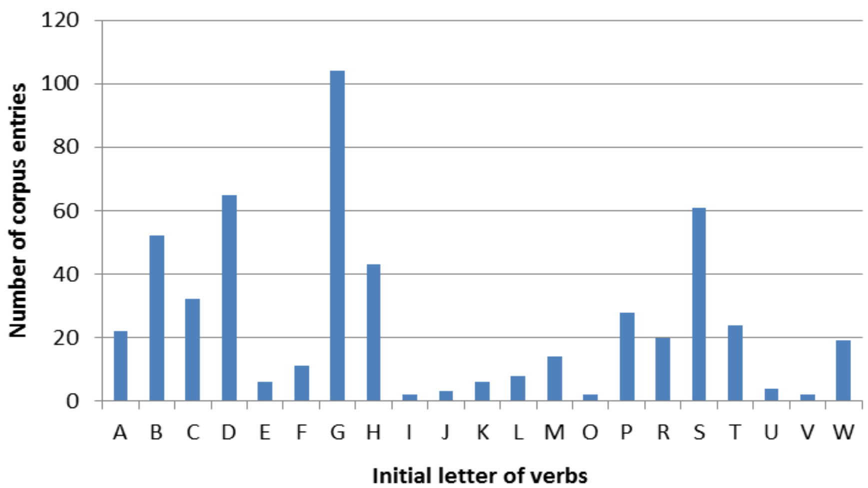
Such repeated and uncontrolled priming of production could account for the description of output by speakers such as HB as voluble.

It is interesting, too, to consider how the type of blends a speaker produces might be linked to their general tendencies regarding the size and specificity of items they use in utterance production (cf. again Dąbrowska, 2014). It could be, for example, that speakers with greater preference for more lexically-specific items would produce more splice blends (splicing one part of a sentence onto the end of part of another sentence), whereas speakers tending to use constructions with a higher degree of schematicity may produce more substitution blends (substituting part of a sentence for part of another) (see again Fay, 1982). A further question is how such issues may also relate to neologisms (also produced by HB). If words can be seen as a smaller form of construction like any other, then it may be that some speakers make more use of fully or partially schematic word constructions and that these speakers are more likely to produce neologisms through erroneous insertion of phonemes into these templates. As stated above, the potential link between speakers' aphasia profiles and their processing and storage preferences is an interesting area for future research.

Lastly, in addition to these errors compromising string well-formedness, another error type seen in the data, that affected string fluency, could also be influenced by frequency and collocation, that is, 'false starts'. These could result because the start of the word is so frequent following another that its production is 'automatically' begun in this position. An example of this could be the [g] in ST's string:

he can ***[g'ᵊ] [g']*** *erm (5.9)*

Of all corpus entries for verbs immediately following *he can*, the greatest number (104 entries, 20%) begin with the phoneme [g] (Figure 10.12)[64], so production of this phoneme is unsurprising here. However, the two most frequent verbs beginning with [g] in this slot, *get* and *go* (Table 10.30), which are in fact two of the most frequent of *any* words in this position (Table 10.31), have roughly equal (1:1) frequency in this trigram (51 and 38, respectively). These two words could therefore have competed for activation, and neither achieved a sufficient activation margin for retrieval. Consequently, nothing was produced after the part of the item that these two words have in common (the first phoneme). Alternatively, it might be posited that the frequency of the phoneme in this position, and the consequent chunking it could undergo, could even result in the storage of a form *he can [g]*. The remainder of *get* and *go* could then either be unavailable or in competition, with neither 'winning out'.



<u>Figure 10.12. Number of entries for all verbs following *he can* in the Spoken BNC (Davies, 2004-), grouped by initial letter.</u>

[64] The corpus can only be searched by orthographic form. Therefore, Figure 10.12 shows the frequency distributions for items following *he can* sorted by their initial letter, rather than phoneme. In all cases, though, the words starting with the letter G were ones where this would conventionally be pronounced as the phoneme /*g*/.

Table 10.30. The ten most frequent words following he can in the Spoken BNC (Davies, 2004-).

Verb	Trigram frequency
do	55
get	51
go	38
be	36
have	33
see	22
come	17
not	17
only	14
just	12

Table 10.31. The ten most frequent words following *he can* beginning with *g* in the Spoken BNC (Davies, 2004-).

Verb	Trigram frequency
get	51
go	38
give	8
grab	2
grow	2
guarantee	2
gain	1

An alternative cause of false starts could be that an individual begins production of an item but then becomes aware that what is being produced is not the item intended and is able to halt the utterance mid-production. Here, the amount produced would depend on the point at which the speaker gained this awareness and was able to halt production. (Note, however, that it is also possible that a speaker realises that an item is not ideal, but does not consider it sufficiently problematic to warrant interrupting their speech to correct it).

10.5.3. Limitations and methodological considerations

There are several limitations and methodological considerations with this study. Beginning with the rating of participants' expressive language, assigned using the WAB fluency rating scales (Kertesz, 1982), there are considerations regarding the fluency ratings of HB and MH. HB was given a lower rating than MH as her speech generally contains neologisms whilst MH's does not. However, the current analysis showed that many more of her strings were produced fluently than were MH's. Therefore, the labelling of MH as having greater expressive language capability seems somewhat problematic, and this could have contributed to HB's production numbers sometimes exceeding those of MH, disrupting the general tendency of productions to increase with WAB fluency rating.

A second methodological issue relates to the extraction and categorisation of verbs. Firstly, as was the case for nouns (section 8.5.2), the identification of verbs again encounters the difficulties of assigning grammatical classes to aphasic language. This can particularly be so in blends, in which the combination of utterances can result in items not usually found together being produced in succession. For example (item of ambiguous class in bold):

HB: *what did I do with the* ***have*** *the [ϑəsəs:]*

There were also considerations with the verb subtype classification. Again, there are general differences between definitions of certain subclasses in the literature, for example, with phrasal verbs (see again point 3.3.2.2, Appendix XVIII). The classification system employed in this study sought to distinguish the main subtypes using definitions based on the majority opinion in the literature. However, there are more subtle differences in verbs within these classes and the current study did not (aim to) capture these. This was especially true for the lexical group, which despite having the further distinction of phrasal verbs, included any verb not listed as an auxiliary by Aarts, Chalker and Weiner (2014) (see again point 3.3.2.1, Appendix XVIII). However, further subtypes could be distinguished within this group based on distribution and function. An example of such a subtype is catenative verbs (such as *make* and *get*), that were classed here as lexical but also share certain characteristics with auxiliaries (e.g. Palmer, 1987).

In terms of the string extraction procedure adopted, there were limitations in the constructions that could be studied using this protocol. These limitations mainly related to the restrictions on string size, which meant that certain potentially longer constructions, for example hosting coordinated main clauses with separately stated subjects, could not be examined (see chapter 7 for full discussion of this protocol).

Apart from this, there are also limitations regarding the use of number of verbs per string as a measure of complexity. While a higher number of verbs might generally indicate greater syntactic and semantic complexity and thus a higher level of expressive capability, this is not always the case. Firstly, there are certain phrases, such as *make do*, that contain multiple verbs but are relatively highly collocated[65] and thus could be retrieved as wholes, which would not demand higher capability. Secondly, in aphasic speech, the strings may contain multiple verbs but not be well-formed, especially, for example, in those containing blending errors:

[65] *Do* is the 39th most frequent of a total 828 words found to follow *make* in the Spoken BNC (Davies, 2004-), with *make do* having a frequency of 36.

ST: *it **was went** to the party.*

HB: *[fɑːˈ] **goes** round to **say** (that?) everybody **must try** to **find** who this (.) **had** this child **was**[k] who **came***

It could therefore be beneficial in future research to consider other possible measures of string complexity as well.

A further methodological issue relates to the coding of strings for well-formedness and fluency. In terms of well-formedness, as well as well-formedness of language in general being subjective, the coding of strings as well-formed here does not include a qualitative assessment of whether these are semantically well-formed or conventional for the parts of the storyline they attempt to relay. It would be interesting to examine the exact productions of PWA in relation to those used by the HSp for the same parts of the storyline. It would also be interesting to examine well-formedness and fluency in the HSp' strings. In the case of fluency, this would require detailed notation of all productions and pausing (measured acoustically), which was not available with the healthy speaker narratives used in this study.

In addition to this, the difficulties of measuring construction frequency raised in section 8.5.2 also apply here at the level of verbs and verb strings: corpus entries are sometimes unlikely to reflect the meaning paired with these forms as found in the PWAs' narratives. However, there are additional difficulties in calculating string frequencies. As mentioned, it seems inevitable that strings that are not well-formed will have few, if any, entries in a corpus of typical speech. Therefore, 'grammaticalised' forms of these strings were also tested where possible, using what were proposed to be the most plausible target productions for the narrative and linguistic context. This again involves a subjective judgement and is also somewhat problematic in that the target utterance cannot be known with certainty (cf. Menn, 2010). Furthermore, it cannot be assumed that there is indeed a target for such utterances, as speakers may begin an utterance without knowing how it will unfold (Menn, 2010). Also, such 'grammaticalised' versions of strings only adapted the string by making the minimum additions/ substitutions to render it grammatically well-formed. Therefore, any semantically ill-fitting elements were left unchanged as this judgement could involve many more possible target options and be even more subjective.

Another consideration relates to the predictions made regarding how utterances have been created by participants. Hypotheses can be generated for whether an utterance has been retrieved as a whole or assembled from its components. However, these are at present still predictions. Moreover, it is also not possible to state with certainty that speakers have not applied abstract syntactic rules to formulate their utterances. Further research, especially involving focused experimental testing may help to shed further light on such matters.

There were also limitations with the error analysis. This focused on the errors that rendered strings ill-formed, that is, those manifesting as semantic and morpho-syntactic errors and neologisms. In this approach, only errors that were not self-corrected were analysed and it would be interesting to also examine those that were self-corrected (in the well-formed strings). Moreover, the phenomena disrupting string fluency, such as phonemic paraphasias and false starts, would also provide another interesting area for further research.

Another issue that should be highlighted in relation to the error analysis is the difficulty encountered when coding errors into types, especially in identifying blends. Blends are not straight-forward as they can result in several points of a string being ill-formed and subjective judgement is then required to determine whether these are separate errors (e.g. word substitution or inflection) or related and resulting from a blend. An example of this can be seen in one of MH's strings:

Omission of determiner ↓

Separate errors: *every [ᵐ] woman of certain age**s** will be (1.4) has to go along*

↑ Incorrect plural marking

Blend: *every [ᵐ] woman* ***of certain ages*** *will be (1.4) has to go along*

[*of a certain age*]
+
[*of certain* [N]+plural]

The string may at first appear to contain two errors: one involving omission of a determiner and the other incorrect marking for number. However, when examined together, these two issues seem likely to be part of the same error, involving erroneous retrieval and combination of constructions of a larger size.

Similarly, the error in the following string by MH, involving an erroneous word-final *[d]* on *dance* was particularly difficult to code:

> *she (1.8) had* ***danced*** *(.) after dance after dance ((emotion)) (1.6) [INT] after dance*

It is tempting to class the erroneous [d] here as a phonemic or a 'verb-marking' error. However, this is not a verb-marking error as the item marked with the past tense morpheme, *dance*, is not a verb in this context, but rather a noun. MH may originally have intended to produce *she had dance after dance after dance* but the subject noun and following form *had* could have primed retrieval of either the lexicalised form *danced* or the past tense -*ed* which is also common after a subject and the form *had*. Alternatively, just the form *had* used as a lexical verb here could have primed activation of auxiliary *had* which could then have triggered production of the lexicalised past tense form *danced* or schematic past tense construction, -*ed*. The addition of the past tense -*ed* would also be made more likely here, though, because the form it is combined with, *dance*, although a noun here, also shares its form with, and therefore could have activated, a verb stem, which past tense constructions usually combine with. The error here was therefore classified as a blend:

she (1.8) had ***danced*** *(.) after dance after dance ((emotion)) (1.6) [INT] after dance*

had$_{\text{Lex}}$ *dance*$_{NOUN}$ *after dance after dance*
+ *had*$_{\text{Aux}}$ [V]*ed*).
+ *dance*$_{VERB}$

10.5.4. Theoretical, methodological and clinical implications

Overall, the findings in this study support constructivist, usage-based theory and demonstrate how aphasia can provide new ground for testing this approach. They also have methodological implications for future aphasia research, firstly in showing the benefit of qualitative as well as quantitative analyses of the items produced. Secondly, they highlight a need to consider such issues as frequency, collocation and schematicity, and thus take into account whole-form processing beyond the single word level as well as constructional priming. These issues can arguably help to account for some of the phenomena that are currently problematic for aphasia research, in particular the unevenness seen in individual speakers' language. Indeed, in assessing production of certain grammatical classes, constructivist, usage-based theory shifts the focus from unevenness in these across individuals and aphasia types to unevenness within individuals' production and offers a plausible explanation for it: unevenness in the input.

For verbs, specifically, the existing research into the role of verbs in producing sentences lacks consideration of the converse possibility that the wider structures a verb occurs in could influence its retrieval. For example, it could be that people who produce higher numbers of verbs, leading to them being characterised as hyper verb producers, in fact do so because their preserved lexically-specific and schematic constructions happen to include, or be limited to, ones that contain multiple verbs, such as progressives, which would increase token numbers. Conversely, it may not be the case that less fluent speakers do not have access to verbs but rather that these are only accessible within certain structures (e.g. fixed within lexically-specific sequences or in schematic constructions in which the verb has a high 'item-in-construction' frequency). Furthermore, such larger structures could also affect whether the verb is produced in the appropriately marked form for the context. By aiding access to part or all of such constructions, it might be that verb production could be improved in speakers with aphasia.

A particularly interesting production in this regard, is DB's additional token of FIT, produced correctly to complete a sentence prompt from the interviewer. The fact that DB was able to respond with an appropriate verb and indeed in a correctly marked form for the prompt could suggest that she can access certain verb forms more easily or even *only* when provided with part of a wider construction that the particular verb lemma and form is associated with. This could be because the verb form needed is associated with the sequence of lexis in the prompt or with a schematic construction hosting this lexis. This raises the possibility that verbs may be primed in PWA through provision of part (or all) of a construction (of any level of schematicity) with which the verb is associated. This is an interesting proposal that could be experimentally probed in future research and which could have wide-reaching implications for aphasia assessment and therapy. If verbs can indeed be primed in this way, then the testing and treatment of deficits in aphasia - both at single word and sentence level- need to take such findings into account, to control for and utilise frequency effects and/or the influence of the verb's semantic association with its host construction(s). Current assessment methods, such as the CAT (Swinburn, Porter & Howard, 2004), consider word frequency in tests assessing single words. However, they do not consider how frequencies at other constructional sizes and levels of schematicity could affect sentence production and comprehension. Such frequency effects could skew test results and thus contribute to incorrect diagnosis of aphasia type/severity (see again section 2.5.3).

In addition, this study has research and clinical implications for how such aphasia types are characterised. Whilst the productions of the PWA in this study may appear qualitatively different, they can in fact be explained by the same impairment: difficulties with retrieval at all constructional sizes and levels of schematicity. The difference in production, it is argued, is one of degree, depending on the number and productivity of constructions a speaker has at their disposal and participants should therefore arguably be regarded as being on a continuum. This is in line with work by Bates and Goodman (1997), who point out that all PWA have both grammatical and lexical impairments to some extent and that this argues against a clear division of grammar and lexicon (see also Bates & Goodman, 1999; Dick, Bates, Wulfeck, Utman, Dronkers & Gernsbacher, 2001). As they explain, the various symptoms traditionally used in distinguishing aphasia types may rather be accounted for in a unified lexicalist account, and this has been demonstrated for the data in the present study using one such approach: constructivist, usage-based theory.

In the constructivist, usage-based view, the speakers with the most limited expressive language, who should have access to very few constructions with practically no productivity, would be expected to produce a limited number of single (lexicalised) words and some lexically-specific phrases. These phrases should be well-formed as these speakers are expected to rely almost entirely on whole-form retrieval and therefore should not make errors (for example, with verb marking) through having to combine constructions. This characterisation fits the language produced by the most impaired speaker in this study, KP.

Individuals with slightly greater expressive language capability should have access to more constructions, and with greater flexibility, but their range of verbs should still be limited. They may often still rely on lexically-specific sequences, meaning that utterances produced fluently are likely to be restricted to short strings or fragments. However, they may also have some item-based constructions with low-level slots and possibly some fully schematic constructions of a basic nature (such as the intransitive). This limited number of constructions available to such speakers, coupled with some schematic slots, should mean they can attempt novel utterances but these are likely to be ill-formed, with, for example, verb-marking errors that mainly go uncorrected. There should, however, be unevenness in such errors because they would not be expected in these speakers' lexically-specific strings (retrieved as wholes). Overall, the linguistic behaviour predicted here of few verbs and short, fragmented utterances, coupled with verb marking errors, would fit the typical signs associated with Broca's (agrammatic) aphasia, and such language production is indeed seen for TH and DB, both diagnosed with this syndrome.

With greater expressive capability yet, there should again be an increase in the number of constructions available and the productivity with these. Speakers with this degree of expressive language may again show some reliance on lexically-specific sequences and item-based schemas, but should also have more fully-schematic constructions. They should be more likely to attempt creation of novel utterances and there should be more chance that these will be well-formed. They are still expected to make errors with verb-marking and erroneous insertions of words/ phrases, but should have more ability to self-correct these (assuming they are aware of them). Since they should have larger and more schematic constructions, they may also produce blending errors. This characterisation fits the productions observed for ST, towards the middle of the speaker continuum.

At the least impaired end of this continuum, speakers would be expected to have a far greater variety of constructions and much more productivity. They should therefore show more flexibility in creating novel utterances and most of these should be grammatically well-formed. They would be predicted to make far fewer (if any) errors with verb-marking and should be more able to correct these and other errors (such as erroneous lexical/ phrasal insertions). Again, they should also have a higher likelihood of producing blending errors which could manifest as utterances that are generally grammatical but are less meaningful semantically. This characterisation is borne out in the productions of the two participants with greatest expressive language capability, HB and MH.

10.6. Conclusion

In conclusion, this chapter has examined the verbs and verb strings produced by six people with a range of aphasia types and severities. In doing so, it shows how constructivist, usage-based theory might offer a plausible framework for characterising the participants' production. Such an account suggests that the difference across the participants' productions is one of degree. That is, the speakers can be placed on a continuum in accordance with their level of expressive language capability. Here, the constructions available to the most impaired speakers are restricted to a limited number of words and lexically-specific phases. In contrast, the speakers with the greatest expressive language capabilities appear to have access to a greater number of constructions, including more lengthy and productive schematic patterns.

Differences were also found in the errors made by the participants, with the more impaired speakers producing more omission and inflection errors, whilst the less impaired produced more blends. It can be argued that while these various errors may appear outwardly different, they can all be explained within a constructivist, usage-based account, by difficulties with retrieval.

These findings have implications for the characterisation of aphasia profiles and for clinical practice in that deficits traditionally described as syntactic may not need to be distinguished from lexical retrieval difficulties. In addition, the suggestion that items larger than words can be stored as wholes, and can therefore be subject to whole-form frequency effects, is an important consideration for aphasia assessment and therapy (see again 2.5.3).

11. General discussion

11.1. Findings

This thesis has analysed spoken language in aphasia from a constructivist, usage-based perspective (e.g. Ambridge & Lieven, 2011; 2015), influenced by Construction Grammar (e.g. Goldberg & Suttle, 2010). There appear to be no previous studies that explicitly apply this approach to language in aphasia, and thus, the findings include observations about the methods required in such research, as well as the main analytical results.

Firstly, in terms of the methods, there were no existing procedures tailored specifically to a constructivist, usage-based examination of language in aphasia. Therefore, the current project reviewed existing methods and reported gaps in these. It then explained how elements of existing procedures could be incorporated, but also adapted and supplemented, in new protocols suited to a constructivist, usage-based study of aphasic language. This included developing protocols for transcription and segmentation (verb string extraction), as well as methods of constructional analysis.

Each of the three main analytical chapters also reported interesting results. The first of these explored the effects of different types of frequency on the PWAs' nouns. In most participants, these nouns mainly mirrored those most frequently used by the healthy speakers for the same referents, that is, those with the highest 'context-specific frequency'. This was regardless of the nouns' *general* frequencies (in spoken English), which suggests that in some cases, context-specific frequency has a greater effect on noun production than general frequency. This fits with the constructivist, usage-based approach, in which speakers acquire constructions through repeated exposure to a form being used with the same function in similar contexts. Therefore, the pragmatic-functional properties that contribute to a construction's *meaning* component should be heavily influenced by the construction's usage context. It makes sense, then, that context-specific frequency effects could arise from items being more frequent in a given context than others.

However, this context-specific frequency seemed to be more influential for some participants than others. Some speakers showed little or no such effect, and instead their productions suggested greater influence of general frequency. The strength of context-specific frequency effects on an individual speaker's productions will likely depend on that person's familiarity with the context in question, in this case, the Cinderella story. Speakers who have had less exposure to a particular story should not have constructions so firmly entrenched within that specific context, and therefore their productions should not be subject to the frequency effects associated with that context. In such cases, general frequency effects may 'win out'. The issue of context-specific frequency effects, and the interplay between these and general frequency effects, does not appear to have been considered in aphasia research previously, and this would be an interesting area for further research.

Another potential question that was highlighted for future research was whether there is any effect of production order on the nouns used for a given referent. There was some suggestion that when first referring to a referent, speakers may retrieve whichever noun they can that is most relevant to the target, before they then shift to more conventional nouns for that target (those with a higher context-specific frequency) in later productions for that referent. If found, such an effect could also be accommodated by the constructivist, usage-based approach. Constructions with shared properties are thought to be linked in the constructional network and therefore retrieval of a noun partially related to the target might lead to some activation of the more conventional form for that target. This should then facilitate retrieval of the more conventional form in later productions.

The second study investigated participants' errors in marking their nouns for grammatical number. Again, it was found that such phenomena could be explained within a constructivist, usage-based account, through recourse to (general) frequency effects and whole-form storage. This was also the case for regular plurals, which have traditionally been described as requiring rule application for inflection to be achieved. The observed errors pose difficulties for such rule-based theories and, instead, better fit models that propose that at least *some* regular plurals are stored as wholes. Of these approaches, constructivist, usage-based theory offers a particularly suitable account, because of its additional ability to accommodate the observed unevenness in participant's noun marking. Furthermore, there was again some suggestion that the production order of tokens of a noun may affect a speaker's ability to produce it in the correctly marked form. For those participants who used the nouns involved in the errors both erroneously and correctly, the erroneous (more frequent) form was always the first token of that noun, before the 'correct' (less frequent) form was produced in later tokens. This could also be accounted for within the constructivist, usage-based perspective. Forms that are more frequent should be easier to retrieve and are therefore more likely to 'win out' over the noun's other forms the first time the noun is attempted. However, retrieval of one form of a noun should lead to partial activation of the other forms of that noun, thereby potentially aiding retrieval of the other form in later productions.

Finally, the third and largest analytical chapter comprised an examination of the verbs and verb strings produced by the PWA, investigating speakers' productivity with the constructions used. Findings showed that participants could be placed along a continuum that generally correlated with their WAB fluency rating. The most impaired speakers showed little variety of verbs, and their strings were largely restricted to frequent and lexically-specific or item-based constructions, with limited productivity. Consequently, these speakers showed little to no ability to combine constructions to create well-formed novel utterances. In turn, this resulted in unevenness in the well-formedness of their productions overall, with the strings that were indeed well-formed being ones that were comparatively more frequent and thus more likely to have been stored and retrieved as wholes. In contrast, those that were not well-formed, were infrequent strings that were predicted to constitute participants' (less successful) attempts at assembling utterances through combining constructions. Towards the less impaired end of the continuum, however, speakers produced a greater variety of verbs and constructional combinations, with the productions of the very least impaired showing much greater resemblance to healthy speech, in the range and well-formedness of the structures used. These speakers also appeared to be much more successful in creating novel utterances, showing less unevenness in the well-formedness of their strings.

In assessing these strings, an important part of the chapter was the analysis of errors made by the speakers across the continuum. The more impaired speakers made more omissions and 'inflection' errors, while the less impaired were far less likely to produce these error types. The latter group, however, made more errors of a kind not found in the more impaired speakers, that is, 'blending errors'. These were thought to result from these speakers also having longer and more schematic constructions at their disposal, and erroneous retrieval and combination of such constructions leading to unconventional juxtaposition or superimposition of items; the outcome being a semantically and/or syntactically ill-formed string. A key argument here was that, despite the errors appearing very different in their manifestations, all could be accounted for by the same problem: difficulties with retrieval. Again, the observations of the study fit the predictions of constructivist, usage-based theory, and with the two noun analyses, demonstrate how this offers a plausible theoretical perspective from which to characterise spoken language in aphasia.

11.2. Limitations

There are several limitations with the findings in this thesis. Many of these are specific to particular analyses and have therefore been detailed in the respective chapters. However, there are also limitations that apply to the thesis in general, and these will now be addressed, as well as reiterating some of the key limitations raised in the analytical chapters.

Firstly, there are a number of limitations relating to the frequency values used. Of course, there are always general limitations with using corpus frequencies, notably that these can never mirror exactly the participants' individual familiarity levels with the linguistic items concerned. However, there are also issues with frequency that are specific to studies adopting a constructivist, usage-based approach. A particular challenge is that this theory takes as the main unit of language, the construction. Therefore investigations of frequency under this approach should arguably measure 'construction' frequency, even for single words, and this raises the issue of how such frequencies should be calculated. If constructions are defined by very specific properties (e.g. Croft & Cruse, 2004), then construction frequency equates to the summed entries in which the item possesses the exact form and meaning properties as the participant's production. However, it would not be practical to conduct such a count, not least because it is not possible to assess the exact phonological properties of entries in main corpora such as the BNC (Davies, 2004). In addition, since constructions are thought to be richly connected in a speaker's inventory, the frequency of one item should affect other forms with similar properties. Therefore, frequency counts may not need to be so specific. This is a question for future consideration. Regardless of how lenient the criteria are for defining constructions, though, the issue of whether corpus entries reflect a participant's production is especially pertinent in aphasic language, where forms are often used with unconventional meanings or in unconventional syntactic distributions. Both context-specific and general frequency effects were found in the analyses in this thesis. However, the issue of how closely corpus entries match participants' productions remains a consideration for all research examining frequency effects in aphasia.

Also crucial to the constructivist, usage-based approach are frequency effects beyond the single word level. These were not examined in the noun studies, and it is possible that such effects influenced the noun forms produced. It would be interesting to investigate this in future research. Frequency effects beyond the single-word level were, however, explored in the analysis of verb strings, and this highlighted additional limitations relating to frequency. The main challenge was in measuring the multi-word frequency of strings that were ill-formed. It seems inevitable that such sequences in their exact form will not be found in a corpus of primarily healthy speaker productions. Therefore, it is also useful to search for well-formed versions of these strings. However, this is problematic as it relies on an assumption by the researcher about what the participant's target production was. In reality, this target can never be certain, and given that speakers sometimes begin an utterance without knowing themselves how that utterance will unfold, it may be wrong to assume that there even is a target (Menn, 2010). This limitation, which also applies to single words if these are ill-formed, does not appear to have an obvious, immediate solution.

This issue links to general limitations concerning the fact that the findings in any qualitative analysis of aphasic language rely heavily on the researcher's interpretation of the speech, and it is impossible to know whether this interpretation matches the intended meaning of the speaker. This issue arguably reflects the inherent difficulties of analysing aphasic language. However, in the current project, the robustness of such interpretations was maximised through conducting reliability tests for various stages of the method. Therefore, the interpretation of the tokens included in the analyses was not judged to be of concern. In spite of this, however, such interpretation difficulties did lead to further potential tokens being discounted as they were deemed too ambiguous. For example, in chapter 9, there were several productions that were potential errors with grammatical number, but which could not be confirmed with certainty as erroneous. Also, in the noun and verb studies, there were occasional difficulties with assigning productions to a grammatical class, because of the unconventional distributions of some items in the aphasic speech (especially those produced in blending errors). This led to some tokens that would typically be classed as nouns or verbs in healthy speech being excluded from the data. Consequently, the error rates and token numbers may be conservative compared to other research employing less strict coding criteria.

There are also limitations relating to the scope of the project. Firstly, the studies mainly focused on morpho-syntax and this was necessarily at the cost of neglecting other properties of constructions. In particular, there is only a very limited discussion of phonological and pragmatic features. These were examined briefly, for instance, in the analysis of *I don't know* (section 10.4.2.2.1), but offer considerable potential for further investigation. In addition, the project did not analyse participants' nonverbal communication, which too could be regarded as involving constructions. For instance, it would be interesting to examine possible constructions in participants' co-speech gesture, as well as considering how such nonverbal constructions could supplement, contradict or be 'syntactically' combined with spoken constructions. It may be, for example, that speakers who cannot access words, instead insert gestures into the slots of partially-filled spoken schemas, thus utilising multimodal constructional combinations.

More generally, there are also limitations with the number and type of speech samples analysed. Firstly, although the project included speakers with a range of aphasia types and severities, the overall number of participants was relatively small. The number of speech samples that can be included is arguably restricted by the time commitment involved in conducting such qualitative analyses of aphasic language. However, it would be useful to extend these analyses to a greater number of speech samples. If these again included speakers with a range of aphasia types and severities, further examination could be conducted into the effects of impairment level on speakers' constructions. Secondly, as the participants in the current study were largely recruited using convenience sampling, there was also no control over their lesions (resulting from their strokes), and it would be interesting to control this factor to assess any effect of lesion site and size on participants' constructions. Also uncontrolled was the length of the narrative samples across the participants. The speech samples were analysed in their entirety but varied considerably both in their duration and in the number of productions they contained. This too could be controlled in future by only analysing a specified duration of speech or a fixed number of productions. However, this could be at the cost of missing interesting phenomena in the excluded speech, and may even lead to exclusion of speakers completely if their speech sample did not reach the minimum length. Such speakers are arguably important to include, precisely because of their limited capacity to produce spoken output. To exclude them would be to risk misrepresenting the language of PWA in such analyses.

Apart from increasing the number of speech samples, it would also be beneficial to analyse different kinds of language data from PWA. The project only examined narratives of the Cinderella story, but it would also be interesting to test other well-known stories or different types of narratives, such as descriptions of frequent, entrenched events (e.g. going to a restaurant or the doctor's). The analyses could also be extended to spontaneous speech produced in interactional contexts, such as conversation. Moreover, this project focused solely on the production of *spoken* language. It did not investigate *written* language production, or any modality of comprehension, and these too offer much scope for future examination.

11.3. Theoretical implications

As explained, the main theoretical implication of the findings is that phenomena in aphasic language, just like those in other language areas (e.g. child language), can be accounted for with reference to frequency, collocation and schematicity - the three main pillars of the constructivist, usage-based approach. The studies support the proposal that structures larger than words do not need to be treated differently to words themselves: the lexicon does not need to be distinct to the grammar.

Instead, all language can be seen as consisting of constructions, varying in size and schematicity along a 'syntax-lexicon continuum' (e.g. Croft, 2007). The main implication of this for aphasiology is that what have traditionally been described as syntactic impairments do not need to be distinguished from the retrieval difficulties posited for single words. Such a proposal is not currently accommodated in the retrieval/ production models employed in aphasia research. However, that is not to say that it would be incompatible with such models. Rather, it may be that the processes thought to be involved in single-word retrieval could also apply to the retrieval of constructions of all types and sizes.

In addition, these findings have implications for how aphasia types are characterised. Whilst the productions of the PWA in this study may appear qualitatively different, they can in fact all be explained by retrieval difficulties at different constructional sizes and levels of schematicity. Rather than fitting distinct profiles, the difference in productions across participants can be seen as one of degree, depending on the number and productivity of constructions a speaker has at their disposal. This also links to a general need for aphasia research to move away from 'all or nothing' characterisations of speakers' language abilities. It is often not the case that a person with aphasia cannot produce a certain linguistic feature at all, but that they can rather produce it at some times but not others. This fits with constructivist, usage-based theory, which shifts the focus from unevenness in productions across individuals and aphasia types to unevenness within the productions of each individual, and furthermore offers a plausible explanation for it: unevenness in the input.

In this regard, the benefits of this project are twofold. Firstly, it highlights the potential value of constructivist, usage-based theory in elucidating the nature of spoken language in aphasia. Secondly, it demonstrates how aphasia can provide new ground for testing this theoretical approach. The project adds to the growing body of research conducted in the field of Cognitive Linguistics, and in doing so, extends this field to new territory.

Apart from these overall implications, the aphasic data in this project also raise fundamental theoretical questions regarding the nature of 'constructions' generally. Aphasia is typically characterised as not affecting a person's thinking (e.g. National Aphasia Association, 2015): PWA are generally regarded as being able to access their 'core conceptual knowledge'. Therefore, it can be argued that in producing utterances, such speakers have the meaning components of constructions but they no longer have, or can no longer access, the forms paired with some of these. Consequently, they commonly pair their intended meanings with forms that they *can* access, whether consciously, as a 'next-best' option, or unintentionally, if they cannot inhibit production of the form. This can result in 'unconventional' pairings, in which the form is used with a meaning it would not normally convey in conventional usage. This may involve a form being used as a 'one-off' to convey a particular meaning or alternatively a form could be repeatedly paired with the same (unconventional) meaning over time, thus becoming conventional for that speaker.

In the latter case, it could be argued that PWA are creating their own constructions. However, these may not be comprehensible to the listener, which raises the question of how many people need to comprehend a production (in the same way) for it to be considered a construction. This issue does not seem to feature in the commonly accepted definitions of 'construction' in the literature. Therefore, such productions by PWA can indeed be regarded as constructions even if they are incomprehensible to another person. Furthermore, through communicating with the (same) person with aphasia over time, a listener can become familiar with the way in which these unconventional constructions are used by that individual, and can therefore indeed gain the ability to comprehend them. Many, if not most, of these 'unconventional' constructions created by PWA may be essentially unique to the individual speaker. However, because of the proposed influence of, for example, frequency on the accessibility of linguistic items, there are also forms that are more likely to feature in such constructions across PWA. An example from the current project is the [*it's* UTTERANCE] schema used by DB and ST and recognised as a common production by English-speaking PWA (see again Menn & Duffield, 2013).

One other issue that merits discussion is the relationship between aphasia and child language, since there are noticeable similarities between children's early utterances and the language of the more impaired PWA in this study. Both can be characterised by a limited number of single words, lexically-specific strings and, sometimes, item-based constructions with low-level schematic slots. Because of these similarities, it could be tempting to ask whether aphasia therefore manifests as a regression of language to a certain point in the acquisition process. In answer to this, it is possible *in theory* that the brain could 'shut down' or reduce access to certain elements of language to conserve processing capacity. However, it is difficult to imagine the nature of such a 'shut-down'. Presumably, it could not involve a systematic loss of specific elements of language, since this seems to be contradicted by the unevenness observed in PWA's language.

Instead, it seems more plausible that rather than resulting from a protective mechanism put in place by the brain, the language that becomes inaccessible, does so because it is less entrenched, making it more difficult to retrieve. Conversely, items that are more frequent should be more entrenched and easier to retrieve, thus being more likely candidates for production by PWA. Frequent items are also likely to be acquired early. Therefore, what aphasic and child language have in common is the influence of frequency levels in the input. It should be noted, though, that what is more frequent for these two language populations is not necessarily the same. For children, the input is likely to be language produced by early caregivers (child-directed speech), whilst in aphasia, the input includes any exposure to language up to the time of the stroke (and perhaps afterwards). The latter input will therefore also be influenced by, for example, the social groups to which the person has belonged and their occupation. In addition, there could also be a direct link between the constructions that are learned earlier and those that are preserved/ accessible in aphasia. The earlier a form is acquired, the longer the available period of time over which an individual can produce it. Therefore, forms that are acquired earlier should be more likely to be produced a greater number of times and thus be more entrenched than those acquired later.

While aphasia and child language therefore differ and are indeed different research fields, they are mutually beneficial in what they can reveal about language storage and processing. It particularly makes sense, in trying to explain which constructions are preserved in aphasia, to understand how these were acquired in the first place. In this way aphasia research could benefit from greater consideration of the acquisition process.

11.4. Methological implications

As mentioned, one of the methodological findings was that the relevant existing methods for studying aphasia were either largely untested for reliability or were not suitable for an analysis employing a constructivist, usage-based approach. In addition, the methods used to apply this approach in other language areas were not always suited to use with aphasic language. Therefore, new methods were developed for this purpose, and since these have been proven to be reliable, they offer robust procedures that can be employed in future research of this kind.

The project also highlighted a number of methodological issues for consideration in future research. Firstly, it is crucial in studies examining which constructions a speaker might have access to, that *all* productions in that person's speech sample are considered. This includes not only words, but also phonemic paraphasias, neologisms, partial productions such as individual phonemes and unfinished words, as well as audible hesitation tokens. Instrumentally measured pauses should also be taken into account. This level of detail, while often 'messy' and laborious to transcribe and analyse, has much potential in revealing speakers' ease or difficulty in producing certain utterances. In turn, this can hint at which items may have been retrieved as wholes or assembled from component constructions. Such analyses cannot be completed if, right from the start, transcriptions do not include these details or -worse- present a ‘cleaned up’ or ‘restored’ version of the speech (see again Menn, 2010). A further consideration that was highlighted regarding completeness of data is the value of analysing video as well as audio recordings. This can provide extra contextual cues in the form of non-verbal communication, which can aid (or even completely change) the researcher’s interpretation of an utterance.

The project also highlighted an important methodological consideration for studies of grammatical number errors in noun production. This was that caution is needed when judging ‘singularisation’ errors (use of a noun’s singular instead of the expected plural) prompted by object or picture stimuli. Even if multiple objects or items on a picture are being displayed to a participant at the time of them producing the singular, it is possible that they have actually only attended to one of these, in which case the production is arguably not a linguistic error. Of further note in this regard is the possibility that PWA may also suffer from hemispatial neglect as a result of their stroke (see again 9.6.4), and this would make them less likely to attend to all items seemingly in their field of vision.

11.5. Clinical implications

The findings of this project also have important clinical implications for aphasia assessment and therapy. If linguistic items of all sizes can be stored and retrieved as wholes, then both assessment and therapy need to consider frequency effects beyond the single-word level - something which they currently do not do (see again section 2.5.3).

Existing assessment methods, such as the CAT (Swinburn et al., 2004), consider word frequency, but do not consider how frequencies beyond this level could affect a person’s production and comprehension abilities. For example, if a multiword sequence is frequent enough, it is likely to be stored and retrieved as a whole, increasing the probability that a speaker will produce it as a well-formed utterance. In this way, frequency could directly affect the overall well-formedness of a person's connected speech, and thus influence whether the speaker is judged (using traditional labels) to have 'syntactic' deficits. Such larger effects could also impact on retrieval of single words. If a word is frequent within a certain lexically-specific or schematic construction, then presentation of part or all of this host construction could aid the word's retrieval. It may not be the case that speakers do not have certain words or classes at their disposal, but rather that they only have them stored within other constructions. Therefore, the context in which a test item is presented could influence the participant's performance on an assessment. Consequently, if frequency effects beyond the single-word level are not considered, test results could be skewed, potentially leading to incorrect diagnoses of aphasia type or severity (see again section 2.5.3).

Such effects of frequency and collocation could, however, be very beneficial in aphasia therapies, in treating production of items of all sizes. Again, item-in-construction frequency effects could be used to help speakers access a given word, and the possibility of such priming was raised in relation to verbs in chapter 10. Verbs have traditionally been described as notoriously difficult or lacking in aphasic speech, particularly in speakers with Broca's agrammatic aphasia. However, in the current project, it was observed that one of the participants with this aphasia syndrome, DB, was able to produce a verb, and indeed in its correct past-tense form, to complete a sentence initiated by the PATSy interviewer. This could have been because the form produced by DB was linked to the constructions in the interviewer's prompt through semantic association and frequency effects and, thus, this preceding context primed DB's production.

This example indicates that it may not be true that PWA cannot produce certain items, but rather that they do not have (or cannot access) the larger constructions, either lexically-specific or schematic, that these are stored in. This could have wide-reaching implications for aphasia assessment and therapy. By aiding access to part or all of such ‘host’ constructions, it might be that PWAs’ production of difficult items such as verbs could be improved. Similarly, multiword frequency effects could be exploited in helping speakers to re-access or re-learn ‘chunks’ of language to improve their connected speech (see again the discussion of Herbert et al.’s (2014) paper, section 2.5.3).

11.6. Directions for future research

In looking to future research, it is important to re-emphasise the exploratory nature of this thesis. One of its primary purposes was hypothesis generation, and as such, it stands at the beginning of the ‘scientific process’ (see again Eddington, 2008). If the application of constructivist, usage-based theory to language in aphasia is to be conducted under the label of the scientific method, the next stage for these hypotheses is rigorous testing, again underpinned by reliable empirical analysis of data from real speakers. Such research should both target specific aspects of language through focused experimental testing, and also conduct further qualitative analysis similar to the kind employed in this thesis.

Several areas have been highlighted for future testing throughout the thesis. These include, in particular, the experimental testing of constructional priming effects on verb retrieval, and also further assessment of the schematic constructions that speakers’ have access to, such as noun phrase or subject-predicate constructions. Finally, it would also be of great value to conduct constructivist, usage-based examinations of aphasia in speakers of other languages. This would be especially interesting in languages with richer morphological systems than English, since these could provide further clues about the exact forms produced and the speakers’ productivity levels with such items.

12. Conclusion

In conclusion, this thesis has demonstrated how constructivist, usage-based theory may be applied to spoken language in aphasia. Using data from speakers with a range of aphasia types and severities, it has developed reliable methods appropriate to analysing aphasic spoken language from this theoretical perspective. It has then applied such an analysis, focusing on noun and verb constructions in the data. In doing so, this project highlights how constructivist, usage-based theory could help to elucidate language in aphasia and, conversely, how aphasia offers new ground for testing this approach. In sum, this exploratory body of work stands at the beginning of the scientific process by observing phenomena, generating hypotheses for testing, and identifying other directions for future research in this area.

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Appendix I: 'Aphasia-friendly' information leaflet for prospective participants (format informed by Herbert et al.'s (2012) *Accessible information guidelines*).

The University Of Sheffield.

Department of Human Communication Sciences

31, Claremont Crescent,

Sheffield, S10 2TA

Recurring language structures in connected speech in aphasia

Researcher:

Rachel Hatchard ☏ 0114 222 2410

Supervisor:

Dr. Ruth Herbert ☏ 0114 222 2403

Locations:

In your own **home**

or

The **clinic**,
Department of Human Communication Sciences
(Sheffield University)

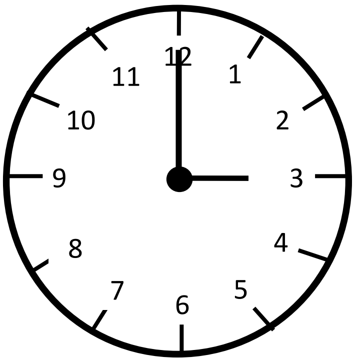
The **study** looks at **language** after a stroke.

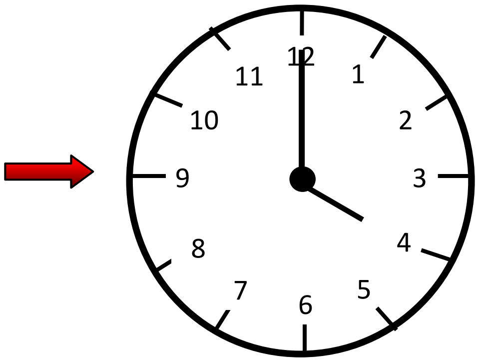
Taking part is **voluntary**

I will see you **2 or 3 times.**

Each time will last up to **1 hour**.

e. g.





I can come to your **home**

or you can come to the **clinic** at the **university**.

You choose.

This is **not therapy.**

We will do some **language tests**.

We will **talk** about things.

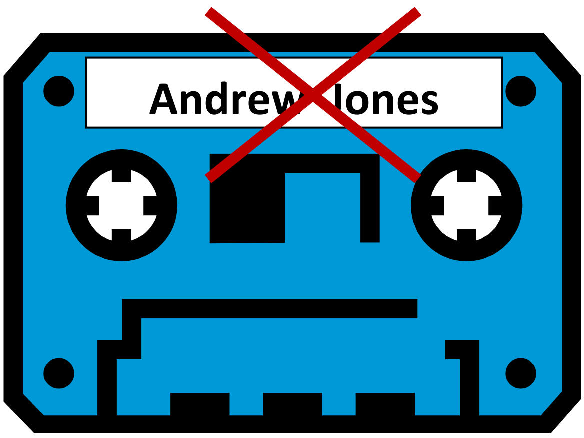
It will be **video recorded**.

You can **rest** at **any time**.

You can **stop** at **any time**.

If you **stop**, this **doesn't affect** your **communication support group**.

The **study** will be **anonymous**.



We will **not** write your **name** on the **recordings** or in the **study**.

We will keep the **recordings locked** in a **secure office**.

Only Rachel and her **supervisors** will **listen** to the **recordings**.

Rachel will use the **results** in her **PhD thesis**.

We might **present** the **results** at **conferences**.

We might **show** the **video recordings** at **conferences, if you give permission**.

Please **tell** your **group coordinator** if you **want** to **take part.**

Approved by the Research Ethics Committee, Department of Human Communication Sciences.

Appendix II: More detailed information booklet for prospective participants with sufficient reading capabilities and/or friends and relatives.

The University Of Sheffield.

Department of Human Communication Sciences

31, Claremont Crescent,

Sheffield, S10 2TA

Research Project Information Sheet

Project title: Recurring language structures in connected speech in aphasia

Researcher:

Rachel Hatchard ☏ 0114 222 2410

Supervisor:

Dr. Ruth Herbert ☏ 0114 222 2403

This information sheet is about a study at the University of Sheffield, looking at language after a stroke. For further information, please contact the researcher, Rachel Hatchard.

The Research Team

Rachel Hatchard is a PhD student in the Department of Human Communication Sciences, The University of Sheffield. Dr Ruth Herbert is a speech and language therapist and aphasia researcher, and is supervising Rachel’s PhD.

Ethical approval

This study is approved by the Department of Human Communication Sciences’ Research Ethics Review Committee.

What is the study about?

The study is looking at language in people who have had a stroke. We hope to find out more about the language that stroke survivors use. We will do this by video-recording speech. We will then write down the recorded speech and look carefully at the language involved.

We hope this will help to understand more about language difficulties after a stroke. This might then help to improve therapy in the future.

Who is taking part?

People who have language difficulties after a stroke are being asked to take part.

Deciding whether to take part

Everyone is free to choose whether they take part.

Whether someone takes part or not, this does not affect their attendance at the Communication Support Group or any other groups.

Anyone who decides to take part will sign a consent form, but after that, they can still change their mind and stop or withdraw from the study at any point. If someone does withdraw from the study, any video recordings already made of that person will be destroyed at that point.

What is involved

The study involves each person having two or three interview sessions on a one-to-one basis with Rachel. Each session will last up to one hour. This can take place in people's own homes (Rachel will come to people's houses) or at the Department of Human Communication Sciences speech and language clinic, if people can make their own way there. Unfortunately, expenses for travel to the clinic cannot be refunded.

The sessions do not provide therapy or counselling of any kind. They will involve some standard speech and language tests and then general conversation, talking about whatever participants would like to talk about. All three interview sessions will be video recorded. We will then watch the recordings. We will write down the speech and look at the language in it.

What will happen to the data and recordings?

The researcher, Rachel Hatchard, will keep all data and recordings securely locked on her password-protected computer in her office at the University. Only Rachel and her two supervisors will have access to the data and recordings.

People involved in the study can watch the recordings of their own interviews, if they wish to. We may present the data and results at research talks/ conferences. We may also play sections of the video recordings during research talks/ conferences, if the participant gives extra consent for this. (N.B. This extra consent to show the video recordings at such events is not essential and people can still take part in the study if they do not give this extra consent.)

All data and recordings will be anonymised and participants will not be identifiable in any publications.

All data and recordings will be kept for the duration of the study. We would also like to keep the data and recordings beyond this time, for up to five years in total, as it may be useful in other research. Participants will be specifically asked to consent to the data and recordings being kept for this extra time period. If the participant gives consent, the data and recordings will be kept under the custody of Rachel's supervisor, Dr. Ruth Herbert, for the longer period. (N.B. This extra consent for longer storage of data and recordings is not essential. Participants can still take part in the study if they do not give this extra consent.)

What will happen to the results of the study?

The results will be used as part of Rachel Hatchard's PhD thesis and may be published in scientific journals or presented at research conferences. The results may also be presented to local groups and organisations supporting people with language difficulties.

The information collected through this study could possibly be used for future research.

Will this study help the person? What are the potential advantages of taking part?

It is unlikely that the results of this study will help anyone directly. However, we hope that the study will help to find out more about language problems after a stroke. In the long term, this might help to improve treatments for language difficulties.

What are the potential risks of taking part?

The interview sessions will involve some language assessment, similar to what happens in speech and language therapy clinics, and will involve talking to Rachel, so we do not think there are any specific risks or disadvantages to taking part. If a person does not want to do the interview, they can stop at any time.

What if there is a problem or I want to make a complaint?

If you have any concerns, you are welcome to discuss these freely with Rachel or her supervisors using the following contact details:

Rachel Hatchard

Department of Human Communication Sciences
University of Sheffield
31 Claremont Crescent
Sheffield, S10 2TA
Tel: 0114 222 2410

Email: r.hatchard@sheffield.ac.uk

You can also discuss your concerns with Rachel's supervisor:

- Dr. Ruth Herbert
  Tel: 0114 222 2403
  Email: r.herbert@sheffield.ac.uk

If you wish to speak to someone unrelated to the project you can contact the Head of the Department of Human Communication Sciences at the University of Sheffield:

- Professor Shelagh Brumfitt
  Tel: 0114 222 2406
  Email: s.m.brumfitt@sheffield.ac.uk

If you are not satisfied your concerns have been dealt with satisfactorily by the people above, you can write to

- The Registrar and Secretary of the University of Sheffield, Western Bank, Sheffield, S10 2TN.

Thank you for reading this information sheet

Appendix III: Consent form.

The University Of Sheffield.

Department of Human Communication Sciences

31, Claremont Crescent,

Sheffield, S10 2TA

Recurring language structures in connected speech in aphasia

Researcher: Rachel Hatchard

Participant Identification Number for this project:	**Please initial box**
1. I have **read** and **understand** the **information sheet** about the study.	☐
2. I have had the **opportunity** to **ask questions** about the project.	☐
3. I understand that my **participation** is **voluntary**.	☐
4. I understand that I can **stop** or **rest** at **any time**.	☐
5. I understand that my speech will be **video recorded**.	☐
6. (a) I give **permission** for the research team to **keep** and **watch** the **recordings of me**.	☐

7. (b) [**Not essential** for **participation**]

I give **extra permission** for the research team to **keep** and **listen** to the **recordings** for a **longer** period of time (up to **5 years**).

(c) [**Not essential** for **participation**]

I give **extra permission** for the research team to

show the **video recordings** of me at **research talks/ conferences**.

7. I understand that this study **does not affect** my attendance at the **Communication Support Group**.

8. I understand that the study will be **anonymous**. My name will **not** be on the recordings or in the study.

9. I agree for the **recordings** of me to be used in **future** research.

10. I **agree** to **take part** in the above research project.

Name of Participant	Date	Signature
(*or legal representative*)		

______________________	______________	_________________
Name of person taking consent	Date	Signature
To be signed and dated in presence of the participant		
______________________	______________	_________________
Lead Researcher	Date	Signature
To be signed and dated in presence of the participant		Lead Researcher

Appendix IV: Form for recording participant details.

The University Of Sheffield.

Department of Human Communication Sciences

31, Claremont Crescent,

Sheffield, S10 2TA

Recurring language structures in connected speech in aphasia

Researcher:	**Rachel Hatchard**
Address:	Department of Human Communication Sciences, University of Sheffield, 31, Claremont Crescent, Sheffield, S10 2TA
Telephone:	0114 222 2410
Email:	r.hatchard@sheffield.ac.uk

Supervisor:	**Dr. Ruth Herbert**
Address:	Department of Human Communication Sciences, University of Sheffield, 31, Claremont Crescent, Sheffield, S10 2TA
Telephone:	0114 222 2403
Email:	r.herbert@sheffield.ac.uk

Participant information sheet

1. PERSONAL DETAILS

Name/ id code	M/F
Date of birth	Age at testing
Address	
Telephone number	
Family/ friend contact details	

2. GENERAL BACKGROUND

Languages
Years/ details of education
Career background *- previous work* *- current work*
Home circumstances

Usual weekly activity

MEDICAL DETAILS

(i) CVA

Age at onset	Time passed since CVA (duration of illness)
CT scan reports/ details of CVA	
Circumstances of CVA (at time of and immediately prior to stroke)	
Details of any subsequent TIAs	
General symptoms	

(ii) LANGUAGE

Aphasia type	Fluent / non- fluent speech production
Overview of language skills/ difficulties	

Details (including focus) of any SLT (prior to and at time of data collection)
Other factors compromising intelligibility of speech

(iii) OTHER

Handedness
Hearing
Visual
Physical mobility

4. CONTACTS

Referrer/ Communication Support Group coordinator:
Previous/ current speech and language therapist
Other:

5. OTHER OBSERVATIONS

Apparent ability to participate in conversation/ level of understanding and ability to express themselves

Other

Information collected by ___________________________ **Date** _________________

Location of data collection ____

Appendix V: Full language assessment results for participants LC and RD.

LC

The results of LC's language assessments are shown in Table V.i., followed by a description of his performance on each task type.

Table V.i. Language assessment results for LC

Task	Max. score	Healthy Mean	Healthy Range	LC Score
Language comprehension				
Single-word level				
Spoken word comprehension[a]	30	29.15 SD=1.35	25 – 30	28
Written word comprehension[a]	30	29.63 SD=0.79	27 – 30	19
Auditory sentence comprehension				
Spoken sentence comprehension	32	30.17 SD=1.85	26 – 32	23
Expressive language				
Repetition				
Word repetition[a]	32	31.73 SD=0.67	30 – 32	30
Nonword repetition[a]	10	9.23 SD=1.48	4 – 10	7
Spoken language production				
Naming objects[a]	48	46.37 SD=1.6	42 – 48	35
Reading aloud				
Reading words[a]	48	47.42 SD=1.06	44 – 48	35
Connected speech				
Fluency rating[b]	10			5

Key to Table V.i. a = Comprehensive Aphasia Test (Swinburn et al., 2004); b = Western Aphasia Battery (Kertesz, 1982); SD = standard deviation.

Language comprehension

Single-word level

LC performed within the healthy limits on spoken word comprehension, giving no incorrect responses on this test, although he did make one delay and one repetition request. He showed substantial impairment, however, on written word comprehension, giving five incorrect responses and making one delay on this test. The incorrect responses included one phonological error and four semantic errors.

Sentence level

LC was also impaired on spoken sentence comprehension, making three incorrect responses, two delays and a repetition request on this test. All three incorrect responses were with reversible sentences, suggesting some difficulty with this sentence type.

Expressive language

Repetition

LC performed within the healthy range on both word and nonword repetition, although his score for word repetition was at the lower limit of this range. On word repetition, he gave one incorrect response, involving addition of a single phoneme, whereas on nonword repetition he gave an incorrect response involving deletion of a single phoneme and also made one repetition request.

Spoken language production: naming objects

LC's performance on picture naming revealed considerable word-finding difficulties. These manifested in four incorrect responses, four delays and a self-correction. All the incorrect answers and the self-correction involved visual-semantic errors.

Reading aloud

LC also showed considerable deficits on reading words aloud, giving six incorrect responses and making one delay on this test. All of the incorrect responses involved words of low imageability. Five of the incorrect responses were visual lexical errors and the remainder was a phonemic error involving a single phoneme substitution.

RD

RD's language assessment results are summarised Table V.ii, with his performance on each task type described in more depth below.

Table V.ii. Language assessment results for RD

Task	Max. score	Healthy Mean	Healthy Range	RD Score
Language comprehension				
Single-word level				
Spoken word comprehension[a]	30	29.15 SD=1.35	25 – 30	26
Written word comprehension[a]	30	29.63 SD=0.79	27 – 30	30
Auditory sentence comprehension				
Spoken sentence comprehension	32	30.17 SD=1.85	26 – 32	29
Expressive language				
Repetition				
Word repetition[a]	32	31.73 SD=0.67	30 – 32	32
Nonword repetition[a]	10	9.23 SD=1.48	4 – 10	10
Spoken language production				
Naming objects[a]	48	46.37 SD=1.6	42 – 48	43
Reading aloud				
Reading words[a]	48	47.42 SD=1.06	44 – 48	48
Connected speech				
Fluency rating[b]	10			9

Key to Table V.ii. a = Comprehensive Aphasia Test (Swinburn et al., 2004); b = Western Aphasia Battery (Kertesz, 1982); SD = standard deviation.

Language comprehension

Single-word level

RD's performance on both spoken and written word comprehension was within the healthy range. However, his score was considerably lower on the spoken test, where he made one incorrect response and two self-corrections. Both the incorrect response and at least one of the self-corrections involved semantic errors[66]. His performance on the written test was at ceiling.

Sentence level

RD's score for spoken sentence comprehension was at the middle of the healthy range. He made one incorrect response and one delay on this test, both of which were on reversible sentences, hinting at a possible difficulty with this sentence type.

Expressive language

Repetition

RD's performance on both repetition of words and nonwords was at ceiling.

Spoken language production: naming objects

RD performed within healthy limits on naming, although his score was towards the lower end of the healthy range. He gave two no responses and made one delay, all of which involved low-frequency, inanimate words, suggesting that he may have greater difficulty with this word type.

[66] The type of error made in the other self-correction was not noted due to researcher error.

Reading aloud

RD’s performance on reading words aloud was at ceiling.

Appendix VI: Transcription protocol.

Listen to the speech samples using appropriate audio software. This protocol describes the procedure for samples listened to using the software *Audacity 2.0.5*, but other software with the necessary features may also be used. Listen to the speech as many times as necessary and transcribe as follows:

1. Layout

a. Identification (and inclusion/ exclusion) of speakers

Each speaker should be identified in the left margin, using 'Pa:' for the participant and 'R:' for the researcher/ interviewer. An indent should be inserted after these codes before including the productions of that speaker. When the speaker changes, begin the new speaker's speech on a new line, for example:

R: so they went to the ball and what did they do when they were there

Pa: I don't know its erm dance

In the event that a speaker other than the participant or the researcher enters the interaction, use the identification code 'Other:'. NB. Speakers other than the participant and researcher should only be included in the transcription if they are involved in the interaction with the participant and/ or researcher. Background speech, for example from distant speakers in another room or from television sound, should not be included.

b. Order of speech

Speech should be written in the exact order that it is heard in the recording. If a pause (of any length) occurs within the speech of one speaker and within that pause, a second speaker produces speech, then the speech of the second speaker should be placed on a separate line between the first and second parts of the initial speaker's speech, as follows:

R: they wanted to see whose foot would

Pa: yeah

R: fit the slipper

If, however, the second person's interjections occur simultaneously to the initial speaker's speech, this should be presented following the procedure outlined in section 1e.

2. Notation of speech

a. Words

All words should be transcribed using English orthography. The transcription should capture as accurately as possible the actual productions of the speakers. Therefore, words such as *don't* should be transcribed as *don't* rather than as *do not* and *d'y'* should be transcribed as such, as opposed to writing an assumed 'full' version like *do you*.

In some instances, there may be ambiguity over the production due to similarities in the phonological form of several items. For example, *I* can sometimes be pronounced like *a*, and unstressed '*a*' can sound like '*her*' with the initial 'h' dropped (as well as resembling the audible hesitation token *er*). It could be that both the following utterances, for instance, sound the same:

she lost a slipper

she lost her slipper

In such cases, greater attention should be paid to the context of the ambiguous item. If this does not resolve the ambiguity, the item should be transcribed phonetically, as follows:

she lost [ə] slipper

In other cases, perhaps because of a speaker's accent, an item might be produced in such a way that it sounds like another item, although the meaning apparently intended is not that of the item it resembles. For instance, the word *wasn't* in the utterance *wasn't she?* may sound identical to *want*, despite it seeming clear from its usage that the intended meaning is *wasn't*. Similarly, *they* may be realized as *the* in certain instances, such as *aren't they?* In these cases, the item should be transcribed phonetically, as in the following example:

she was crying (.) [wɒnt] she

b. <u>Neologisms and phonemic paraphasias</u>

For neologisms and phonemic paraphasias, broad phonetic transcription should be employed, using the standard symbols of the International Phonetic Alphabet [IPA] (2005). In instances where a paraphasia is assumed, but this resembles a real word (different to that which was apparently intended), the item should be transcribed phonetically, rather than the using standard orthography of the word that the production resembles. For example, in the following, [kəʊst] is transcribed phonetically, rather than as *coast*:

R: yes it's the post yes

Pa: the [kəʊst] yeah

In instances in which phonemes have been produced with reduced volume, the phonemes in question should be transcribed using superscript IPA symbols, as illustrated for the first schwa in the following attempt at *godmother*[67]:

er fairy (.) [gɒdᵊnəðə]

c. Sub-vocalic speech

Sub-vocalic speech (produced 'under the breath') may be produced, for example, when a speaker is 'thinking out loud' or practising what he or she will say before producing it aloud. Such speech should be transcribed using the relevant guidelines for the particular type of speech output (words, neologisms or phonemic paraphasias) in 2 a and b above, but also placed in round brackets.

d. Unintelligible speech

Unintelligible speech should be indicated using the symbol (xxxx), as in the following example:

Pa: she cry cry (xxxx) sisters

[67] This point was added to the transcription protocol after reliability testing had been conducted.

3. Punctuation

To avoid assumptions about structure at the point of transcription, no punctuation (including sentence-initial capitalization) should be used in the transcription. An exception to this is any punctuation marks, such as hyphens and apostrophes, which are part of the standard orthography of a word, for example, the apostrophe in *don't* and the hyphen in *short-lived*.

Pauses

a. Longer pauses (intra- and inter-speaker)

Pauses of more than one second (from 0.95 seconds upwards) should be measured to one decimal place. To do this in *Audacity*, select the area of the pause on the wave form. Pauses are regarded to be periods between speech, but may include other background noise, such as moving of papers, which could appear similar to speech on the waveform. A pause should be taken to begin at the point when the final sound of the last utterance before the pause has ceased, when the wave form will usually, but not always, have returned to its 'resting' form (approximately a flat horizontal line). The end of the pause should be taken to be the last point before the initial sound of the next utterance (and usually the point before the waveform deviates from its flat line shape).

When the pause has been selected with the cursor, this can then be checked by listening to it, and the selected section can be adjusted to match the area of pause as accurately as possible. Once the area of pause has been ascertained, keep this selected and note the length of the pause, which is displayed in round brackets at the bottom of the window, as shown in Figure VI.i.

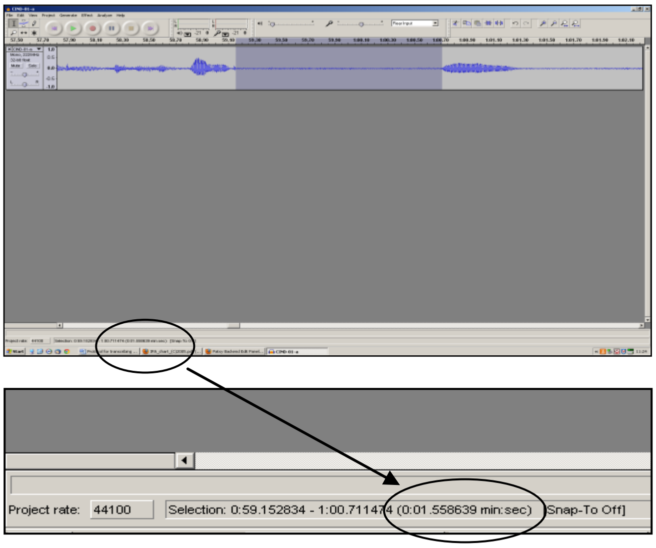


Figure VI.i. Pause duration as displayed on the *Audacity* software window.

As is common practice in the Jeffersonian system of transcription notation used in conversation analysis (e.g. Jefferson, 2004), pauses should be noted to one decimal place. If the second number after the decimal point is 5, the number in the first decimal place should be rounded up (rather than down). In the above screen shot, the length of the pause would therefore be noted as 1.6 seconds.

To indicate the pause in the transcription, include the pause length in italicised font placed within round brackets at the point of occurrence in the speech (Jefferson, 2004), as follows:

Pa: cinderella *(4.5)* went *(2.2)* to the ball

If the pause occurs between the speech of the participant and the researcher, it should be included on its own separate line between the participant's and researcher's speech, for instance:

Pa: they want ball

(5.4)

R: and then

b. Micropauses (intra-speaker)

Shorter 'micropauses', defined here as pauses of between 0.45 and 0.95 seconds occurring within one speaker's speech, should be reported using a dot in round brackets (cf. Jefferson, 2004[68]), as in the following example:

Pa: two ugly (.) ugly sisters

NB. Pauses of this length that occur between speakers should not be included (see previous section for details on inter-speaker pauses).

4. Overlapping speech

Where two (or more) speakers' speech overlaps, that is, occurs simultaneously, this should be marked in the transcription by underlining the exact sections of overlapping speech as precisely as possible. This may require the underlining to begin or end mid-word (in the event that only part of a word overlaps with another speaker's output). For example:

R: that's right (.) they're the sisters

Pa: ugly sisters (.) bad

If there is repeated intermittent overlapping within a stretch of speech, the overlapping sections should be vertically aligned at the exact point of occurrence during the initial speaker's speech. For instance:

R: can you remember (.) who these two are

Pa: yeah no

[68] This symbol is used to represent micropauses in the Jeffersonian system of transcription notation (e.g. Jefferson, 2004), but the time-length used to define such pauses may vary across research. The length used in the current procedure is that chosen by the researcher.

5. Non-speech

Non-speech includes noises produced by a speaker that cannot be regarded as speech, but could either be viewed as having communicative value or as impacting on the person's ability to speak. This includes, amongst others, tutting, laughing or coughing, but excludes, for example, noises made by general movement during the recording. Again, output should only be included from speakers involved in the interaction that is the main focus of the recording (see also Ia(i)).

Nonspeech should be noted in the transcription in double round brackets at the precise point of occurrence. For example:

Pa: can't remember ((laughs)) (.) no ((tut)) oh dear

Noises made by the speaker taking a deep breath in should only be noted when this occurs over a micropause, as follows:

Pa: she run and left (. ((partly covered by in-breath))) the thing (.) the slipper

6. Transcriber's observations/ comments

Any notable observations/ comments that the transcriber wishes to make about the speaker's productions, or regarding any difficulty in transcribing them, should be included as footnotes inserted at the relevant point of the transcription.

References

International Phonetic Association. (2005). *International Phonetic Alphabet*. Retrieved February 23, 2012, from: http://www.langsci.ucl.ac.uk/ipa/IPA_chart_%28C%292005.pdf

Appendix VII: Procedure for comparing transcriptions to measure intra- and inter-rater reliability.

In the intra- and inter-rater reliability tests, the transcriptions were compared on each of the three identified transcription aspects: turns, verbal content and pauses. The comparison procedure used is detailed for each of these separately below.

1. Turns

Agreement on turn notation was defined as both transcriptions including the same turn at the same point of interaction, marked as having been produced by the same speaker.

In this type of procedure where the transcriber has a choice in all compared instances, between a specified number of definitive categories (that is, to posit a participant turn, researcher turn or no turn), agreement can be statistically tested using Cohen's Kappa (1960) (Wood, 2007). This was, therefore, calculated for agreement on turn notation.

2. Verbal content

In comparing the transcriptions for verbal content, different comparison procedures were used for words and neologisms/ phonemic paraphasias since these were transcribed differently (see again Appendix VI).

a. Words

Agreement on words (transcribed using standard English orthography) was defined as both words being identical or being homophones, such as *who's* and *whose*. Flexibility was allowed for words judged as being very similar in phonological form and as having the same communicative function. These mainly consisted of items signalling agreement or confirmation and also audible hesitation tokens such as *erm*. Specifically, the following pairs were counted as being in agreement:

mm	mh*mm*
yes	*yeah*
er	*erm*
erm	*um*
oohh	*oh*

An verdict of agreement was also given when groups of words could also be written as one word depending on speech production or dialect, such as the following pair:

got to	*gotta*

Although, words were primarily to be transcribed orthographically, the phonetic transcription of words was also a possibility if the transcriber felt that several homophones of an item were possible and the context was insufficient to determine which of these had been produced (see again Appendix VI). Where a word represented orthographically in one transcription had been transcribed phonetically in the other, agreement was allowed if the production of the two items was deemed the same, as in the following examples

bye	[baɪ]
is	[ɪz]
er	[ə]
er	[ɛ]

b. <u>Neologisms/ phonemic paraphasias</u>

Neologisms and phonemic paraphasias were compared using the combined criteria of syllable number and percentage of common phonemes. Agreement was regarded as both items having the same number of syllables and a minimum of 75% phonemes the same. In the examples below, the first two pairs were, therefore, classed as agreements, whereas the last two were not:

[pænsɪn]	[pænsɪŋ]
[ðɪts]	[θɪts]
[dɛts]	[θɪts]
[pʊm]	[hʌmf]

Exceptions to the rule about syllable number were instances where an extra syllable in one item consisted of a (full or superscript) schwa that could be likely to undergo deletion in production. For instance, agreement was given for the following pairs, despite the former item in each pair containing an extra syllable.

[sɪndᵊɹɛn]	[sɪndrɜ]
[gɒdᵊnəðə]	[gɒdnʌðə]
[sɪndᵊɹəl]	[sɪndrəl]

In comparing the component phonemes for a minimum of 75% in common, agreement on two phonemes was defined as these being either identical (regardless of whether they had been written in full or superscript form) or very similar in phonetic form. The latter group included the following pairs:

[æ]	[a]
[n]	[ŋ]

[ə]	[ɛ]
[ɛ]	[ɜ]
[ð]	[θ]
[ɹ]	[r]
[z]	[s]

Exceptions were made to the rule regarding minimum percentage of common phonemes, in the case of short items that although transcribed differently, were judged as having a very similar overall sound-form and communicative content, as follows:

[əh]	[ʌʔ]
[əh]	[uh]
[ɛə]	[ʌʔ]
[ə]	[ʌʔ]
[ɹə]	[r]

Since the procedure for noting verbal content does not involve a choice between definitive, closed-class categories, and nor, therefore, any repetition of the same decision, it was not possible to test the results using Cohen's (1960) Kappa, and proportional agreement was calculated instead.

3. Pauses

a. Pause position

Agreement on pause position was defined as both transcriptions including a pause in the same position. The only exception to this was when a pause that was absent in one transcription had been noted in the other as present but covered by, for example, a breath. In this case, there was arguably potential for discrepancy since a pause covered by a breath could easily be regarded by another transcriber simply as the participant breathing rather than as a pause. Therefore, such instances were excluded from the comparison, but instances where both transcribers had noted a 'covered' pause were included.

The agreement level was then calculated, and to do so, it was decided not to test the agreement using Cohen's (1960) Kappa. This was because the Kappa results could be distorted by the fact that one of the two rating options, that is, 'no pause', relied on the other transcription including an extra pause, and agreement on where pauses were not posited could not be assessed. (Although this was also true with turns, in that case 'no turn' was one of three rating choices and indeed rarely used. For pause position, contrastingly, 'no pause' was one of only two rating choices, so the effects on the Kappa result of the lack of agreement on 'no pause' ratings could have been greater.) Proportional agreement was therefore calculated instead.

b. Pause length

All pauses for which there had been agreement on position were then compared for length. Agreement was regarded as the pauses matching each other within +/- 0.1 seconds or both being noted as micropauses. Instances where a micropause included in one transcription had been marked as a full pause of 1.0 second in the other were not counted as agreements (although a micropause (defined as between 0.45 and 0.94 seconds) could fall within +/- 0.1 seconds of a 1.0 second pause, it also may not. Since measurement of pause length again does not require a repeated rating choice between a fixed number of categories, it was not appropriate to test these results using Cohen's (1960) Kappa. Therefore, proportional agreement was calculated instead.

Appendix VIII: First segmentation protocol

1. Preparation before beginning segmentation

    a. Begin by reading this protocol in its entirety.

    b. After this, listen to the whole recording file containing the section to be segmented before beginning the segmentation (this should allow a general sense of the speakers' speech patterns to be gained).

2. Segmentation

    a. Overview of procedure and notation of segments

In each narrative, segment the speech of the participant and the researcher (marked in the margin as 'Pa' and 'R', respectively) separately, following the guidelines stipulated in section 3 below. The recording should be listened to as many times as necessary to complete the segmentation for each speaker.

Participant's speech

Begin by segmenting only the participant's speech, focusing the listening on this one speaker throughout. Since the primary focus is on prosodic criteria (see 3.a below), it is important (as far as possible) to listen to the recording without looking at the transcription, only marking segments on the transcription after deciding through the prosody where segment boundaries lie. The segmentation should not be influenced by the way that the speech is written down, for example by turns or any perceived syntactic units in the written form. Mark the beginning and end of each segment in the participant's speech using the symbol **|**. Segments can be further distinguished from each other by adding more spaces between these as necessary for clarity (see examples of this notation in section 3 below.)

Researcher's speech

After segmenting the participant's speech, segment the researcher's speech using the same procedure. This time, however, mark the beginning and end of each segment with the symbol ¦ , again adding more spaces between segments if necessary (see again section 3 for examples of this notation).

3. <u>Guidelines for determining segment boundaries</u>

a. <u>General basis for segmentation units</u>

The aim of the segmentation is to separate the speech into units in which speech items are produced together in one continuous entity. The main motivation for the segment boundaries is prosodic criteria: segments are items or groups of items which, through their intonation, give the sense of being one cohesive unit. This is similar to the concept of the 'tone unit', but with the important exceptions listed in section 3b below.

A tone unit (also 'tone-group' or 'pitch contour') can be defined as "…a finite set of pitch movements, formally identifiable as a coherent configuration, or contour, and used systematically with reference to other levels of language, especially syntax" (Crystal, 1981, p.62). Tone-units contain at least one tonic syllable (Crystal, 1981), that is, the syllable which carries "maximum prominence" in a section of speech, signalled mainly through pitch movement, "…but extra loudness is involved, and duration and silence may be used to heighten the contrast between what precedes and follows" (Crystal, 1981, p.63). The following examples illustrate speech separated into tone units, with the tonic syllable of each unit underlined.

| she <u>got</u> it **|** **|** she got the <u>wand</u> **|**

| yes | | I did |

In the current procedure, a segment may continue across several pauses[69] or even across several turns. Generally, if there is a sense from the intonation that the unit produced by a speaker is continuing – regardless of intermittent pauses of any duration –, the segment has not yet ended.

b. Important exceptions to the concept of tone unit defined above

i. Sentences

Crystal (1981) states that tone unit boundaries may correspond to syntactic units, such as clauses. When segmenting using the current procedure, many tone units may indeed be clauses. However, regardless of these individual clauses, any speech that forms a sentence (syntactically) and which through its intonation can be perceived as a continuous unit, should be treated as **one** segment. In this case, the segment may span several clauses and should not be subdivided. For instance, both the sentences shown below should be treated as a single segment (including Crystal's example which he marks as consisting of two tone units, indicated here using /).

| when he comes/ tell him I'm out | (Crystal, 1981, p.62.)

| he told Cinderella that she couldn't go to ball |

Such sentences may also be interrupted by pauses in the speech. However, if, as explained, the speech forms a sentence in terms of its syntax and gives a sense of being continuous through its prosody, it should still be treated as

[69] (Pauses are noted in the transcription either as a number denoting the length of the pause in seconds, for example (2.6), or are symbolised by a full stop in the case of micropauses.)

a single segment regardless of pauses of any size. The sentence below, for instance, if produced with one continuous intonation contour, would be one segment:

| she (3.4) had to (5.2) stay at home and (2.6) clean **|**

If, however, speech that forms a sentence appears, in terms of its prosody, to be produced in seemingly distinct units, the sentence should be divided accordingly into these units:

| she (3.4) had to (5.2) stay at home **|** (2.3) **|** and (2.6) clean **|**

ii. Lack of a tonic syllable

As defined above, a tone unit includes at least one tonic syllable. However, some words or groups of words in the sample may be regarded as being one distinct unit, despite not containing a tonic syllable. For example, utterances can remain unfinished, and consequently the point of a tonic syllable is not reached. This may occur due to language difficulties, in which case a pause in the participant's speech can become so long that the preceding item has clearly ended or ends when the researcher eventually interjects. Other instances could include the speaker coughing and then not continuing with the same (or any) utterance.

An example of such an item lacking a tonic syllable could be the second segment below.

| she went home **|** (1.0) **|** and she er **|** (4.0) **|** oh dear **|**

A unit may also remain unfinished (and therefore potentially lack a tonic syllable) in the researcher's speech, for instance because of attempts to prompt speech from the participant, as in the first segment in following example:

R: ¦ she wanted to go to the ¦

(1.0)

Pa: | ball |

R: ¦ that's right ¦

c. <u>Specific considerations</u>

i. Word/item repetitions

A segment may include repetitions of a word (or phrase), if it is felt that the item is being repeated due to a difficulty in producing that (or perhaps the subsequent) item, and there is still a sense of continuation from the intonation:

| he asked [sɪndɹɛ] [sɪndɹɛ] Cinderella |

| she got the (.) she got the the wand |

However, if it appears that the item is being produced as a separate entity, for example, being repeated for effect such as confirmation or emphasis, this should involve separate segments:

| he's mad | (1.9) | mad |

ii. Syntax

Since aphasic (and unimpaired) language may deviate from what could be classed as well-formed syntax, segments (regardless of size) can also be expected to lack syntactic well-formedness in many cases, for example:

| she wasn't | (1.0) | went home |

| got to go | (.) | twelve o'clock |

Syntax should not be the main focus when determining segments. Rather, prosody should be of primary concern.

iii. Pauses

As explained, segments may include several pauses, and these pauses should be kept within the segment boundary marks. Other pauses, however, may occur between segments and these should remain outside the boundary marks:

|she went to ball (1.0) and (1.1) dancing | (1.6) |and happy|

iv. Non-speech items

At times the transcription might include non-speech items (e.g. coughing, laughter, tutting and sighing), indicated in double round brackets. These should be ignored during the segmentation. Only speech items (words, non-words, phonemic paraphasias and, where possible, unintelligible speech) should be considered in determining segment boundaries.

v. Observations whilst segmenting

Any noteworthy observations by the segmenter, for example, regarding difficulties or uncertainty in determining particular segment boundaries) should be noted in footnotes inserted at the relevant point of the transcription.

References

Crystal, D. (1981). *Clinical linguistics*. Vienna: Springer Verlag.

Appendix IX: Second protocol (verb string extraction)

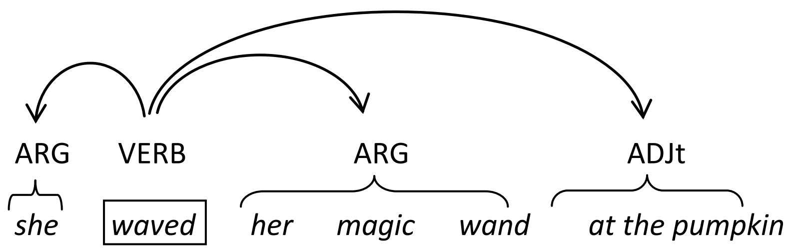
Overview

This protocol aims to identify the wider utterances that verbs occur in, in healthy and aphasic speech. To do so, it takes as a starting point the verb of interest, and works outwards from this to identify the string in which it has been produced (as opposed to imposing boundaries on the speech and then looking for verbs and other constructions within these segments).

Procedure

1. Immediate production context of the verb

Beginning with the verb of interest and working outwards from this, the immediate context around the verb (e.g. up to the clause it is produced in) should be examined to identify and include in the string anything that is an argument or adjunct of the verb. For example, both the arguments (labelled ARG) and the adjunct (ADJt) identified below would be included in the string for the verb token *waved*.



It is crucial in this protocol, however, that the string or any of the elements within it do not have to be well-formed. That is, the string may not be syntactically well-formed, may include phonemic or semantic paraphasias or neologisms, or may be unfinished. For example, all of the following (with the problematic element shown in bold) would still be classed as strings:

(not syntactically well-formed:)

__she waving__ her (.) magic wand at the er pumpkin

(phonemic error) *she waved her (.) __[mɛdʒɪk]__ wand at the er pumpkin*

(semantic error) *she waved her (.) magic wand at the er __orange__*

(neologism) *she waved her (.) magic wand at the er __[dʒə dʒɜn lə bɪgdʒæm]__*

(unfinished) *she waved her (.) erm (4.2)*

Note, therefore, that not all arguments of the verb need to be present for the utterance to constitute a verb string. The string should rather include the elements that *are* present (according to the criteria in this protocol). For example, the following utterance has no subject (an argument of the verb GET) but still counts as the string for *get*:

now (1.0) get beautiful dress

2. Adjoining clauses

After examining the verb's immediate context, the wider context should be inspected for any adjoining clauses. These should be included or excluded in the string following the criteria in (a) and (b) below.

a. Clauses joined through coordination

The wider context should be checked for any clauses joined to the verb's own clause by coordination. Here coordination is defined as "the joining of two or more units…at the same hierarchical syntactic level, usually by means of a coordinator"

(Aarts, et al., 2014, p.101). Examples of coordinators (or ‘coordinating conjunctions’) include *and*, *nor*, *then*, *but*, *yet* and *so* (Collins Cobuild, 1995, pp.373-4). In this protocol, any clauses that are coordinated with the same subject (or patient in passive structures) should be classed as being within the same one string. For example, the following three utterances (with subjects in bold and coordinators underlined) would each be counted as one verb string:

> ***Cinderella*** *wanted to go but couldn’t*
>
> ***She*** *waved her magic wand at the pumpkin and turned it into a coach*
>
> ***Cinderella*** *was brought up from the kitchen and taken to the prince*

Note that this also applies to multiple clauses coordinated with the same subject (or patient), not all of which may be preceded by a coordinator. For example, the following would be classed as one string:

clause | clause | clause

> ***She*** *turned the pumpkin into a coach, the rats into coachmen and the mice into horses*

However, any clauses that are coordinated with a separately stated subject (or patient in passive structures) per clause should be classed as separate strings, even if the separately stated subjects constitute the same person/ people. For example, each of the following would be classed as containing two verb strings:

> ***Cinderella*** *sat in the erm kitchen and* ***she*** *began to er [k] crying*
>
> ***The ugly sisters*** *went off to the ball but* ***the prince*** *wasn’t interested in them*
>
> ***Cinderella*** *was given a new dress so off* ***she*** *went*

In this case, the coordinating conjunction should be excluded from both strings:

Cinderella *sat in the erm kitchen* <u>*and*</u> ***she*** *began to er [k] crying*

↙ ↘

Cinderella sat in the kitchen   she began to er [k] crying

b. Clauses joined through subordination

The verb string should also include any clauses attached to the verb's clause by subordination (regardless of whether they include separately stated subjects). Subordination is defined, formally, as "the joining of a unit, e.g. a subordinate clause, to a higher linguistic unit, such that the former is dependent on the latter" (Aarts, et al., 2014, p.400). Alternatively, it can be seen as "a particular way to construe the cognitive relation between two events, such that one of them…lacks an autonomous profile, and is construed in the perspective of the other event…" (Cristofaro, 2003, p.2). Subordinate clauses can be recognised by the fact that they are usually preceded by a subordinating conjunction, such as *although*, *because*, *before*, *for*, *if*, *since*, *that*, *whereas*, *whether*, *in order that*, *provided (that)*, *as long as*, *in case* (Aarts, et al., 2014, p.401), or relative pronoun such as *who*, *whom*, *which*, *when*, *where*, *that*, etc. (Swan, 1995).

Therefore, if the verb in question is in a main clause, any subordinated clauses attached to that main clause will be included in the same string. For example, the following (verb shown in box and subordinator underlined) would be one string:

main clause   subordinate clause

The fairy godmother told Cinderella that she must be back by midnight

Similarly, if the verb in question is in a subordinate clause, then any main clause attached to this should be included in the string, along with any other subordinate clauses that are linked to that main clause. For example:

main clause | subordinate clause

The fairy godmother told Cinderella that she must be back by midnight

Further examples of utterances containing main and subordinated clauses (which would therefore be classed as one string) are:

She longed to go to the ball ***although*** *she knew she had nothing to wear*

Cinderella (.) and the prince erm (.) dancing (.) ***until*** *erm the clock strikes midnight*

Nobody knew ***who*** *this girl was* ***that*** *was dancing with the prince*

[70]The criteria apply, too, in cases where a subordinator is produced at the start of the string. For instance, the following (subordinators in bold) would each be one string:

as *they were jealous of her they didn't want her to go*

although *the sisters were there they didn't recognise Cinderella*

[70] The following point was added after the first reliability testing of this protocol.

The criteria also apply in instances when no subordinator or relative pronoun is present. For example, the following utterance, either with or without the pronoun in square brackets, would be treated as one string:

*She was the one [**that**] he wanted*

Note that the criteria for both coordinated and subordinated clauses should be considered simultaneously when identifying a verb string, as it is possible for a string to include both types of clause, as in the following examples:

coordinated main clauses with same subject — subordinate clause

*The fairy godmother appeared and told Cinderella **that** she must be back by midnight*

main clause — subordinate clause containing coordinated clauses with same subject

*The fairy godmother told Cinderella **that** she must leave the ball **and** be back by midnight*

Again, it is emphasised that components should be included according to these criteria, regardless of whether they are well-formed or complete. It is possible, for example, for a string to consist only of a subordinate clause if this was produced in isolation without a main clause.

3. Ambiguities

In some cases ambiguities may arise over whether items at one end of a string are indeed part of that string or not. For example, items next to a string, which could form a semantically and/or syntactically plausible part of this may also be separate items produced in isolation.

It could be ambiguous, for instance, whether the noun *coach* in the following utterance was an adjunct of the verb *went off* (i.e. that Cinderella went off *in* the coach) but with the preposition missing, or if the speaker was beginning a new utterance referring to the coach using this noun in isolation:

Cinderella went off (1.0) erm coach

[71]Similarly, it could be that the item is ambiguous because it could also plausibly form part of an adjacent string. An example would be the time phrase, *as the clock strikes midnight* in the following utterance, which could form the latter part of the first string or the beginning part of the second in the following utterance:

Possible string

Cinderella leaves the ball (.) as the clock strikes midnight (.) she runs down the stairs

Possible string

In such cases, particular attention should be paid to the phonological features, such as intonation and pausing, as well as semantics, to determine whether an item belongs to a certain string. In cases where only a transcribed speech sample is available, extra focus should be placed on the semantic properties of the items concerned.

[71] The following point was added after the first reliability testing of this protocol.

4. [72]False starts, repetitions and self-corrections

In the case of false starts, repetitions and self-corrections of an item within a string, all productions of/ attempts at the item should be included, as in the following examples (with the item concerned in bold):

false start:	***[ð-^{ə}] [ðɛ^{əb}] that*** *was it*
repetition:	*he said* ***I will erm I will I will*** *find the girl*
self-correction:	*they went off to* ***the funeral erm the party***

In some instances, repetitions or self-corrections may be more difficult to identify, particularly if the attempts at an item span quite far backwards before the final version (sometimes even across speaker turns). For example, the items in bold in the participant's speech (labelled Pa) below would still be included as attempts at the same item.

Pa: ***man (.) erm (.) no***

R: *mmm*

Pa: ***woman (.) erm cinderella*** *crying*

It is therefore important to consider the preceding context until the point when preceding attempts at the item can be ruled out. If speech recordings are available, phonological features such as intonation, as well as semantic and syntactic properties, should be used to establish this cut-off point.

In the case of repetitions, attention should also be paid to semantic, syntactic and phonological features to determine whether these are indeed repetitions or rather distinct productions that happen to occur in succession. An example of such successive but distinct productions is shown in bold in the following utterance, which would constitute two verb strings:

[72] The detail about false starts in the following point was added after the first reliability testing of this protocol.

then comes the ***prince / prince*** *goes off to find her*

5. [73]Other exclusions

Conjunctions and other linking words just prior to or after a string (in bold in the following examples) should not be included.

she wanted to go too ***(.) but***

and also *she got a dress*

Note, though, that linking words that convey the timing of events and can therefore be regarded as adjuncts (time phrases) of the verb, should be included in the string. For example:

then *she went to the garden*

Similarly, exclamations and initiators preceding the string that are not an argument or adjunct of the verb should also be excluded:

blimey *I've forgotten*

well erm *there was a young girl called Cinderella*

Other items that might seem semantically linked to the string but are not arguments or adjuncts of the verb, such as particles, should also be excluded:

yes *it's erm pretty*

no *(.) it didn't fit*

6. [74]Aborted strings

[73] The following point was added after the first reliability testing of this protocol.

Occasionally a speaker may begin a string but then halt this, for example, because of word-finding difficulties. If this string remains abandoned, this alone should be classed as one string (as stated in point 1). However, if the string is later returned to and continued, the separate sections should be considered as one continuous string, even if interspersed with other productions. For example, the following utterance (with the interrupting productions shown in bold) would be classed as one string:

she went off in the ***erm er (.) but she (.) erm*** *coach the coach*

7. Direct speech

Sometimes verbs are produced within direct speech in the narrative, and in these cases the string should again be identified following points 1-6 above. If a reporting verb is present introducing the speech (e.g. *said*, *whispered*), this should be included using the same criteria. Reporting verbs will often be within the first string of the speech. For example:

the fairy godmother ***said*** *don't worry Cinderella/ I'll help you/*

[75]However, they could also be in later strings of the speech:

don't worry Cinderella/ I'll help you ***said*** *the fairy godmother*

8. Noting the string

The verb string should be copied exactly from the transcription, retaining all content (e.g. false starts, pauses, AHTs, non-speech, etc.) except footnotes. It may often be

[74] The following point was added after the first reliability testing of this protocol.
[75] The following point was added after the first reliability testing of this protocol.

the case that the same string is used for several verbs (if multiple verbs are produced in one string).

References

Aarts, B., Chalker, S., & Weiner, E. (2014). *The Oxford dictionary of English grammar* (2nd ed.). Oxford: Oxford University Press.

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Appendix X: Protocol for identification and coding of nouns.

This procedure involves four stages: (I) identification of nouns, (II) identification of target nouns, (III) coding for grammatical number and (IV) coding for 'correctness' of grammatical number. Please complete all four stages for each participant.

1. Identification of nouns

Listening to/ watching the recordings as many times as necessary, please identify and note all instances of nouns produced by the participant within the section of transcription using the guidelines in A-D below (any language produced by the researcher should not be included). When looking at the transcriptions, please take into account only the transcribed language, ignoring any footnotes in the document.

a. Definition of noun

An item should be identified as a noun, irrespective of whether it is a paraphasia, following the criteria below. The semantic criteria should be used as a guideline whilst particular attention should be paid to the syntactic criteria.

- Semantic criteria

  A noun is *usually* "a word that refers to a person, place, thing, event, substance, or quality: 'Doctor', 'tree', 'party', 'coal' and 'beauty' are all nouns" (Cambridge Advanced Learner's Dictionary and Thesaurus, 2013).

- Syntactic criteria

  The item should be included as a noun if it appears in a position where a noun would be expected in relation to other syntactic categories in standard English, for example, a noun "…can combine with *the* to form a complete phrase" (Börjars & Burridge, 2010, p.48). Therefore, the items listed in (i) below can be classed as nouns, whilst those in (ii) cannot:

(i)		(ii)	
	discussion		*discusses* *
the	*time*	*the*	*timed* *
	shade		*shaded* *

An example of a paraphasia that might be classed as a noun because of its syntactic relations to other categories is [*taʊzəz*] below:

she gave him the [taʊzəz]

Please note that in some cases, syntax alone must be used to establish an item's category, for instance, it can be determined from syntax, but not semantics, that *think* is a verb in (iii) and a noun in (iv) below (Chalker & Weiner, 1994, p. 266):

(iii) *I must think*

(iv) I'll have a think

b. Definition of 'instance'

Each occurrence of a noun should be included as one instance (and therefore as one entry in the table) unless it occurs within a consecutive repeated attempt at the same item, for example:

[k] castle castle castle

In this case, the whole attempt is one instance and usually only the final production of the item should be included in the coding. If, however, the final production of the item within such a repeated attempt is less complete than the previous productions in that attempt, the more complete form should be the one included for coding. For instance, in an attempt as follows, the penultimate form would be the one included:

[sɪn] [sɪŋɛlə] [sɪnə]

c. Inclusions

Please include:

(i) common nouns, e.g. *window*
(ii) proper nouns (names), e.g. *Mary*
(iii) –ing forms appearing in a position where a noun might typically be distributed, e.g.
the washing

(iv) nouns appearing in what might seem to be 'fixed' phrases or exclamations, such as the underlined items below[76]

[76] Point c (iv) is an addition to the protocol following the reliability testing.

twelve o'clock

in charge

oh God

oh dear

(v) numerical items that function as a noun in that the word is the term for a specific thing (e.g. *the twelve* referring to a card in a pack of cards or *the twenty-nine* referring to the brass numbers on a front door). Numerical items should not be included if they are quantifiers, that is, specifying the quantity of something (e.g. *twelve mice*), or pronouns referring to an items or people (e.g. *those two*). (See also D (i)).[77]

d. Exclusions

Please exclude:

(i) pronouns, e.g. *he*, *she*, *it*, *everybody*, *the four*, *that one.*

(ii) *-ing* forms for which it is not possible to determine with certainty whether this is a noun/gerund (as opposed to a verb) form, such as *washing* below:

table (.) washing

(iii) other forms that could potentially belong to more than one category, whose surrounding items do not help to determine with certainty whether the item is a noun form. For instance, *dance* below could be a verb or a noun (*the dance*).

dance (.) dance (.) cinderella

(iv) short productions, such as individual phonemes, for which it is not possible to judge reasonably what the attempted item is, for instance:

[77] Point c (v) is an addition to the protocol following the reliability testing.

the [*b*]

with a [*hə*]

(v) numerical items functioning as quantifiers or pronouns (see C (v) above).[78]

2. Identification of target nouns

In the case of phonemic paraphasias (usually noted using phonetic transcription), if the intended target noun seems apparent, this should be noted in brackets immediately after the paraphasia. For example, if the target noun of [*taʊzəz*] was thought to be *trousers*, this would be noted as follows:

[*taʊzəz*] (trousers)

3. Coding for grammatical number

Again listening to/ watching the recordings as many times as necessary, please whether each noun recorded has been produced in its singular or plural form. If the noun is judged to be a mass noun (for example *happiness*, *furniture*), please record this as 'singular (mass)'. In cases where the grammatical number of the noun cannot be determined for any reason, please write 'don't know'.

4. Coding for 'correctness' of grammatical number

For this stage, please listen to all the narrative up to the selected section under analysis as it is important to understand the context of this section within the whole narrative. Then, again listening to/ watching the recordings as many times as necessary, for each noun recorded, please note whether the grammatical number

[78] Point d (v) is an addition to the protocol following the reliability testing.

of the noun produced appears to be correct in relation to what would be expected from the narrative or linguistic context. For participants whose data is available on video and who used the picture book whilst producing the narrative, please refer to the appropriate parts of the picture book to check the grammatical number expected of nouns at the relevant points of the story. For instance, if a participant produces *horse* at a point where the story appears to involve more than one horse, the noun form produced would be deemed incorrect. Equally, if the plural form was used at a point where the singular would be expected from the point of the story, this too would be incorrect, as in the example below (if produced whilst looking at a picture of Cinderella on a horse)

cinderella (.) riding (.) horses

As well as basing judgements on the context of the story, 'incorrectness' may also be determined by the linguistic context, for instance the grammatical number of the noun in *six horse* is incorrect as a noun should be produced in the plural when following a quantifier greater than *one*.

Please note that 'correctness' here refers only to grammatical number, irrespective of whether the form produced is a paraphasia. For instance, if a participant produces the semantic paraphasia *aunties* when seemingly referring to the two ugly sisters, this would be judged as correct, since the plural form would be expected from the narrative context (there are two ugly sisters). In cases of uncertainty regarding the correctness of the grammatical number (e.g. if it cannot be reasonably judged who or what in the story the participant is referring to and the linguistic context does not help to determine correctness of grammatical number), please write 'don't know'.

References

Börjars, K. & Burridge, K. (2010). *Introducing English grammar* (2nd ed.). London: Hodder Education.

Cambridge Advanced Learner's Dictionary and Thesaurus. (2013). Retrieved March 16, 2013, from http://dictionary.cambridge.org/dictionary/british/noun?q=noun.

Chalker, S. & Weiner, E. (1994). *The Oxford dictionary of English grammar*. Oxford: Clarendon Press.

Appendix XI: Reliability testing of procedure for noun identification and coding of nouns for correctness of grammatical number

Method

Tests were conducted to assess the intra- and inter-rater reliability of the four main elements of the noun identification and coding procedure:

i. Identification of noun instances in the narratives
ii. In the case of paraphasias/neologisms, identification of the intended target noun.
iii. Coding of nouns for grammatical number
iv. Coding of nouns for 'correctness' of grammatical number

To measure intra-rater reliability, 15 - 20%[79] of each participant narrative, measured by duration of recording, was coded by the researcher on a second occasion following the same procedure (Appendix X[80]) on both occasions. For the inter-rater tests, 15 - 20% of each participant narrative was coded by a second person familiar with language in aphasia, following the same protocol used by the researcher (Appendix X). The tested sections were selected pseudo-randomly and were taken from different points into the recording across participants, to counterbalance any effect of the time point into the narrative task on the ease of noun identification and coding. Also, the sections used in the intra-rater tests were different to those used in the inter-rater tests.

Agreement was assessed on each element of the procedure as follows:

Noun identification

[79] Previous reliability tests in this thesis have used 10% of narratives for recoding. Since some participants produce relatively few nouns, a longer section was selected for use in this test, to maximise the potential tokens for comparison.
[80] excluding points C (iv-v) and D (v) of Appendix X, which were additions following the reliability tests.

Agreement on noun identification was classed as both raters identifying the same item in the same position in the narrative as a noun.

Grammatical number

Agreement on grammatical number was defined as the same grammatical number being found for a given noun token by both raters. No distinction was made between singular forms and mass nouns, since the focus here was on the distinction between forms that do and do not include the regular plural ending (+[z], +[s], +[əz] or +[ɪz]) and since neither the singular or mass forms take this ending, these were grouped together during this stage. Therefore, if one rater had not included the word (mass) when the other had, this was still classed as agreement. Thus, all pairs which were counted as being in agreement were those in Table XI.i.

Table XI.i. All form pairs counted as being in agreement for grammatical number

1st rater	2nd rater
singular	singular
plural	plural
singular (mass)	singular (mass)
singular (mass)	singular
singular	singular (mass)

Correctness

Agreement on correctness was defined as both raters having made identical judgements regarding the noun's grammatical number (i.e. 'correct', 'incorrect', or 'don't know').

Target noun

Agreement on target noun was defined as both raters having ascribed the same target noun to a given paraphasia.

Results and discussion

Table XI.ii: Agreement on noun identification and coding

Procedure	Agreement between ratings, as a proportion of instances compared (n for each analysis in parentheses)	
	Intra	Inter
Noun identification	0.99 (103)	0.89 (92)
Target noun identification	1.00 (15)	0.92 (12)
Coding of grammatical number	1.00 (102)	0.99 (82)
Coding of correctness of grammatical number	1.00 (102)	0.95 (81)

As shown in Table XI.ii, both intra- and inter-rater agreement on all four elements of the procedure exceeded the minimum 80% level recommended by Ferguson and Armstrong (2009). The procedure was therefore deemed to be reliable.

The greatest number of disagreements arose for the noun identification stage, and it is worth briefly discussing the potential causes of disagreement in this element of the procedure.

There were ten instances of disagreement on noun identification. These involved items being overlooked or discounted by one of the two raters in the following circumstances:

i. the item was a paraphasia/ neologism (and was perhaps therefore more difficult to identify as a noun);
ii. a form repeated within a short space of time was classed as two separate instances by one rater but as only one instance by the other;
iii. a paraphasic item [sɪŋə] was classed as finished and thus counted as a noun instance by one rater but judged as unfinished and therefore discounted by the other rater;
iv. the noun occurred as part of a longer string, such as an idiomatic phrase or exclamation, such as the underlined items below

    in *<u>charge</u>*
    twelve o' *<u>clock</u>*
    oh *<u>God</u>*
    oh *<u>dear</u>*

v. a numerical item (*twelve*), appearing without sufficient context to be identified as a noun, was included as a noun instance by one rater.

Despite the confirmed inter-rater reliability of all elements of the protocol, additions were made to the protocol for future use, specifically to clarify the procedure relating to (iv) and (v) above (see points 1c(iv-v) and 1d(v) of Appendix X) in an attempt to reduce such disagreements further.

<u>Conclusion</u>

In summary, both intra-rater and inter-rater agreement exceeded 80% on all four elements of the protocol, and the procedure for noun identification and coding was therefore deemed reliable. In spite of this, additions were made to the protocol for future use, aimed at preventing specific types of inter-rater disagreement on noun identification, and thus further increasing the protocol reliability.

References

Ferguson, A., & Armstrong, E. (2009). *Researching communication disorders*. Basingstoke, Hampshire: Palgrave Macmillan.

Appendix XII: Protocol for noun inclusion and referent identification

Please read this protocol in its entirety before completing the noun ratings

Aim

The aim of this protocol is to identify which nouns produced by the participants should be included in the analysis and for those included, to establish each noun's referent.

Method

Before completing the ratings, please look at the picture book of the Cinderella story to remind yourself of the story. Then, to complete the ratings, please listen to/ watch the audio/ video recording for each participant. It may also be necessary to refer to the picture book whilst watching any participants who use this resource whilst producing the narrative, to ascertain which page they are viewing at a given time. Please listen to/ watch at least all the narrative preceding the section to be analysed, before focusing on this section more carefully. Each noun to be rated should be listened to/ watched as many times as necessary, but at least twice.

In accordance with the aim stated above, the rating task consists of two parts: to establish, firstly, which nouns should be included in the analysis and, secondly, what the referent is for each included noun.

1. <u>Inclusion</u>

Nouns to be included in the analysis should fulfil the following criteria:

a. The noun must refer to an item in the Cinderella story. For example, the emboldened noun in (i) but not that in (ii) below would be included.

   (i) *erm (1.2) oh yes (.) the* ***pumpkin***

   (ii) *she went to (3.2) oh (.)* ***word***

b. The noun must <u>make reference to</u> the item, that is, it should be used in a literal way, as is the case for *mouse* in (iii) below. Nouns used in a non-literal way, such as mouse in (iv), would be excluded.

   (iii) *make the* ***mouse*** *into horses*

   (iv) *she was sat (.) as quiet as a* ***mouse***

c. The noun's referent will be a concrete item (animate or inanimate object) in the story. However, an exception to this is that all terms/ phrases (which may not all be considered nouns) referring to 'midnight' and the 'ball' (event held by the prince) should be included. Therefore, *twelve* in (v) and *do* in (vi) below would be included.

   (v) *dancing but erm* ***twelve*** *(.) erm (.) ran off*

   (vi) *and then off to the* ***do***

d. Phonemic paraphasias/ neologisms

Please note that it even if the term to be rated is a phonemic paraphasia/ neologism, it may still be possible to judge whether this fulfils the above criteria. In this case, the context of production, any accompanying gesture made by the participant and the page of the picture book viewed at the time of production may help to identify the intended referent.

2. Recording the referent

For each ‘included’ noun, please also note which item in the story you think the noun refers to. (Again, efforts should be made to also identify the referents of phonemic paraphasias/ nonwords, as above.) If a judgement cannot reasonably be made, please write ‘d/n’.

Appendix XIII: Reliability testing of noun inclusion and referent identification protocol

Method

Tests were conducted to assess the intra- and inter-rater reliability of the protocol for noun inclusion and referent identification. To measure intra-rater reliability, 15% of each of the 12 PWAs' nouns were re-coded by the researcher. For the inter-rater tests, 15% of each of the PWAs' nouns were coded by a second person (a postgraduate research student experienced in analysing aphasic language) following the same protocol. The sections used for the two tests were selected pseudo-randomly independently of each other and in both cases, the re-coded sections were taken from different points of the narrative recordings across participants, to minimise any effect of the time-point into the recording on the ease of coding. In each test, the two ratings were firstly compared for agreement on noun inclusion, whereby agreement was simply defined as both ratings including or both ratings excluding the noun. All nouns for which there was agreement on inclusion were then compared for consistency of referent identification. Agreement here was defined as both ratings noting the same referent for the noun.

Results/ Discussion

The protocol was found to be reliable both within and between raters for noun inclusion and referent identification (Table XIII.i), exceeding the minimum agreement level of 80% specified by Ferguson and Armstrong (2009).

Table XIII.i: Intra- and inter-rater agreement on noun inclusion and referent identification

Part of procedure	Proportion agreed (n for each analysis shown in parentheses)	
	Intra-rater	Inter-rater
Noun inclusion	0.99 (68)	0.90 (67)
Referent identification	0.96 (53)	0.88 (56)

Resolution of disagreements

The intra-rater disagreements were resolved through re-examination by the researcher. The inter-rater disagreements were discussed by the researcher and the second rater resulting in agreement on all but one instance. This final token was examined by a third person and the majority opinion adopted.

References

Ferguson, A., & Armstrong, E. (2009). *Researching communication disorders*. Basingstoke, Hampshire: Palgrave Macmillan.

Appendix XIV: Protocol for counting words in a speech sample.

Aim of the protocol:

To count the number of words produced by a given participant in a speech sample by this and potentially other participants.

Procedure:

Overview

The word count should be calculated by opening the transcription in Microsoft Word® and removing the items to be excluded from the count (see steps 1 and 2), before using Microsoft Word®'s 'word count' function to find the number of words remaining in the document after these exclusions. Further details of these stages are now provided in steps 1-3 (which assume that the transcription is already open in Microsoft Word®). Note: In step 2 it is necessary to have another copy of the full transcription to hand for reference and to refer to the original recorded speech samples, if available, to make some decisions in step 1.

1. Excluded items

To isolate the participant's words, the following should be deleted from the document:

i. all speaker identification codes (e.g. 'Pa' for participants; 'R' for researcher)[81];

ii. all productions from other speakers (e.g. the researcher);

[81] This point was added to the protocol after reliability testing.

iii. all pauses (including micropauses);

iv. all footnotes and any other comments on the speech that happen to be included (in double round brackets) in the main body of the transcription (e.g. ((with emotion)))[82];

v. all non-speech items (e.g. coughs, laughs, sighs, etc.).

vi. audible hesitation tokens (AHTs), such as *er*, *erm*, or *mm*.

vii. neologisms, defined here as nonwords that are not approximations of recognisable target words, that is, those productions "…with no, or only remote (fewer than 50% of phonemes in common), relation to the target" (Boyle, 2014, p.970)[83]. Note that this may include individual phonemes produced in isolation (e.g. as false starts). (Neologisms are distinguished from phonemic paraphasias, which do have at least 50% of phonemes in common with a recognisable target word (cf. Boyle, 2014[84]) and should be included in the word count (see section 3i).) Examples of neologisms are those crossed through in the following:

> it was a ~~[k]~~ not a ~~[kɒn]~~ but and anyway it makes a lovely big ~~[dʒə dʒɜː^{n} lə bɪgdʒæm]~~ with ~~[ɹ^{ə} ^{ə}ɹəʊpəz]~~ on the top

viii. unintelligible speech

ix. identical repetitions of an item which are part of the same attempt at that item (the item should only be counted once). This applies to both single word and multiword items, for example:

[82] The latter part of this point (regarding other comments on the speech) was added to the protocol after reliability testing.
[83] See also Biran and Friedmann (2007) and Moses, Nickels and Sheard (2004) for similar definitions (although Moses et al. use the term 'phonological error' rather than 'phonemic paraphasia').
[84] Again, see Biran and Friedmann (2007) and Moses, Nickels and Sheard (2004) for similar definitions.

(word) with the ~~the the the~~ pumpkin

(multiword item) I will ~~I will~~ go now

(multiword item) I want to go to the ball but ~~I want to go to the ball but~~ I haven't got anything to wear

The repetitions may also occur across turns on the transcription, for example:

Pa: I will ~~I will~~

R: mm

Pa: ~~I will~~ have to erm…

Note 1: In cases where there are repeated attempts at a multiword item but this is produced somewhat differently on repetition, both the original production and the repetition should be counted, for example,

he goes out the town goes round the town

Note 2: If items are repeated for effect (e.g. for emphasis), or the repetitions are part of an idiomatic expression, then all productions (original and repeated) should be counted, for example:

(repeated for emphasis)	he said no way (.) no way
(part of idiomatic expression)	it was the same day after day after day

x. utterances that are direct responses to comments or closed questions from another speaker (e.g. the researcher)[85]. An example of such a response to a comment would be

R: don't worry just take your time

Pa: ~~alright~~

Examples of responses to questions would be:

R: do you remember what happened

Pa: ~~yeah~~

or

R: are you ok to carry on would you like to take a break

Pa: ~~no no it's ok~~ and then cinderella went off

Note: Responses to open questions that are used as prompts should, however, be included, for example,

R: what happened then

[85] These responses may be included in other studies investigating dialogic/ multi-speaker discourse, depending on the aims of the research concerned.

Pa: it's cinderella and castle and dancing

2. Included speech

The speech remaining on the document after steps 1 and 2 should therefore include the following:

i. all recognisable words and phonemic paraphasias of recognisable target words, whereby phonemic paraphasias are defined as nonwords that have at least 50% of their phonemes in common with those of the target word (cf. Boyle, 2014). (Note: these are distinguished from neologisms, as explained in point 2ii.) Examples of phonemic paraphasias could be *[pɹɪn]* for the target word *prince* and *[sɪnəlɜlə]* for Cinderella, etc.

   Note 1: Items that are usually written as one word in standard English should also be counted as one word in this procedure. Therefore, if any such items are separated in the transcription, these should be put together as one word. For example, the following would each be treated as one word:

   step mother → stepmother

   ball erm gown → ballgown

   Contracted items, such as *can't*, *don't*, *gonna*, etc, should be kept as one word each.

   Note 2: All items that are phonetically transcribed should be checked and, if necessary, amended to ensure that each word of these is indeed only counted as one word by Microsoft Word® (for example, by removing any unnecessary spaces within a word to prevent it being counted as more than one word).

ii. repetitions that are not part of a repeated production attempt (e.g. repeated instead for effect or as part of an idiomatic expression; see part 2).

Example:

An example section of speech (from MH's narrative) illustrating items that should be included in and excluded from the word count is provided in Figure XIV.i (with the excluded items crossed through).

and so they said ~~(.) /d/ /d/ /d/ (.)~~ don't worry about the ball ~~(.)~~ and ~~/ʃᴵ/ /ʃ/~~ she said ~~(2.5) /s ᵊ ᵈᶾ/ (.) /ʃ/ (.)~~ six ~~(.)~~ I will ~~(1.2) /ð/ (2.0) I will (1.3) /ð/~~ the six little mice ~~/s/~~will change to six beautiful horses ~~(.)~~ and also the pumpkin ~~(.)~~ it will ~~(.) / vɪl/ will~~ be ~~(.) /tʃ/ /ᵈᶾ/ /d/~~ also ~~(.) er (1.0)~~ and if ~~if~~ I can only think of what it is ~~(1.3) erm /ɪ/ /ɪ/~~ it's ~~(.)~~ a big ~~/θ/ /ð/ big~~ /sɜːkᵊləᵛ/ thing ~~(.) er /ænɪn/ er~~ anyway I'll come back to that one I'll remember it later on ~~(.)~~ and cinderella got in the

Figure XIV.i: Example of included and excluded items in a speech sample[86].

3. Noting the word count

When all excluded items have been deleted from the document, the word count for the remaining speech, as counted by Microsoft Word®, should be noted.

References

Biran, M., & Friedmann, N. (2007). From phonological paraphasias to the structure of the phonological output lexicon. *Language and Cognitive Processes*, 20(4), 589-616.

Boyle, M. (2014). Test-retest stability of word retrieval in aphasic discourse. *Journal of Speech, Language, and Hearing Research*, 57, 966-978.

[86] (The items /sɜːkᵊlə ᵛ/ and /hɒᵊl/ are included because real-word targets are recognisable for these: *circular* and *hall*/*ball*, respectively.)

Moses, M. S., Nickels, L. A., & Sheard, C. (2004). Disentangling the web: Neologistic perseverative errors in jargon aphasia. *Neurocase*, 10(6), 452-461.

Appendix XV: Reliability testing of word counting procedure

Method

The word counting procedure was tested for intra- and inter-rater reliability. To test intra-rater reliability, 12.5% of each aphasic narrative and of six (half) of the healthy narratives was recoded by the researcher on a second occasion. To test inter-rater reliability, 12.5% of each aphasic narrative and of six of the healthy narratives was recoded by a second person. The six healthy narratives and all sections tested were chosen pseudo-randomly. The sections used to test each reliability type are shown in Table XV.i.

Table XV.i. Sections tested for reliability of word counting procedure

	12.5% tested	
Participant	Intra	Inter
N1	2nd	-
N2	3rd	-
N3	-	-
N4	8th	8th
N5	-	8th
N6	3rd	4th
N7	-	2nd
N8	-	-
N9	7th	-
N10	1st	7th
N17	-	7th
N18	-	-
DB	8th	3rd
KP	8th	5th
TH	4th	7th
ST	1st	3rd
HB	4th	1st
MH	3rd	7th

Results

Table XV.ii. Intra- and inter-rater agreement on word counting

Speaker group	Proportion agreed (n for each analysis shown in parentheses)	
	Intra	Inter
Overall	0.99 (675)	0.99 (671)
Healthy	1.00 (289)	1.00 (319)
PWA	0.99 (386)	0.99 (352)

Overall, the procedure was found to be reliable both within and between raters, and this was true when applied to the aphasic and healthy groups separately (see Table XV.ii). The intra-rater disagreements were resolved by re-examining these and the inter-rater disagreements were discussed by both raters to reach consensus on each instance.

Appendix XVI: Homophones examined for frequency

Table XVI.i: Homophones examined for frequency

Noun	Homophones examined
BALL	*bawl*
BOOK	*buck*
CASTLE	*Kassel*
CORE	*cause, cor, Corrs*
COURT	*caught*
DAM	*damn*
DAY	*daze*
DEAR	*deer*
DIME	*Daim*
DOOR	*Dore, daw*
FATHER	*farther*
FLOOR	*flaw*
FOOT	*feat*
GUY	*guise*
HALL	*haul*
HORSE	*hoarse*
MAID	*made*
PAIR	*pear*
PAW	*poor, pore, pour, pause*
PIE	*pi*
PRIZE	*prise, pries*
RING	*wring*
SHOE	*shoo, choux*
SIGN	*sine*
SON	*sun*
STAIR	*stare*
STORY	*storey*
TAILOR	*Taylor*
WAR	*wore*
WORD	*whirred*

Appendix XVII: Detailed tables of nouns produced in grammatical number errors.

Table XVII.i: Detailed table of grammatical number errors

Pluralisation errors					
Part.	No. errors	Error token	Form used	Singular frequency	Plural frequency
N1	1	*slippers*	Plural	16	61
KP	3	*[tʃɪpəz] [slippers]* *[dʒɪpəz] [slippers]* *[ɪːpəz] [slippers]*	Plural Plural Plural	16 16 16	61 61 61
IB	4	*shoes* *shoes* *shoes* *shoes*	Plural Plural Plural Plural	157 157 157 157	552 552 552 552
BK	1	*slippers*	Plural	16	61
RD	1	*shoes*	Plural	157	552
JW	1	*shoes*	Plural	157	552
Singularisation errors					
TH	1	*[s] st-ep (1.3) [sː]**son***	Singular	1 [stepson] 731 [son]	0 [stepsons] 134 [sons]
		[s] st-ep (1.3) [sː]son no (.) ***daughter***	Singular	553 [daughter] 0 [stepdaughter]	86 [daughters] 0 [stepdaughters]

Key to Table XVII.i. Part.=participant; no.=number. Frequencies shown are for the singular and plural only (those of frequency comparison 1, section 9.4.3).

Table XVII.ii: Participants' production of all tokens of each noun involved in errors

Part.	Error type	Forms of the noun used overall	All tokens of the noun	Correctness of grammatical number
TH	singularisation	singular	[gɒdf] er [gɒdf] (.) er (2.4) son	Unclassified
			[s] s-tepson	Unclassified
			[s] st-ep (1.3) [sː]son	X
		singular	god (1.2) daughter	✓
			[s] st-ep (1.3) [sː]son no (.) daughter	X
KP	pluralisation	plural	[ʃvɪpəz]	Unclassified
			[tʃɪpəz]	Unclassified
			[tʃɪpəz]	Unclassified
			[tʃɪpəz]	Unclassified
			[gɪpəz]	Unclassified
			[tʃɪpəz]	X
			[dʒɪpəz]	X
			[ɪːpəz]	X
IB	pluralisation	plural	shoes	Unclassified
			shoes	X
			shoes	X
			shoes	X
			shoes	X
BK	pluralisation	singular & plural	slippers	X
			slipper	✓
RD	pluralisation	singular & plural	shoes	X
			shoe	✓
JW	pluralisation	singular & plural	shoes	X
			shoe	✓
			shoe	✓

Key to Table XVII.ii: Part.=participant; X=incorrect; ✓=correct.

Appendix XVIII: Protocol for extraction and classification of verbs.

1. Aim

This protocol aims to identify the verb tokens in healthy and aphasic narratives, listing for each token the following details:

(i) the verb type (lemma)

(ii) the verb form (actual production)

(iii) the verb subcategory (see below).

Before specifying how this information should be recorded, it is important to note that in modern grammar, verbs (and other categories) and their subcategories are defined on their meaning and particularly on morphosyntactic properties (see Aarts, Chalker & Weiner, 2014) in typical usage. However, verbs in aphasic language are not always produced in ways that would be conventional in typical language, and also this 'atypical' usage is likely to vary across aphasic speakers (there is no one conventional 'aphasic usage'). Therefore, in the current protocol (developed for both typical and aphasic language), verbs must be taken to be those items that would be classed as verbs in typical language, using the definitions below.

2. Extraction of verb tokens

2.1. Verb identification

All verb tokens should be identified in each narrative. In terms of meaning, (in typical language) verbs generally express "…the existence of a state (*love*, *seem*) or the doing of an action (*take*, *play*) (Alexander, 1988, p.159), and this notion can contribute to verb identification. In addition, morphosyntactic/ distributional criteria should be considered: a verb is "…normally essential to clause structure…"

and able to "…show (sometimes in combination with other syntactic elements) contrasts of tense, aspect, mood, voice, number, and person" (Aarts, et al., 2014, p.433). Again, it should be emphasised, however, that verbs in aphasic language may not fulfil these criteria (for example, obligatory verbs may be omitted from clause structures, and when present, may not be marked for tense, aspect, mood, etc., as would be conventional). Therefore, verbs should be identified based on whether the item would fulfil this definition in typical language.

Note[87]: Tokens which are deemed to be the gerund form of a verb should be excluded (due to the fact that these also display noun-like properties). Gerunds are defined here as "…the -ing form of a verb when used in a noun-like way, as in *The <u>playing</u> of ball games is prohibited*, in contrast to the same form used as a participle, e.g. *Everyone was <u>playing</u> ball games*" (Aarts, et al., 2014, p.178). Therefore, *crying* in the following utterance would not be counted as a verb token in the current procedure:

*this erm (.) this **crying***

In the current procedure, phonemic paraphasias of recognisable target verbs should also be counted as tokens (also taking into account the criteria in part 2.2). Here phonemic paraphasias are defined as nonwords that have at least 50% of their phonemes in common with those of the target word (cf. Boyle, 2014). Examples of such items that would be counted as verb tokens could be *[fɛksd]* for the target word *fetched* or *[skumɪŋ]* for *scrubbing*.

<u>2.2. Inclusion of tokens</u>

Each time a verb is identified, this should be classed as one token (regardless of the form in which it is produced), with the following exception: if a verb is produced more than once in the same form as part of repeated attempts at the same

[87] This point was added to the protocol after reliability testing.

utterance, the repeated verb should only be counted once. For example, only one token of the verb CAN would be recorded in the following.

*I **can't** (.) I can't erm*

In cases where the repeated verb involves slightly different productions of the same word (for example, because of phonemic errors), the form that either most closely resembles a recognisable word or is the most complete of the forms produced should be taken as the token and the other forms disregarded. For example, the items in bold in the following would be the counted tokens:

E.g. *Cinderella **asking** [æsku]*

*he [mæk] [mɛk] (.) **make** that*

However, if the repeated attempts consist of different words – either different verbs (lemmas) or different forms of the same verb – (for instance, in self-corrections), both words should be included as tokens. For example, the following utterances would each be classed as containing two tokens.

*she **should** (.) **takes** a erm…*

*she **wants** erm **wanted** a erm…*

3. Details to be noted

For each token, the verb type (lemma), form and subcategory should be noted, as exemplified in Table XVIII.i, using the criteria detailed in the following subsections.

Table XVIII.i: Example details of verb tokens

Verb type (lemma)	Verb form	Verb subcategory
BE	*it's*	Lexical
DO	*don't*	Aux (main)
KNOW	*know*	Lexical
WILL	*will*	Aux (modal)
TURN INTO	*turn into*	Lexical (phrasal)
GO	*went*	Lexical
TAKE	*takes*	Lexical

3.1. Verb type (lemma)

The verb lemma is the 'base' form of a verb (ascribed by lexicologists) that represents the verb in all its marked forms and is usually the headword at the beginning of a verb's dictionary entry (Crystal, 2008). For instance, the lemma GIVE subsumes *give*, *gives*, *giving*, *gave* and *given* (see Table XVIII.i, column 1 for further examples). Note: When listing phrasal verbs, both the verb and particle components should be noted[88].

3.2. Verb form

The verb form is the actual form of the verb that was produced by the participant (this may differ from the lemma as it can be marked for tense, aspect, person, number, etc.) (see Table XVIII.i, column 2). The verb form should be noted as the exact item produced by the participant[89]. For example, if the participant produced the verb BE within the item *it's*, the form should be noted as *it's*, rather than isolating the verb from within the contraction (*is*). Further examples would be *he's*,

[88] This point was added to the protocol after reliability testing.
[89] This point was added to the protocol after reliability testing.

she's, *I'll*, *they'd*, etc., which should all be noted as these exact items. Again, when noting phrasal verbs, both the verb and particle components should be listed[90].

3.3. Verb subcategory

Each token should be classed as belonging to one of the following broad subcategories:

(i) Auxiliary (main)

(ii) Auxiliary (modal)

(iii) Lexical

(iv) Lexical (phrasal)

(v) Unclassified

These classifications should be based on the guidelines in sections 3.4.1 - 2 (see also Table XVIII.i, column 4 for examples).

3.3.1. Auxiliaries

In the current analysis, auxiliary verbs are taken to be those listed by Aarts et al. (2014, p.40) as follows, and should also be subcategorized as either main or modal auxiliaries according to the labels below:

Main auxiliaries:

BE
DO } (when used as auxiliaries)
HAVE

[90] This point was added to the protocol after reliability testing.

Modal auxiliaries (Aarts, et al., 2014, p.253):

CAN

COULD

MAY

MIGHT

MUST

SHALL

SHOULD

WILL

WOULD

In Aarts, et al.'s (2014) definition, auxiliaries are "principally used in combination with one or more other verbs, including a main (lexical) verb, to form constructions that indicate tense, aspect, voice, etc. …" (p.40).
E.g. (auxiliaries emboldened)

he ***doesn't*** *swim very often*
aux lexical

she ***isn't*** *working there anymore*
aux lexical

they ***might*** ***have*** *gone already*
aux aux lexical

Formally, auxiliaries can generally be distinguished from other verbs (including other verbs that appear in combination with a lexical verb) since they display the so-called 'NICE' properties (Aarts, et al., 2014, p.266):

(i) They are negated through the addition of *not* or *-n't* rather than requiring an additional
auxiliary *do*:

e.g. *He* ***cannot*** *speak French* (compare **he speaks not French*

* *he doesn't can speak French*)

(ii) They undergo inversion with the subject in interrogative clauses

e.g. **Is** she arriving tomorrow? (compare **arrived she in time*)

(iii) They can be used alone to avoid repeating full verb phrases (in ellipsis)

e.g. *Harry can swim but Samantha* ***can't*** [*swim*]

(iv) They can take stress to become emphatic

e.g. *You* ***<u>do</u>*** *have time!*

Particular attention should be paid, however, when categorising BE, DO and HAVE, since these can function as both (main) auxiliaries and lexical verbs, and because BE and HAVE can also display the NICE properties in their lexical as well as auxiliary forms. Consequently, the following criteria stated by Alexander (1988) may also assist categorisation:

> *Be* is a full [lexical] verb when it combines with adjectives and nouns… *have* is a full [lexical] verb when it is used to mean 'possess'…*do* is a full [lexical] verb when it is used to mean 'perform an activity'… (p.187)

E.g. *She* ***is*** *generous*

He ***has*** *two sisters*

They ***do*** *calligraphy*

In contrast, these verbs are auxiliaries when used in combination "…with other verbs to 'help' them [the other verbs] complete their grammatical functions…" (Alexander, 1988, p. 187).

E.g. *She* ***is*** *working*
They ***have*** *visited Hong Kong*
He ***does*** *travel a lot*

Note[91]: It was decided in this protocol not to classify instances of *have to* (e.g. *Cinderella* ***had to*** *run from the ball*) as auxiliary HAVE, as *have to* arguably does not display all the NICE properties (e.g. (i) above). Therefore, as with all other verbs not displaying these properties, instances of *have to* should be classified as lexical tokens.

<u>3.3.2. Lexical verbs</u>

<u>3.3.2.1. Identifying lexical verbs</u>

All verbs other than those identified as auxiliaries should be classed as lexical verbs (also termed 'main' or 'full' verbs) (cf. *Collins Cobuild English grammar*, 1990; see also Crystal, 2003). Employing Crystal's (2003) definition, lexical verbs can be recognised as having "a meaning that can be clearly and independently identified (e.g. in a dictionary), such as *run*, *walk*, *jump*…" (p.212). The adopted procedure also fits broadly with the definition of 'main' verbs as those "…that can stand alone in a clause...": except in cases of ellipsis, if a verb phrase only contains one verb, this is usually the main verb (Aarts, et al., 2014, p.240)[92].

[91] This point was added to the protocol after reliability testing.
[92] Aarts, et al (2014) do further distinguish 'lexical' from 'main' verbs, whereas this level of detail was not deemed necessary for the current purposes.

E.g. *I **swim** regularly*

*They **have** nothing*

However, if an unellipted verb phrase contains more than one verb, the lexical verb is the final one (and the others auxiliaries) (Aarts, et al., 2014).

E.g. *Have you **seen** him?*

*They might have **taken** it*

3.3.2.2. Noting phrasal verbs

Of the tokens identified as lexical verbs, it should also be noted whether any of these are phrasal verbs. A phrasal verb is "a multi-word verb consisting of a verb plus one or more particles and operating syntactically as a single unit" (Aarts, et al., 2014, p.306), in which the particle may be "a preposition or adverb or both" (Cambridge Online Dictionaries, 2014d) [93]. In addition, definitions sometimes specify that the global meaning of these units should be non-compositional (Cambridge Online Dictionaries, 2014d; see also Aarts, et al., 2014; Swan, 1995). However, this is not straight-forward (see Aarts, et al., 2014), especially as some verb-particle combinations can have both compositional and non-compositional meanings. For example, *pay for (something)* is a phrasal verb when the meaning is "to be punished for doing something bad to someone else, or to suffer because of a mistake that you made" (Cambridge Online Dictionaries, 2014c) but not in its compositional usage meaning "to give money to someone for something you want to buy or for services provided" (Cambridge Online Dictionaries, 2014b). Consequently, for ease

[93] Some grammars limit the term 'phrasal verb' to multi-word verbs in which the particle is an adverb and use 'prepositional verb' for those in which the particle is a preposition (see Crystal,2003) . However, this level of detail is deemed unnecessary in the current analysis and therefore the procedure follows grammar which use phrasal verb for all multi-word verbs, as in Aarts, et al.'s (2014) definition.

of identification in the current procedure, tokens should be classed as phrasal verbs if they are listed as a phrasal verb (with the same usage as in the participant's narrative) by Cambridge Online Dictionaries (2014a).

3.3.3. Unclassified tokens[94]

In some cases, it may not be possible to classify a token as a lexical or auxiliary verb. For example, it is not clear in the following (unfinished) utterance whether is was going to constitute the lexical or auxiliary form of BE:

> *the king* ***is*** *erm (1.4) er ((tut))-*

The category noted for such instances should therefore be 'unclassified'.

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[94] This point was added to the protocol after reliability testing.

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Appendix XIX: Reliability testing of verb extraction and classification procedures

Method

The procedures for verb extraction and classification were tested both within and across raters. To measure intra-rater reliability, 25% of all six aphasic narratives and 12.5% of half of the healthy narratives were re-coded by the researcher on a separate occasion. To measure inter-rater reliability, 25% of all six aphasic narratives and 12.5% of half of the healthy narratives were re-coded by a second person with a background in linguistics. In all cases, the healthy narratives and all sections tested were chosen at random. The two sets of ratings by the researcher were then compared for intra-rater agreement and the first ratings by the researcher were compared with the second person's ratings for inter-rater agreement.

Agreement on verb extraction was gauged on two measures. Firstly, ratings were compared on the identification of a verb in a certain place in the narrative, whereby agreement was defined as both ratings noting the same verb lemma at the same point of the transcription. Here, it was not taken into account whether phrasal verbs had been listed in their phrasal form (including a particle) or not; only the verb and not the particle of any phrasal verbs were compared at this stage. Therefore, if one rating had listed a verb token as, for example, *turned into* and the other rating had listed *turned*, this was classed as agreement that there was some form of verb at this point in the transcription. For the second measure, the tokens for which there had been agreement on the first measure were then compared on the exact form of the verb noted. Here, agreement was classed as both ratings listing the same verb form exactly, including in the comparison the particles of any phrasal verbs. The tokens for which there had been agreement at the verb identification stage were then compared for agreement on verb classification. Agreement here was defined as both ratings listing the same category and subcategory for a given verb token.

Results

Both the extraction and classification procedures were reliable within and between raters (see tables XIX.i and XIX.ii and Table XIX.iii). All intra-rater disagreements were resolved through re-examination by the researcher. All inter-rater disagreements were discussed by both raters and agreed by consensus. Despite reliability of the procedures being confirmed, several points were added to the protocol following reliability testing (see footnotes of protocol; Appendix XVIII) to reduce any potential causes of the disagreements that arose, and thus increase the robustness of the protocol.

Table XIX.i: Agreement on verb identification

Participant group	Agreement between ratings, as a proportion of the instances compared (n for each analysis in parentheses)	
	Intra	Inter
Healthy	0.99 (68)	0.98 (46)
PWA	1.00 (80)	0.90 (90)
Overall	0.99 (148)	0.93 (136)

Table XIX.ii: Agreement on form identification

Participant group	Agreement between ratings, as a proportion of the instances compared (n for each analysis in parentheses)	
	Intra	Inter
Healthy	0.97 (67)	0.96 (45)
PWA	0.99 (80)	0.89 (81)
Overall	0.98 (147)	0.91 (126)

Table XIX.iii: Agreement on verb categorisation

Participant group	Agreement between ratings, as a proportion of the instances compared (n for each analysis in parentheses)	
	Intra	Inter
Healthy	0.96 (67)	0.91 (45)
PWA	0.96 (80)	0.93 (81)
Overall	0.96 (147)	0.92 (126)

Appendix XX: ‘Grammaticalised’ versions of strings tested for frequency (Spoken BNC, Davies, 2004-).

DB

Table XX.i. Grammaticalised versions of DB’s strings tested for frequency

Original production	Forms tested	Frequency
it’s ball	*it’s a ball* *it’s the ball* *it’s his ball* *it’s the prince’s ball*	2 0 0 0
[ɪz] it’s [pʴaɪz]	*it’s a surprise*	2
[ɪzp] it’s erm (4.5) [ɪz] [pʴaɪz]	*it’s a surprise*	2
[ɪz] [pæl] [plænʔᶿ] palace	*it’s a palace* *it’s the palace* *it’s his palace* *it’s the prince’s palace*	0 0 0 0
it’s glass [glæsɪpɜː] glass slipper	*it’s a glass slipper* *it’s the glass slipper* *it’s Cinderella’s glass slipper* *it’s her glass slipper*	0 0 0 0
it’s erm (2.0) glass [zɪpə]	*it’s a glass slipper* *it’s the glass slipper* *it’s Cinderella’s glass slipper* *it’s her glass slipper*	0 0 0 0
it’s it’s [glɛs] [gˡɛsɪpə]	*it’s a glass slipper* *it’s the glass slipper* *it’s Cinderella’s glass slipper* *it’s her glass slipper*	0 0 0 0
it’s it’s er pairy( ). [gɒdᵊnəðə] [gɒdnə]	*it’s the fairy godmother* *it’s a fairy godmother* *it’s Cinderella’s fairy godmother* *it’s her fairy godmother*	0 0 0 0

ST

Table XX.ii. Grammaticalised versions of ST’s strings tested for frequency

Original production	Forms tested	Frequency
*[ɪ] **it’s** (1.4) erm (1.0) [daʊnɒnən] her [hæz] and knees (.) erm [skumɪŋ] on the floors*	*she was down on her hands and knees*	0
	she's down on her hands and knees	0
	it was down on her hands and knees	0
*[æ] [ɑ] **out reels** a erm (4.8) erm (.) [^{ə}] [^{ə}] [^{ɜ} ^{h}] (1.3) [ð] [ð] [^{d}]the landed gentry*	*out reels %*	0
*it was (1.5) [^{ʊw}] **went** [t^{ð}baːti]*	*she went to the party*	0
	Cinderella went to the party	0
	it went to the party	0
	they went to the party	0
	the coach went to the party	0

MH

Table XX.iii. Grammaticalised versions of MH's strings tested for frequency

Original production	Forms tested	Frequency
every [^{m}] woman of certain ages will be (1.4) has to go along	*every woman of a certain age will be*	0
	every woman of a certain age has to go along	0
	women of a certain age have to	0
	women of certain ages have to	0
	women of a certain age will be	0
	women of certain ages will be	0
they went and [fɛksd] cinderella up to the (1.0) [INT] (2.2) [d] up to the stairs	*they went and fetched Cinderella up to the stairs*	0
	they went and fetched Cinderella up the stairs	0
she (1.8) had danced (.) after dance after dance ((with emotion)) (1.6) [INT] after dance	*she had dance after dance*	0
	she had danced	0

Key to Table XX.iii: [INT] = interjection by interviewer.

Appendix XXI: Verb tokens produced by HB.

Table XXI.i. Verb tokens produced by HB, ordered by number of tokens per lemma

Verb	Token	Verb string
BE_{Lex}	*'s [it's]*	***'s** too big for them*
	are	*the two girls [n] **are** big*
	be	*you're going to **be** the tailor now (.) because you've got it right*
	he's	***he's** glad*
	is	***is** that right*
	they're	***they're** they look look her down*
	that's	***that's**[w] when the thing*
	that's	*then (1.7) **that's** when [ˈ] the[ⁿ] man went out looking out with this man for the farmer to look for him*
	was	*[faːˈ] goes round to say (that??) everybody must try to find who this (.) had this child **was**[k] who came*
	was	*I don't know what it **was***
	was	*he **was** at he **was** at this thing sewing [ɪnð] [wəð] this erm a man*
	was	*he **was** fond of her*
	was	*he **was** rather [ϑɔːhəv]-*
DO	*didn't*	*he **didn't** like the other girls*
	does	***does** she show the [tɜːᵊzəz] to the men*
	doesn't	*it **doesn't** fit [ᵊ ˢᵊ]*
	did	***did** she come*
	did	*what **did** I do with the have the [ϑəsəsː]*
	don't	*I **don't** know what it was*
	don't	***don't** like her at all*

	don't	*I **don’t** remember what comes next*
COME	*came*	*[faː[ˡ]] goes round to say (that?) everybody must try to find who this (.) had this child was[k] who **came***
	come	*did she **come***
	comes	*she **comes** home[ᵊ] (.) and puts the (.) puts the shoe on her*
	comes	*that’s[w] when the thing **comes***
	comes	*I don’t remember what **comes** next*
	comes	*she **comes** (.) in*
LOOK	*looked*	***looked** like a tomato*
	look	*then (1.7) that’s when [ˡ] the[n] man went out looking out with this man for the farmer to **look** for him*
	look	*they’re they **look look** her down*
	looking	*he sits there **looking** [ə-və]very sad*
	looking	*she sits **looking** at him*
	looking	*then (1.7) that’s when [ˡ] the[n] man went out **looking** out with this man for the farmer to look for him*
GET	*get*	*they **get** all ready to go off*
	got	*he **got** -*
	got	*you’re going to be the tailor now (.) because you’ve **got** it right*
GO	*go*	*er you can’t **go** with us*
	going	*you’re **going** to be the tailor now (.) because you’ve got it right*
	went	*the two girls **[wɜːnt]** first*
HAVE_{Lex}	*had*	*the girl **had** it right*
	have	*then he says let-s **have** that one over there*
SAY	*say*	*[faː[ˡ]] goes round to **say** (that??) everybody must try to find who this (.) had this child was[k] who came*
	says	*then he **says** let-s have that one over there*
	says	*she **says** I’ll help you*

TAKE	*takes*	*he **takes** her back (1.3) on a horse (.) takes her back to the (.) [pæwl] to the palace*
	takes	*he takes her back (1.3) on a horse (.) **takes** her back to the (.) [pæwl] to the palace*
	takes	*that **takes** her to the [ϑ]thing*
BE$_{Aux}$	*she's*	*[s] [εn^{ə}]cinderella **she’s** rubbing away on the rub and the scrubbing on the floor*
	was	*he **was** dancing with her all evening*
	you're	***you’re** going to be the tailor now (.) because you’ve got it right*
DO$_{Lex}$	*do*	*what did I **do** with the have the [ϑəsəsː]*
	does	*it’s [də ɪːd] (.) **does** a big [əs]thing*
FIT	*fit*	*it doesn’t **fit** [$^{ə\ sə}$]*
	fits	*it **fits** beautifully*
GO ROUND	*go round*	*they **go round** everywhere*
	goes round	*[fɑː^{l}] **goes round** to say (that??) everybody must try to find who this (.) had this child was[k] who came*
LIKE	*like*	*he didn’t **like** the other girls*
	like	*don’t **like** her at all*
SIT	*sits*	*he **sits** there looking [ə-və]very sad*
	sits	*she **sits** looking at him*
WILL	*I'll*	***I’ll** make you (in?)to the(?) tailor*
	I'll	*she says **I’ll** help you*
BE$_{Unclass}$	*it's*	***it’s** [də ɪːd] (.) does a big [əs]thing*
CAN	*can't*	*er you **can’t** go with us*
DANCE	*dancing*	*he was **dancing** with her all evening*
FIND	*find*	*[fɑː^{l}] goes round to say (that??) everybody must try to **find** who this (.) had this child was[k] who came*
HAVE$_{Aux}$	*you've*	*you’re going to be the tailor now (.) because **you’ve** got it right*

HAVE$_{\text{Unclass}}$	*had*	*[faː^{l}] goes round to say (that?) everybody must try to find who this (.) **had** this child was[k] who came*
HELP	*help*	*she says I’ll **help** you*
KNOW	*know*	*I don’t **know** what it was*
LAUGH	*laugh*	*the girls **laugh** at her*
LET	*let's*	*then he says **let-s** have that one over there*
MAKE	*makes*	*it **makes** a lovely big (.) [^{t}ʃː^{ʔ}] [dʒə dʒɜː^{n} lə bɪgdʒæm] (.) with [ɹ$^{ə\text{-}ə}$ɹəʊpəz] on the [^{ən}] the [v] the the donkeys no (.) the horses*
PUT	*puts*	*she comes home[^{ə}] (.) and **puts** the (.) **puts** the shoe on her*
REMEMBER	*remember*	*I don’t **remember** what comes next*
RUB	*rubbing*	*[s] [ɛn^{ə}]cinderella she’s **rubbing** away on the rub and the scrubbing on the floor*
SEW	*sewing*	*he was at he was at this thing **sewing** [ɪnð] [wəð] this erm a man*
SHOW	*show*	*does she **show** the [tɜː^{ə}zəz] to the men*
TRY	*try*	*[faː^{l}] goes round to say (that??) everybody must **try** to find who this (.) had this child was[k] who came*
TURN	*turns (into?)*	*she **turns** [ðəs^{Y}] thing -*
GO OFF	*go off*	*they get all ready to **go off***
GO OUT	*went out*	*then (1.7) that’s when [^{l}] the[^{n}] man **went out** looking out with this man for the farmer to look for him*
MAKE INTO	*make you (in)to?*	*I’ll **make** you **(in?)to** the(?) tailor*
MISS OUT	*missed out*	*I **missed** him **out***
MUST	*must*	*[faː^{l}] goes round to say (that??) everybody **must** try to find who this (.) had this child was[k] who came*
SEND OUT	*sends out*	*the servant **sends out** the[^{v}] [ð^{ə}s] the [faːm]*
TRY ON	*try on*	*they(?) [tɹ] the girls **try on** the thing*

Appendix XXII: Verb tokens produced by MH.

Table XXII.i. Verb tokens produced by MH, ordered by number of tokens per lemma

Verb	Token	Verb string
BE_{Lex}	*are*	*[ɪ] in the book [ᵊ] [əˈ] in that book there are two (1.1) daughters (.) [ϑɹ] three daughters*
	be	*every [ᵐ] woman of certain ages will be (1.4) has to go along*
	is	*[t] the [fɹɪnz] says (.) is there ((emotion)) [INT] (4.4) is there anybody else at this at this house*
	is	*he said oh (4.5) my (1.7) that is a princess that I want*
	is	*if if I can only think of what it is*
	is	*this is a story*
	it's	*[ɪ] [ɪ] it’s (.) a big [ϑ] [ð] big [sɜːkᵊlə˅] thing*
	there's	*they said (.) well there’s only [ᶞ] the little[ᵈ] (.) [s] (.) [m] [s] [mː]maid*
	was	*[ð-ᵊ] [ðɛᵊᵇ] that was it*
	was	*[ðʉʄβæ]her job (.) was (1.0) the same day after day after day*
	was	*[ʊɐt] he said was (.) now listen everybody*
	was	*there was (2.1) [ɜf] (.) a little ((clears throat)) (.) a little (3.5) but [ð-ᵊ] (.) [ɪ] [ɪᵊ] it (1.5) [əm] pumpkin a pumpkin*
	was	*it was [ᵛ]really about (3.4) cleaning the floors (.) and[sk] and everything connected with (.) [ð] the floors*
	was	*in the one I heard (.) it was [sɛndəɹɛlə] and three daughters*
	were	*[ᶞ] there were (.) [ɛˈ] there were two or three (.) [mː] - [(3.1) I want to say maids but I don’t really think maids for that]*
	were	*[ð]they were busy cleaning the house*

	were	*they were so excited [ð] [ðᵊˢ] the two or the three (1.0) that they (.) they [kʊˀᶟⁿᶟⁿᵈᵗ] couldn’t get (.) into it hard enough*
	what's	*the prince the prince [ᵊ]says (2.2) said (1.5) [h] ᶷwhat’s the matter [t] Cinderella*
SAY	*said*	*[ʊɐt] he said was (.) now listen everybody*
	said	*they said (.) [d] [d] [d] (.) don’t worry about the ball*
	said	*they he said (.)[æ] I [w] [ᶷ w] (1.0) er [kæᵊ] I will have to [t] (1.5) I will have to (1.8) to to trace*
	said	*[ʃ'] [ʃ] she said (2.5) [s ᵊ ᵈᶾ] (.) [ʃ] (.) six (.) I will (1.2) [ð] (2.0) I will (1.3) [ð] the six little mice [s]will change to six beautiful horses*
	said	*all of a sudden (1.2) she [ᵊs] [ᵊwᶷ ᵊ] [ðs] [ə] said (.) [ʷ]because [ᶞ] the clock was starting to [t] strike twelve*
	said	*Cinderella said (.) [ᵊ]er I’m (.) want to [gɛᵊᶷᵛ] go to the ball (.) but (5.0 including emotion) I want to go to the ball*
	said	*he said oh (4.5) my (1.7) that is a princess that I want*
	said	*it came [t] to pass (.) that the prince said (.) he was going round all the? (1.6) ladies in the [INT] neighbourhood*
	said	*she said (1.5) [dᵊ] (.) [ᶟᵊᶷw] is [ɪʔ] [ðᵊ] [ᶞ] (.) I must get back [ᵈ] before the [pɹɪn]*
	said	*they (.) said fetch cinder [ɛl] cinderella up the stairs (1.1) [t] [f] [v] [vɹɒm] the (.) [n] dirty dishes and what not down below*
	said	*they said (.) well there’s only [ᶞ] the little[ᵈ] (.) [s] (.) [m] [s] [mː]maid*
	said	*they said (1.0) [ɪ] [ɪ] [i] if you [k] [ʔgʔ] can (.) please try this on*
	said	*they said ((emotion))*
	said	*the prince the prince [ᵊ]says (2.2) said (1.5) [h] ᶷwhat’s the matter [t] Cinderella*
	say	*I want to say maids*

	says	*[t] the [fɹɪnz] says (.) is there ((emotion)) [INT] (4.4) is there anybody else at this at this house*
	says	*the prince the prince [^{ə}]says (2.2) said (1.5) [h] ^{ʊ}what's the matter [t] Cinderella*
WILL	*I'll*	*I'll come back to that one*
	I'll	*I'll remember it later on*
	will	*[ʃ'] [ʃ] she said (2.5) [s ^{ə} ^{dʒ}] (.) [ʃ] (.) six (.) I will (1.2) [ð] (2.0) I will (1.3) [ð] the six little mice [s]will change to six beautiful horses*
	will	*it will (.) [vɪl] will be (.) [tʃ] [^{dʒ}] [d] also-*
	will	*they he said (.) [æ] I [w] [^{ʊ} w] (1.0) er [kæ^{ə}] I will have to [t] (1.5) I will have to (1.8) to to trace*
	will	*every [^{m}] woman of certain ages will be (1.4) has to go along*
	will	*I will (.) ((blows nose?)) (1.2) need to [j]*
	will	*[ʃ'] [ʃ] she said (2.5) [s ^{ə} ^{dʒ}] (.) [ʃ] (.) six (.) I will (1.2) [ð] (2.0) I will (1.3) [ð] the six little mice [s]will change to six beautiful horses*
	will	*I will tell the story of cinderella*
GO	*go*	*Cinderella said (.) [^{ə}]er I'm (.) want to [gɛ$^{əʊ\,v}$] go to the ball (.)but (5.0 including emotion) I want to go to the ball*
	go	*Cinderella said (.) [^{ə}]er I'm (.) want to [gɛ$^{əʊ\,v}$] go to the ball (.)but (5.0 including emotion) I want to go to the ball*
	going	*it shows her going up the hill*
	going to	*the prince is going to [^{hʔ}ʉ^{lt}] give a (2.8) give a [ka^{nʔ}] [əg^{ə}] [^{n}] [not a concert but a]*
	went	*they went and [fɛksd] cinderella up to the (1.0) [INT] (2.2) [d] up to the stairs*
	went	*it went to the [pʊʔ] to the [h^{ɒ}] [hɒ^{ə}l]*
$BE_{Unclass}$	*be*	*it will (.) [vɪl] will be (.) [tʃ] [^{dʒ}] [d] also-*
	I'm	*Cinderella said (.) [^{ə}]er I'm (.) want to [gɛ$^{əʊ\,v}$] go to the ball (.) but (5.0 including emotion) I want to go to the*

		ball
	is	*she said (1.5) [dᵊ] (.) [ᵊᵊᶷw] is [ɪʔ] [ðᵊ] [ᶞ] (.) I must get back [ᵈ] before the [pɹɪn]*
	was	*the house was-*
	was	*one day (1.7) it [wᵊ] (1.2) it was[ⁿ]*
BE$_{Aux}$	*is*	*[ð'] there is-*
	was	*[v] when she was standing at the door (.) the prince (5.1) the prince looked at [ᶞ] her*
	was	*all of a sudden (1.2) she [ᵊs] [ᵊwᶷ ᵊ] [ðs] [ə] said (.) [ʷ]because [ᶞ] the clock was starting to [t] strike twelve*
	was	*it came [t] to pass (.) that the prince said (.) he was going round all the? (1.6) ladies in the [INT] neighbourhood*
COME	*came*	*one (.) day (2.2) [ægsᵏ] (3.4) a servant on behalf of the prince (.) came*
	came	*it came [t] to pass (.) that the prince said (.) he was going round all the? (1.6) ladies in the [INT] neighbourhood*
	came	*she (.) er [ᵊ] [v] he came (.) to the house*
	came	*he and his [m] (1.3) servant came to the house*
DO$_{Aux}$	*didn't*	*it didn't include cinderella*
	don't	*they said (.) [d] [d] [d] (.) don't worry about the ball*
	don't	*I don't really think maids for that*
	don't	*I don't mean trace*
HAVE$_{Lex}$	*had*	*all the[m] (.) the [ϑ] two or three neighbours [d] [d] two or three [sɪktəz] (.) all had (.) [ə ᵈᶾ] [ɒn] [ɒʔ] opportunity (.) to try the slipper [æᵊn]*
	had	*I think [ɪ] [ɪ] it (1.9) [ˈ]sometimes had [fᵊˀ] six mice in it*
	has to	*every [ᵐ] woman of certain ages will be (1.4) has to go along*
	have to	*they he said (.)[æ] I [w] [ᶷ w] (1.0) er [kæᵊ] I will have to [t] (1.5) I will have to (1.8) to to trace*
WANT	*want*	*Cinderella said (.) [ᵊ]er I'm (.) want to [gɛᵊᶷᵛ] go to the ball (.) but (5.0 including emotion) I want to go to the*

		ball
	want	*he said oh (4.5) my (1.7) that is a princess that I want*
	want	*I want to go to the ball*
	want	*I want to say maids*
CAN	*can*	*if if I can only think of what it is*
	can	*they said (1.0) [ɪ] [ɪ] [i] if you [k] [ʔgʔ] can (.) please try this on*
CLEAN	*cleaning*	*[ð]they were busy cleaning the house*
	cleaning	*it was [$^{\text{v}}$]really about (3.4) cleaning the floors (.) and[sk] and everything connected with (.) [ð] the floors*
COULD	*couldn't*	*they were so excited [ð] [ð$^{\text{əs}}$] the two or the three (1.0) that they (.) they [kʊ$^{\text{ʔɜnɜnd̚}}$] couldn't get (.) into it hard enough*
	couldn't	*they couldn't (1.5) get (.) anything er any sign of it*
FETCH	*[fɛksd]*	*they went and [fɛksd] cinderella up to the (1.0) [INT] (2.2) [d] up to the stairs*
	fetch	*they (.) said fetch cinder [ɛl] cinderella up the stairs (1.1) [t] [f] [v] [vɹɒm] the (.) [n] dirty dishes and what not down below*
FORGET	*forgotten*	*[$^{\text{æ}}$]-I've forgotten*
	forgotten	*I've forgotten*
GET	*get*	*they couldn't (1.5) get (.) anything er any sign of it*
	got	*cinderella got in the coach*
GIVE	*gave*	*[v] he[$^{\text{v}}$] [$^{\text{g}}$] [$^{\text{g}}$] gave[$^{\text{əθ}}$] (.) gave (.) [əv]*
	give	*the prince is going to [$^{\text{hʔ}}$ʉ$^{\text{l t}}$] give a (2.8) give a [ka$^{\text{nʔ}}$] [əg$^{\text{ə}}$] [$^{\text{n}}$] [not a concert but a]*
HAVE_{Aux}	*I've*	*[$^{\text{æ}}$]-I've forgotten*
	I've	*I've forgotten*
LIVE	*lived*	*[w$^{\text{ʊ d ɜ}}$ø]cinderella lived in a [hæv] big house*
	lived	*they both lived happily ever after*
SHOW	*shows*	*it shows her going up the hill*

	shows	*the book [ˢʃw]shows three mice*
SIT	*sat*	*[ð] they sat Cinderella down*
	sitting	*she was sat in at [həʊ] sitting at home (.) feeling very [vɛliᵛ] depressed*
THINK	*think*	*I don’t really think maids for that*
	think	*I think [ɪ] [ɪ] it (1.9) [ˡ]sometimes had [fᵊˀ] six mice in it*
TRACE	*trace*	*they he said (.) [æ] I [w] [ᵅ w] (1.0) er [kæᵊ] I will have to [t] (1.5) I will have to (1.8) to to trace*
	trace	*I don’t mean trace*
TRY ON	*try on*	*all the[m] (.) the [ϑ] two or three neighbours [d] [d] two or three [sɪktəz] (.) all had (.) [ə ᵈᶾ] [ɒn] [ɒʔ] opportunity (.) to try the slipper [æᵊn]*
	try this on	*they said (1.0) [ɪ] [ɪ] [i] if you [k] [ʔgʔ] can (.) please try this on*
CHANGE	*change*	*[ʃ'] [ʃ] she said (2.5) [s ᵊ ᵈᶾ] (.) [ʃ] (.) six (.) I will (1.2) [ð] (2.0) I will (1.3) [ð] the six little mice [s]will change to six beautiful horses*
COME BACK	*come back*	*I’ll come back to that one*
DANCE	*danced*	*she (1.8) had danced (.) after dance after dance ((with emotion)) (1.6) [INT] after dance*
END	*ends*	*the story ends that they took her [həm] back home (3.0) in the (.) on the horse*
FEEL	*feeling*	*she was sat in at [həʊ] sitting at home (.) feeling very [vɛliᵛ] depressed*
FIT	*[pœtəd]*	*it [pœtəd] her perfectly*
GET BACK	*get back*	*she said (1.5) [dᵊ] (.) [ᵊᵊᵘw] is [ɪʔ] [ðᵊ] [ᶞ] (.) I must get back [ᵈ] before the [pɹɪn]*
GET INTO	*get into*	*they were so excited [ð] [ðᵊˢ] the two or the three (1.0) that they (.) they [kʊˀᵌⁿᵌⁿᵈᵗ] couldn’t get (.) into it hard enough*
GO ALONG	*go along*	*every [ᵐ] woman of certain ages will be (1.4) has to go along*
GO BY	*went by*	*then (1.3) the days went by*
GO ROUND	*going*	*it came [t] to pass (.) that the prince said (.) he was*

	round	*going round all the? (1.6) ladies in the [INT] neighbourhood*
HAVE$_{\text{Unclass}}$	*had*	*she (1.8) had danced (.) after dance after dance ((with emotion)) (1.6) [INT] after dance*
HEAR	*heard*	*in the one I heard (.) it was [sɛndəɹɛlə] and three daughters*
INCLUDE	*include*	*it didn't include cinderella*
LISTEN	*listen*	*[ʊɐt] he said was (.) now listen everybody*
LOOK	*looked*	*[v] when she was standing at the door (.) the prince (5.1) the prince looked at [ᶞ] her*
LOSE	*lost*	*she ran downstairs (.) ever so quickly (.) with the result that she lost one shoe ((emotion)) [INT] (1.7) on the stairs*
MEAN	*mean*	*I don't mean trace*
MUST	*must*	*she said (1.5) [dᵊ] (.) [ᶟᵊᶷw] is [ɪʔ] [ðᵊ] [ᶞ] (.) I must get back [ᵈ] before the [pɹɪn]*
NEED	*need*	*I will (.) ((blows nose?)) (1.2) need to [j]*
PASS	*pass*	*it came [t] to pass (.) that the prince said (.) he was going round all the? (1.6) ladies in the [INT] neighbourhood*
PUT ON	*put it on*	*she (.) put it on*
REMEMBER	*remember*	*I'll remember it later on*
RUN	*ran*	*she ran downstairs (.) ever so quickly (.) with the result that she lost one shoe ((emotion)) [INT] (1.7) on the stairs*
SIT IN	*sat in*	*she was sat in at [həʊ] sitting at home (.) feeling very [vɛliᵛ] depressed*
STAND	*standing*	*[v] when she was standing at the door (.) the prince (5.1) the prince looked at [ᶞ] her*
START	*starting*	*all of a sudden (1.2) she [ᵊs] [ᵊwᶷ ᵊ] [ðs] [ə] said (.) [ʷ]because [ᶞ] the clock was starting to [t] strike twelve*
STRIKE	*strike*	*all of a sudden (1.2) she [ᵊs] [ᵊwᶷ ᵊ] [ðs] [ə] said (.) [ʷ]because [ᶞ] the clock was starting to [t] strike*

		twelve
TAKE	*took*	*the story ends that they took her [həm] back home (3.0) in the (.) on the horse*
TELL	*tell*	*I will tell the story of cinderella*
THINK OF	*think of*	*if if I can only think of what it is*
WORRY	*worry*	*they said (.) [d] [d] [d] (.) don't worry about the ball*

Key to Table XXII.i: [INT] = interjection by interviewer.

Appendix XXIII: Verb strings produced by HB.

Table XXIII.i.Verb strings produced by HB, ordered by well-formedness then fluency then frequency.

Ref no.	String (as produced)	Well-formed	Fluent	Exact string freq.
1	he got -	✓	✓	895
2	is that right	✓	✓	231
3	I don't know what it was	✓	✓	24
4	it doesn't fit [^{ə} ^{sə}]	✓	✓	10
5	did she come	✓	✓	9
6	he's glad	✓	✓	2
7	don't like her at all	✓	✓	1
8	I don't remember what comes next	✓	✓	0
9	the girls laugh at her	✓	✓	0
10	er you can't go with us	✓	✓	0
11	they get all ready to go off	✓	✓	0
12	she sits looking at him	✓	✓	0
13	she says I'll help you	✓	✓	0
14	she turns [ðəs^{ɣ}] thing -	✓	✓	0
15	looked like a tomato	✓	✓	0
16	that takes her to the [θ]thing	✓	✓	0
17	the two girls [wɜ:nt] first	✓	✓	0
18	I missed him out	✓	✓	0
19	he was dancing with her all evening	✓	✓	0
20	he was fond of her	✓	✓	0
21	he didn't like the other girls	✓	✓	0
22	they go round everywhere	✓	✓	0
23	's too big for them	✓	✓	0
24	then he says let-s have that one over there	✓	✓	0
25	it fits beautifully	✓	✓	0
26	I'll make you (in?)to the(?) tailor	✓	✓	0
27	the girl had it right	✓	✓	0
28	that's when [^{l}] the[^{n}] man went out looking out with this man for the farmer to look for him	✓	✓	0
29	you're going to be the tailor now (.) because you've got it right	✓	✓	0
30	she comes (.) in	✓	X	23
31	the two girls [n] are big	✓	X	0
32	he sits there looking [ə-və]very sad	✓	X	0

33	that's[w] when the thing comes	✓	X	0
34	he was at he was at this thing sewing [ɪnð] [wəð] this erm a man	✓	X	0
35	they(?) [tɹ] the girls try on the thing	✓	X	0
36	he takes her back (1.3) on a horse (.) takes her back to the (.) [pæwl] to the palace	✓	X	0
37	[s] [ɛn^{ə}]cinderella she's rubbing away on the rub and the scrubbing on the floor	X	✓	0
38	he was rather [θɔːhəv]-	X	X	0
39	what did I do with the have the [θəsəsː]	X	X	0
40	does she show the [tɜː^{ə}zəz] to the men	X	X	0
41	they're they look look her down	X	X	0
42	it makes a lovely big (.) [^{t}ʃː^{ʔ}] [dʒə dʒɜː^{n} lə bɪgdʒæm] (.) with [ɹ$^{ə-ə}$ɹəʊpəz] on the [^{ən}] the [v] the the donkeys no (.) the horses	X	X	0
43	the servant sends out the[^{v}] [ð^{ə}s] the [faːm]	X	X	0
44	[faː^{l}] goes round to say (that?) everybody must try to find who this (.) had this child was[k] who came	X	X	0
45	she comes home[^{ə}] (.) and puts the (.) puts the shoe on her	X	X	0
46	it's [də ɪːd] (.) does a big [əs]thing	X	X	0

<u>Key to Table XXIII.i.</u> Freq. = frequency (Spoken BNC, Davies, 2004-).

Appendix XXIV: Verb strings produced by MH.

Table XXIV.i. Verb strings produced by MH, ordered by well-formedness then fluency then frequency

Ref no.	String (as produced)	Well-formed	Fluent	Exact string freq.	Gram. string freq.
1	[ð'] there is-	✓	✓	4688	
2	they said ((emotion))	✓	✓	885	
3	[ð-^{ə}] [ðɛ^{əb}] that was it	✓	✓	234	
4	[^{æ}]-I've forgotten	✓	✓	142	
5	I've forgotten	✓	✓	142	
6	the house was-	✓	✓	33	
7	this is a story	✓	✓	3	
8	if if I can only think of what it is	✓	✓	0	
9	I will tell the story of cinderella	✓	✓	0	
10	I'll come back to that one	✓	✓	0	
11	I'll remember it later on	✓	✓	0	
12	I don't really think maids for that	✓	✓	0	
13	it didn't include cinderella	✓	✓	0	
14	I don't mean trace	✓	✓	0	
15	[ð]they were busy cleaning the house	✓	✓	0	
16	cinderella got in the coach	✓	✓	0	
17	they both lived happily ever after	✓	✓	0	
18	she ran downstairs (.) ever so quickly (.) with the result that she lost one shoe ((emotion)) [INT] (1.7) on the stairs	✓	✓	0	
19	[ʊɐt] he said was (.) now listen everybody	✓	✓	0	
20	it shows her going up the hill	✓	✓	0	
21	[ð] they sat Cinderella down	✓	✓	0	
22	I want to say maids	✓	✓	0	
23	[v] he[^{v}] [^{g}] [^{g}] gave[^{əθ}] (.) gave (.) [əv]	✓	X	182	
24	[^{ð}] there were (.) [ɛ'] there were two or three (.) [mː] -	✓	X	6	
25	I will (.) ((blows nose?)) (1.2) need to [j]	✓	X	3	
26	one day (1.7) it [w^{ə}] (1.2) it was[^{n}]	✓	X	2	
27	she (.) put it on	✓	X	1	
28	in the one I heard (.) it was [sɛndəɹɛlə] and three daughters	✓	X	0	

29	they couldn’t (1.5) get (.) anything er any sign of it	✓	X	0	
30	it will (.) [vɪl] will be (.) [tʃ] [ᵈᶾ] [d] also-	✓	X	0	
31	[v] when she was standing at the door (.) the prince (5.1) the prince looked at [ᶞ] her	✓	X	0	
32	then (1.3) the days went by	✓	X	0	
33	she was sat in at [həʊ] sitting at home (.) feeling very [vɛliˇ] depressed	✓	X	0	
34	[ɪ] in the book [ᵊ] [ə'] in that book there are two (1.1) daughters (.) [θɹ] three daughters	✓	X	0	
35	[ᶞᶶʲ³ᵆ]her job (.) was (1.0) the same day after day after day	✓	X	0	
36	it was [ᵛ]really about (3.4) cleaning the floors (.) and[sk] and everything connected with (.) [ð] the floors	✓	X	0	
37	they were so excited [ð] [ðᵊˢ] the two or the three (1.0) that they (.) they [kʊ[illegible]ᶟⁿᶟⁿᵈᵗ] couldn’t get (.) into it hard enough	✓	X	0	
38	there was (2.1) [ɜf] (.) a little ((clears throat)) (.) a little (3.5) but [ð-ᵊ] (.) [ɪ] [ɪᵊ] it (1.5) [əm] pumpkin	✓	X	0	
39	[ɪ] [ɪ] it’s (.) a big [θ] [ð] big [sɜːkᵊləˇ] thing	✓	X	0	
40	one (.) day (2.2) [ægsᵏ] (3.4) a servant on behalf of the prince (.) came	✓	X	0	
41	it came [t] to pass (.) that the prince said (.) he was going round all the (1.6) ladies in the [INT] neighbourhood	✓	X	0	
42	she (.) er [ᵊ] [v] he came (.) to the house	✓	X	0	
43	he and his [m] (1.3) servant came to the house	✓	X	0	
44	the story ends that they took her [həm] back home (3.0) in the (.) on the horse	✓	X	0	

45	it [pœtəd] her perfectly	✓	X	0	
46	it went to the [pʊʔ] to the [hᵒ] [hɒᵊl]	✓	X	0	
47	[wᵘᵈʒø]cinderella lived in a [hæv] big house	✓	X	0	
48	the prince the prince [ᵊ]says (2.2) said (1.5) [h] ᵁwhat's the matter [t] Cinderella	✓	X	0	
49	they said (.) [d] [d] [d] (.) don't worry about the ball	✓	X	0	
50	[ʃ'] [ʃ] she said (2.5) [s ᵊ ᵈʒ] (.) [ʃ] (.) six (.) I will (1.2) [ð] (2.0) I will (1.3) [ð] the six little mice [s]will change to six beautiful horses	✓	X	0	
51	he said oh (4.5) my (1.7) that is a princess that I want	✓	X	0	
52	all of a sudden (1.2) she [ᵊs] [ᵊwᵘ ᵊ] [ðs] [ə] said (.) [ʷ]because [ᶞ] the clock was starting to [t] strike twelve	✓	X	0	
53	she said (1.5) [dᵊ] (.) [ᵊᵊᵘw] is [ɪʔ] [ðᵊ] [ᶞ] (.) I must get back [ᵈ] before the [pɹɪn]	✓	X	0	
54	[t] the [fɹɪnz] says (.) is there ((emotion)) [INT] (4.4) is there anybody else at this at this house	✓	X	0	
55	they said (.) well there's only [ᶞ] the little[ᵈ] (.) [s] (.) [m] [s] [mː]maid	✓	X	0	
56	they he said (.)[æ] I [w] [ᵘ w] (1.0) er [kæᵊ] I will have to [t] (1.5) I will have to (1.8) to to trace	✓	X	0	
57	they said (1.0) [ɪ] [ɪ] [i] if you [k] [ʔgʔ] can (.) please try this on	✓	X	0	
58	they (.) said fetch cinder [ɛl] cinderella up the stairs (1.1) [t] [f] [v] [vɹɒm] the (.) [n] dirty dishes and what not down below	✓	X	0	
59	the book [ˢʃw]shows three mice	✓	X	0	
60	I think [ɪ] [ɪ] it (1.9) [ˡ]sometimes had [fᵊ[illegible]] six mice in it	✓	X	0	
61	all the[m] (.) the [θ] two or three neighbours [d] [d] two or three [sɪktəz] (.) all had (.) [ə ᵈʒ] [ɒn] [ɒʔ] opportunity (.) to try the slipper	✓	X	0	

	[æᵊn]				
62	Cinderella said (.) [ᵊ]er I'm (.) want to [gɛᵊʊᵛ] go to the ball (.) but (5.0 including emotion) I want to go to the ball	✓	X	0	
63	the prince is going to [ʰ[illegible]ʉˡᵗ] give a (2.8) give a [kɑⁿˀ] [əgᵊ] [ⁿ]	✓	X	0	
64 *BL	every [ᵐ] woman of certain ages will be (1.4) has to go along	X	X	0	0
65 *BL	they went and [fɛksd] cinderella up to the (1.0) [INT] (2.2) [d] up to the stairs	X	X	0	0
66 *BL	she (1.8) had danced (.) after dance after dance ((with emotion)) (1.6) [INT] after dance	X	X	0	0

Key to Table XXIV.i: Freq. = frequency (Spoken BNC, Davies, 2004-); Gram. = 'grammaticalised'; [INT] = interjection by interviewer.