

Comprehension of *wh*-questions in agrammatism: a single-case study

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Abstract. Unlike comprehension of declarative sentences, comprehension of *wh*-questions in agrammatic aphasia is a neglected research topic. Not all *wh*-questions are understood equally well yet the nature of this difficulty has received sparse attention in the literature. According to one view (Avrutin 2000), which follows Pesetsky's (1987) well-known distinction of *wh*-questions, questions beginning with *which* prevent people with agrammatic aphasia from establishing a link with a discourse related presupposed referent. This applies only when the *wh*-phrase moves from the object position. Our aim was to investigate Avrutin's hypothesis in a range of *wh*-questions via a single-case study. Different types of *wh*-questions in canonical and non-canonical word order were tested in an act-out task. Patient HT is able to understand canonical *wh*-questions but not non-canonical ones. We argue that the selective deficit of *wh*-questions in agrammatic aphasia is best accounted for at the level of the sentence rather than discourse factors. We also argue that Pesetsky's distinction is unsatisfactory regarding our data.

1. Introduction

Since Caramazza & Zurif's (1976) seminal paper on comprehension deficits in aphasia, a number of studies of sentence comprehension in agrammatic aphasia have depicted a reliable discrepancy among certain declarative sentence types: good performance on actives and subject clefts yet poor performance on object clefts and some, albeit not all (e.g. Pinango 2000), passive constructions. This is sometimes referred to as the "standard picture" (Grodzinsky 1998:179) or the "core data" (Beretta 2001:515) of agrammatic comprehension although some researchers (e.g. Berndt, Mitchum & Haendiges 1996) have cast doubt on the proportion of agrammatic patients that form part of the "standard picture". Nonetheless, a plethora of evidence show that canonical sentences, that is, sentences that follow the subject-verb-object surface word order in English, are understood much better than non-canonical sentences. In non-canonical sentences the word order is object-subject-verb. A less standard picture, which is the focus of this report, is one involving *wh*-questions rather than declarative structures.

Linguistically, *wh*-questions differ from declarative structures in certain respects: the chains that are formed are A'-chains and not A-chains as in declaratives, *wh*-movement occurs in order to satisfy question formation (Baker 1970), the *wh*-trace is a referential expression unlike the NP-trace in declaratives which is an anaphor (Haegeman 1994). *Wh*-questions can also occur with raising verbs, e.g. *seem*. However, *wh*-questions share a similar movement operation with declarative sentences (Chomsky 1981). The post-verbal constituent moves at the beginning of the sentence.

Hickok & Avrutin (1996) described two agrammatic patients who were selectively impaired in only one (1d) of four types of *wh*-questions.

- | | | |
|------|---|---------------------|
| (1a) | who kicked the elephant? | <i>above chance</i> |
| (1b) | who _i did the elephant kick <i>t_i</i> ? | <i>above chance</i> |
| (1c) | which giraffe kicked the elephant? | <i>above chance</i> |
| (1d) | which giraffe _i did the elephant kick <i>t_i</i> ? | <i>chance</i> |

Both patients, nonetheless, did conform to the standard agrammatic profile, that is, better performance in actives and subject clefts and much poorer performance in passives and object clefts (Hickok & Avrutin 1996:318). The pattern shown in (1) is less standard firstly because these sentence types have not been studied extensively; secondly, when the post-verbal noun phrase moves (as in 1b and d) it only yields chance results in (1d) and not in (1b). In English, *wh*-questions occur in canonical (1a) and (1c) as well as non-canonical word order (1b) and (1d). Movement of the post-verbal constituent also occurs in passives and object clefts (Chomsky 1981) and these sentences are known to cause comprehension difficulties in agrammatic aphasia (Beretta 2001).

The comprehension pattern of *wh*-questions is hard to explain with reference to some influential accounts of agrammatic sentence comprehension such as the trace deletion hypothesis (Grodzinsky 1998), the lexical node hypothesis (Caplan 1983), the mapping hypothesis (Linebarger 1995) or the double dependency hypothesis (Maurer, Fromkin & Cornell 1993). These accounts predict worse performance for non-canonical structures (declaratives and *wh*-questions alike) although they were originally proposed to explain comprehension patterns in declaratives and not *wh*-questions. If *wh*-questions are impaired in the same way as declaratives, one would expect both (1b) and (1d) to be understood below or, at the very least, at chance levels according to the above accounts. However, only structure (1d) is at chance in Hickok & Avrutin's (1996) data. More data are required in order to explain Hickok & Avrutin's (1996) pattern.

A different profile from that obtained by Hickok & Avrutin (1996) has been described by Thompson, Tait, Ballard & Fix (1999). Of the four agrammatic patients only one showed the asymmetries (1a-c vs. 1d) Hickok & Avrutin reported. The other three patients showed mixed profiles among different *wh*-question types. Thompson and her colleagues expressed reservations in reaching conclusions from limited research and did not commit themselves to any explanations.

A prevailing view in theoretical linguistic as well psycholinguistic literature on the treatment of *wh*-questions is based on the well-known dichotomy drawn by Pesetsky (1987). Questions headed by *who* and *what* are considered non-discourse linked (non-d-linked), whereas those headed by *which*, are discourse linked (d-linked). This dichotomy was based on the syntactic distribution of *wh*-questions rather than on discourse although Pesetsky appeals to discourse factors in order to explain the different syntactic environments of *wh*-constituents. In particular, Pesetsky (1987:106) observed that *who* and *what* questions occur in nested dependency conditions, whereby when two *wh*-trace dependencies overlap, one must contain the other, as in the following examples:

- (2a) $\text{what}_j \text{ who}_i \text{ you persuade } t_i \text{ to read } t_j ?$
- (2b) $\text{what}_j \text{ who}_i t_i \text{ read } t_j ?$
- (2c) ?? $\text{who}_i \text{ what}_j \text{ you persuade } t_i \text{ to read } t_j ?$
- (2d) * $\text{who}_i \text{ what}_j t_i \text{ read } t_j ?$

In (2a) and (2b) the chains $\langle \text{who}_i t_i \rangle$ are contained within the chain $\langle \text{what}_j t_j \rangle$. However, in (2c) and (2d) the chains are crossed. So, in (2a) and (2b) there is a nested dependency whereas in (2c) and (2d) there is a crossed dependency (Pesetsky 1987:105-6). *Which* questions are grammatical, regardless of nested or crossed dependencies. Thus, "*which man did you persuade to read which book?*" and "*which book did you persuade which man to read?*" are both grammatical.

Pesetsky's (1987) views have been used as an explanatory tool in the aphasic literature. Avrutin (2000) combined the data from Hickok & Avrutin (1996) and Thompson et al. (1999) and found that the mean number of errors was the greatest in non-canonical *which* questions. Specifically, the mean number of errors on canonical *which* questions was 23% whereas on non-canonical ones was 44.3% (Avrutin 2000:303). The difference between canonical and non-canonical *who* questions was less marked, 18.5% and 17.7% respectively. Avrutin advocated Pesetsky's (1987) dichotomy of *wh*-questions to account for the data. In particular, Avrutin (2000:307) claimed that the integration of discourse (as in the case

of d-linked *which* questions) plus syntactic operations which require more energy make *which* questions more challenging for people with agrammatism. Following the same line of argument, non-d-linked *who* questions only necessitate the integration of syntactic operations and thus performance is above chance. Avrutin's analysis is nonetheless selective and becomes less convincing when one looks at two other non-d-linked types, namely *what* questions, from the Thompson et al. (1999) study. The mean number of errors of canonical and non-canonical *what* questions was 35% and 31% respectively. A comparison between *what* and *which* questions in the Thompson et al. data does not conform to Avrutin's prediction ($\chi^2=0.956$, $df=1$, $p=0.328$). There is no significant difference between *what* and *which* questions although the small number of subjects limits the strength of this generalisation.

The discourse vs. non-discourse linking dichotomy has been investigated in non-aphasic subjects. Shapiro (2000) found that normal listeners process *who* and *what* questions in a different way than *which* questions. Gap filling for *which* questions was delayed whereas for *who* and *what* questions was faster. Shapiro, like Avrutin (2000), interpreted these discrepancies as arising from relating *which* questions to a discourse referent, while *who* and *what* questions do not require to be related to a discourse referent. Interestingly however, Shapiro (2000:374) admits that both question types (*who/what* and *which*) are discourse linked because it is the grammatical distinction of the questions rather than the presence of a discourse referent. Similar trends have also been reported by Frazier & Clifton (2002) in English and Diaconescu & Goodluck (2004) in Romanian. In Frazier & Clifton (2002) d-linked phrases were rapidly given a discourse interpretation and were chosen as antecedents for pronouns more often than non-d-linked phrases. Furthermore, data obtained from grammaticality judgement, ungrammatical sentences which lacked a trace for an interrogative phrase were rated more acceptable when the pronoun inside an island was related to a d-linked phrase rather than a non-d-linked one. It should be noted that in Shapiro (2000) as well as Frazier & Clifton (2002) all *wh*-phrases were extracted from object positions and not subject positions. Therefore, it is not known whether the same trend is observed in subject extracted *wh*-phrases.

Another difference between *who/what* and *which* questions is that the latter type are one word longer in Shapiro's stimuli. This could account for the different reaction times that were observed. However, the locus of extraction of the *wh*-word does have processing consequences. De Vicenzi (1996) reports on the following findings from Italian: first, subjects were more accurate in comprehending subject extracted *wh*-questions than

object ones; there was a length effect for *who* questions in that they were read faster than *which* questions (De Vicenzi 1996:124); second, subject extracted *who* questions were understood faster than object extracted ones yet this difference was not present in *which* questions (De Vicenzi 1996:127). De Vicenzi (1996:130) maintains that in her data "there was a simple effect of length in that *who* questions were read faster than *which* questions". She is nevertheless in agreement with Pesetsky's (1987) distinction although she does not discuss the mechanism by which the two question types are given a discourse related referent. Data from German also show a syntactic effect for indirect *who* questions. Fiebach, Schlesewsky & Friederici (2002) found that interrogative *who* pronouns extracted from post-verbal positions were processed differently than those from pre-verbal positions.

To summarise, this selective review suggests that there are different processing profiles for *who* and *which* questions as well as canonical and non-canonical *who* questions. Yet, the authors who appeal to Pesetsky's (1987) d-linking distinction do not make reference to discourse comprehension and do not define the term in the context of sentence comprehension. Pesetsky (1987:123) does not define discourse either and he treats discourse and context synonymously. None of the researchers attempts to give an account of discourse representation and interpretation and how a *wh*-constituent integrates information from discourse which in turn gives rise to some of the comprehension asymmetries that have been reported. This is true for the agrammatic as well as the psycholinguistic literature.

The limited research to date has shown that *wh*-questions in agrammatism do not appear to follow a straightforward parallel with other types of declarative sentences although this is a relatively new research domain. However, different types of *wh*-questions have been found to be selectively impaired in agrammatism. This selective impairment has been attributed to Pesetsky's (1987) d-linking dichotomy of *wh*-questions. Processing limitations in syntax coupled with linking a discourse referent is the reason why non-canonical *which* questions are more impaired than non-canonical *who* questions according to Avrutin (2000).

In the following sections the data we present cast doubt to the validity of the hypothesis advocated by Avrutin (2000). We show that the Avrutin's hypothesis is insufficient for our data and we suggest a different approach of accounting for the data.

2. Method

2.1 Participant

HT is a 71 year old man who has been brought up and lived in Scotland all his life. He is monolingual and a native speaker of English. He had received 10 years of formal education and had worked as a builder before retirement. In 2001 he suffered a stroke. A CT scan showed right frontal and anterior parietal lobe infarct. He reported that he was right-handed pre-morbidly although he presented with left hemiplegia. The status of his handedness was also confirmed by his wife. At the time of testing he was 2 years post onset. He was diagnosed as a mixed non-fluent aphasic on the basis of the Boston Diagnostic Aphasia Examination (BDAE, short version) (Goodglass, Kaplan & Barresi 2001). HT mean percentile score for the auditory comprehension component was 40. A Broca's aphasic should attain a mean percentile score of 50 (Goodglass et al. 2001:60). Table 1 summarises the BDAE percentile scores.

Table 1 Summary percentiles of BDAE

Subtests	Percentiles	
<i>Severity rating</i>	70	
<i>Fluency</i>	phrase length	20
	melodic line	30
	grammatical form	30
<i>Conversation</i>	simple social responses	90
<i>Auditory comprehension</i>	basic word discrimination	60
	commands	40
	complex ideational material	20
<i>Articulation</i>	articulatory agility	30
<i>Recitation</i>	automatized sequences	100
<i>Repetition</i>	words	70
	sentences	60
<i>Naming</i>	responsive naming	90
	Boston naming test	50
	special categories	90
<i>Paraphasia</i>	rating from speech profile	80
	phonemic	70
	verbal	60
	neologistic	100
	multi-word	100

HT's speech output was non-fluent with no more than four words per utterance. It was also effortful and agrammatic. There was no evidence of

speech apraxia or dysarthria. At conversational level his comprehension appeared relatively preserved. A spontaneous language sample of around 150 words was analysed and quantified following Thompson & Edwards' (in preparation) method. The results are presented in table 2.

Table 2 Sentence production characteristics

Mean length of utterance (morphemes)	3.18
Percentage of grammatical sentences	10.3
simple sentences	96.5
complex sentences	3.5
Percentage of verbs produced with correct arguments	44.4
Verb morphology index	1.14
Open:closed ratio	3.63
Noun:verb ratio	1.38

HT's comprehension of declarative sentences was tested in a variety of tasks: the sentence comprehension and grammaticality judgment subtests of the Verb and Sentence Test (VAST) (Bastiaanse, Edwards & Rispens 2002) and an experimental version of the Northwestern Assessment of Verbs and Sentences (NAVS) (Thompson in press). His comprehension was also tested on an object manipulation task. Two animal figures were placed in front of the participant and the experimenter read out a sentence. The participant was asked to manipulate the animals in response to a sentence in such a way so he enacted the thematic roles of the stimulus sentences. The participant was first familiarised with the lexical items. HT was 100% correct in identifying the lexical items. In total 48 sentences were presented, 12 of four types. The lexical items were the same as in the act-out task (described below). Table 3 summarises HT's performance (% correct) in the four sentence types.

Table 3 Comprehension of declarative sentences

	actives	subject clefts	passives	object clefts
VAST	60	80	60	60
NAVS	90	70	30	30
Object manipulation	100	92	17	33

HT's comprehension profile is agrammatic according to the NAVS and the object manipulation task. His performance is better on passives and object clefts on the VAST. The majority of his errors occur in passives and object clefts sentences. The difference between canonical and non-

canonical sentences in the above three tests approached statistical significance according to the Wilcoxon signed ranks test ($p=0.059$). HT was unable to detect ungrammatical sentences on the VAST. He scored 17/20 correct for the grammatical set yet only 4/20 correct for the ungrammatical set.

2.2 Materials and procedure

Thirteen nouns and 5 two-place verbs composed the *wh*-questions. Mean frequency of occurrence was 7 and 5 per million words for nouns and verbs respectively, according to Johansson & Hofland (1989). Some of the lexical items however do not appear in the corpus. The nouns (cow, donkey, elephant, giraffe, goat, gorilla, hippo, kangaroo, penguin, pig, rhino, sheep, zebra) were prototypically non-aggressive animals unlike the nouns in Hickok & Avrutin (1996) and Thompson et al. (1999) which were a mixture of aggressive and non-aggressive animals (e.g. lion, tiger). Prototypically aggressive animals are animals that are primarily predators in the real world. In a study reported in Caplan, Baker & Dehaut (1985:131) an analysis of the aphasic patients' responses between a bear and a frog revealed that "the bear is more likely to be taken as Agent and the frog as Theme". The five verbs were: *to pat*, *to kick*, *to scratch*, *to shove* and *to bump*.

Three sets of *wh*-questions, *who*, *what* and *which*, were tested in simple, raising and padded syntactic structures in canonical and non-canonical word orders, making a total of 250. Each question type had 12 tokens. Examples of simple *wh*-questions are given in (3).

- | | | |
|------|--------------------------------------|---------------|
| (3a) | who/what kicked the hippo? | canonical |
| (3b) | who/what did the hippo kick? | non-canonical |
| (3c) | which elephant kicked the hippo? | canonical |
| (3d) | which elephant did the hippo kick? | non-canonical |
| (3e) | who/what seemed to kick the hippo? | canonical |
| (3f) | who/what did the hippo seem to kick? | non-canonical |

Simple *wh*-questions are overall shorter than raising ones by two words. In order to control for length effects two methods of padding were chosen. First, the adverb *slowly* was inserted between the *wh*-constituent and the verb in canonical questions and between the subject noun and the verb in the non-canonical ones. Second, the adjunct *just now* was added at the end of simple *wh*-questions. The adverb *slowly* intervenes between the grammatical subject and the verb in a similar way the verb *seem* intervenes

in the raising questions whereas the adverbial phrase *just now* does not alter the structure of the SV sequence. The padded sets are summarised in (4).

- (4a) who/which gorilla *slowly* kicked the giraffe?
- (4b) who/which gorilla did the giraffe *slowly* kick?
- (4c) who/which gorilla kicked the giraffe *just now*?
- (4d) who/which gorilla did the giraffe kick *just now*?

An act-out task similar to the one described in Hickok & Avrutin (1996) and Thompson et al. (1999) was used. A simple scenario was acted out in front of the participant. Three animals participated in each scenario, two of the same kind (yet different in size in order to avoid confusion) and another animal of a different kind. The animals were manipulated in such a way by the experimenter so they performed a simple act. The participant was then asked the stimulus *wh*-questions and was instructed to point to the animal he thought was the correct answer. All scenarios were of the same format. An animal of one type (e.g. small giraffe) performed an action upon a different animal (e.g. kangaroo) and then the same action was repeated by the kangaroo to another animal of the first type (e.g. big giraffe). The questioned animal was always the one of which there were two in each scenario. The animals were arranged linearly and after the scenario was acted out they were left on the table so the thematic relations between the animals were available to the patient as described in Hickok & Avrutin (1996). The direction of the action was from left to right as well as right to left in relation to the participant. The questions were pseudorandomised so no more than two questions of the same type were presented consecutively.

One of the flaws of this task is that the animal initiating the first action in each scenario is the Actor in all canonical questions and consequently the correct answer to *all* canonical *wh*-questions. Similarly, in all non-canonical questions the medial animal (i.e. Patient) is always the correct answer. Hypothetically, a participant could achieve ceiling scores once by perseverating responses. To avoid this potentially adverse task effect, a second act-out task was also given to HT. Twenty-four *who* and 24 *what* questions (half canonical and half non-canonical) were prepared for this task. The construction of scenarios was different from the one described above and ensured that the medial animal could also be a correct response. For this task the same scenario was used with two questions (either canonical or non-canonical) as in the following example:

Scenario: small giraffe kicking hippo
 hippo kicking big giraffe
question 1: who kicked the giraffe? Response: hippo
question 2: who kicked the hippo? Response: small giraffe

In the previous act-out task, if HT was not observing the scenario and was simply perseverating on the same animal that initiated the action, he would point to the same animal (e.g. small giraffe) throughout the task. Overall, 24 different scenarios were devised (12 for canonical and 12 for non-canonical). The questions were pseudorandomised so that no more than three canonical or non-canonical questions were presented consecutively.

3. Results

The results (in % correct) from the first task are shown in table 4.

Table 4 Task 1 summary of results

		Canonical	Non-canonical
Simple	who	75	50
	what	75	42
	which	92	8
Raising	who	100	25
	what	100	8
	which	100	0
Padded	who slowly	92	33
	who just now	83	8
	which slowly	58	0
	which just now	75	17

There is an overwhelming effect of canonicity as table 4 shows. The majority of canonical *wh*-questions (apart from the *which slowly* type) are understood much better than the non-canonical equivalents. The difference in comprehension between canonical and non-canonical questions is highly significant ($p=0.006$) according to Wilcoxon signed ranks test. There was no effect for raising or padded questions.

The results from the second task (table 5) also show an overall effect of canonicity. HT performed significantly better on the canonical sets than the non-canonical ones ($\chi^2=4.517$, $df=1$, $p=0.034$).

Table 5 Task II summary of results

	Who	What
Canonical	83	92
Non-canonical	42	25

4. Discussion

It is evident from the results that comprehension of *wh*-questions with canonical word order is well above chance for the majority of question types tested. The only canonical type that is not understood as well as other types is the padded *which slowly* type. HT did not respond correctly to any of the non-canonical *which slowly* questions. All non-canonical types are understood at chance or below chance levels. No non-canonical type is understood more than 50% correct as table 4 shows.

HT's understanding of declarative sentences is also selectively impaired across tests. He cannot assign thematic roles in order to derive the meaning of a sentence as the low percentage rates for passives and object clefts show. This deficit is also evident in his comprehension of non-canonical *wh*-questions.

HT's overall comprehension profile does not conform to Avrutin's predictions of the d-linking hypothesis regarding *which* questions. HT does not present with a selective impairment that only affects non-canonical *which* questions. Other types of non-canonical *wh*-questions are also impaired such as *who*, *what* and also *wh*-questions in raising sentences. Avrutin's explanation is also problematic. In the experimental method that were used in the present and the previous two studies (Hickok & Avrutin 1996; Thompson et al. 1999) all *wh*-questions were referential (or discourse linked) since the scenarios provided the pragmatic background against which the questions were asked. In actual fact, it makes no sense to ask a *wh*-question without some kind of context.

Previous data can be better accounted for by appealing to the difference between *who* and *which* phrases. It may well be that agrammatic patients find *who* phrases easier to understand than *which* phrases because *who* is a head whereas the *which* is a specifier. Heads and specifiers occupy different position at the CP level (Haegeman 1994). Thompson et al. (1999) state that semantic differences among *wh*-phrases could also account for the data. The syntactic differences among *wh*-questions and their contribution to agrammatic comprehension are being investigated (Salis in preparation) as the data we presented in this paper do not throw any light into those possibilities.

HT's performance is strikingly similar across declaratives and *wh*-questions so the presenting deficit appears to involve non-canonical structures, declaratives and *wh*-questions alike. So, the question that emerges is: can the theoretical accounts that have been proposed to explain the comprehension difficulties in declaratives account for the comprehension pattern HT exhibits? The pattern of performance HT shows is consistent with the predictions of several influential accounts of agrammatic comprehension mentioned earlier. Therefore, it is possible that HT may well present with a mapping deficit according to Linebarger (1995) or indeed with a deficit involving double dependencies (Maurer et al. 1993); HT may have a deficit with functional category nodes as Caplan's (1983) lexical node hypothesis postulates. The predictions these three hypotheses make about *wh*-questions are similar; that is, better performance for canonical and worse performance for non-canonical *wh*-question irrespective of the type of *wh*-phrase as was explained in the introduction. All these theories however would fail to account for the data Avrutin (2000) presented.

The d-linking hypothesis advocated by Avrutin (2000) and others in normal language processing (Shapiro 2000; Frazier & Clifton 2002; Diaconescu & Goodluck 2004) is problematic on theoretical grounds since Pesetsky's (1987) definition of discourse vs. non-discourse linked questions are vague. First, it is not clear what is meant by discourse. Second, it seems that discourse and context are treated as synonymous terms. "When a speaker asks a questions like "Which book did you read?", the range of felicitous answers is limited by a set of books ... No such requirement is imposed on *wh*-phrases like *who*, *what* (Pesetsky 1987:107-8). Yet, Pesetsky (1987:123) admits that the set of books need not have been verbally specified as long as both speaker and listener make the same assumptions about context. Moreover, there is another term which is equally nebulous. A question such as "what the hell?" is "aggressively non-d-linked" and "the appropriate figure is presumed not to figure in previous discourse" (Pesetsky 1987:111). This, however, is a poor example since *what* acts as an expletive without reference and the question has little propositional content. So, non-d-linked questions (*who* and *what*) can also be d-linked as Shapiro (2000) acknowledged since in the scenarios we used, the referents of *who* and *what* were always present in the array of animals. The effect of discourse/context was controlled for all questions irrespective of the *wh*-word that introduced them, not only in this study but also in Hickok & Avrutin (1996) as well as Thompson et al. (1999). The factors that varied were *wh*-word, word order and number of constituents but not discourse factors.

Consequently, the explanations that have been proposed in the psycholinguistic literature are also imprecise since they adhere to Pesetsky's (1987) dichotomy. They do not have explanatory power since there is no theory or indeed definition of discourse (a primarily verbal activity) and how the link between sentential syntax, semantics and subsequently discourse is established.

In this paper we have argued that an explanation regarding the comprehension of *wh*-questions based on the d-linking dichotomy is unsatisfactory. We have also argued that the way to explain comprehension asymmetries in *wh*-questions is by adhering to sentence structure, rather than discourse. Moreover, we are aware that the possibility of crossed dextral aphasia in HT may cloud the picture. We understand that pre-morbidly he was right handed although his hemiplegia was only evident on the left side which is contralateral to the site of lesion. However, as no further neuropsychological data were available further speculation is limited. HT represents an exceptional case regarding the locus of lesion, yet his performance is not random and suggests that canonicity impacts on comprehension of question forms as well as declaratives. The patterns observed in agrammatism can be seen in this subject. Admittedly, a single-case study limits any generalisations that can be made regarding the population from which our participant was drawn. Currently, more data are being analysed (Salis in preparation). Thompson et al. (1999:184) remark that "a theoretical explanation of a ... rare pattern ... may impede our progress toward understanding the nature of agrammatism". This may be true but a rare pattern also shows how the language system can fractionate subsequent to brain damage (cf. Shallice 1988). In this paper, we presented a clear pattern of comprehension deficit despite the unusual neurological characteristics of the participant.

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