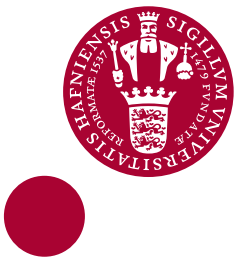

Is there a deictic vs. anaphoric pronoun dissociation in agrammatism?

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IS THERE A DEICTIC VS. ANAPHORIC PRONOUN DISSOCIATION IN AGRAMMATISM?

Abstract: *Background*: A characteristic feature of the acquired language disorder called agrammatism in analytic languages is that grammatical elements are often substituted or omitted. Pronouns have traditionally been regarded as grammatical *en bloc*, and therefore been assumed to be equally susceptible to substitution or omission in agrammatism. This assumption is unwarranted, however. Firstly, Ishkhanyan et al. (2017) argued that a distinction can be made between lexical and grammatical pronouns, and showed that the latter are more prone to omission in agrammatism than the former. Secondly, Avrutin (2000, 2006) argued that anaphoric pronouns are more severely affected in agrammatism if they depend on discourse for reference resolution than if reference can be resolved clause-internally.

Aim & Method: We investigate whether there is also a difference between deictic and anaphoric pronouns in agrammatism. Specifically, we hypothesize that anaphoric pronouns are more severely impaired than deictic ones, as in the case of the former reference resolution depends on memory, whereas in the case of the latter this is not (necessarily, at least) the case. For the purpose of testing this hypothesis, the production of deictic and anaphoric pronouns in semi-spontaneous speech (including autobiographic, descriptive and narrative tasks) in a Danish participant with agrammatism was analysed and compared with the production of such pronouns in semi-spontaneous speech in six non-brain-damaged subjects.

Results: The participant with agrammatism had a significantly lower anaphoric-deictic pronoun ratio than the controls. Both overall and in the individual tasks, she consistently produced more deictic than anaphoric pronouns, whereas the controls produced more

anaphoric than deictic pronouns in all but one task. The participant produced fewer anaphoric pronouns than the controls, but an amount of deictic pronouns comparable to the amount produced by the controls.
Discussion: The results confirm the hypothesis that anaphoric pronouns are more impaired than deictic ones in agrammatism. In fact, only anaphoric pronouns seem to be impaired. The results can be accounted for as reflecting that anaphoric pronouns depend on memory for reference resolution, while deictic pronouns do not, and that agrammatism involves memory impairment. However, the study can be considered a pilot study at best, as the data on which it is based are limited.

Key words: deixis, anaphora, agrammatism, discourse linking

1. Introduction

Agrammatism can be defined as follows:

> "a language disorder resulting from acquired brain damage, characterized by non-fluent speech with reduced speech rate and short grammatically impoverished sentences in which syntactic and morphological devices are limited. Word order difficulty, omission or substitution of bound and/or free-standing grammatical morphemes, and omission or nominalization of main verbs are common." (Thompson & Bastiaanse, 2012: 2)

Pronouns have traditionally been regarded grammatical *en bloc*, because they belong to closed classes and have a rather schematic meaning. They have therefore been assumed to be prone to substitution or omission in agrammatism. However, not all pronouns are equally effected in agrammatism. Firstly, Ishkhanyan et al. (2017) argued that a distinction can be made between lexical and grammatical pronouns, and in a study of pronoun production in French agrammatism they showed that the latter are more prone to omission than the former (cf. Stavrakaki & Kouvava 2003; Martínez-Ferreiro et al. 2017 on Spanish; Messerschmidt et al. 2018 on Danish). Secondly, Avrutin (2000, 2006) argued that anaphoric pronouns are more severely affected in agrammatism if reference must be resolved clause-externally, as in the case of non-reflexive object pronouns, than if it can be resolved clause-internally, as in the case of reflexives (see also e.g. Avrutin, Lubarsky & Greene 1999; Bos et al. 2014; Grodzinsky et al. 1993; Edwards & Varlokosta 2007).

The present paper investigates a third distinction that can be made within the class of pronouns: the distinction between deictic pronouns (such as *I* in the example below) and anaphoric pronouns (such as *he*).

(1) I need to get in touch with Peter, he is waiting for the budget.

This distinction is understood in accordance with Lyons (1977), who defines deixis as "the location and identification of persons, objects, events, processes and activities being talked about or referred to, in relation to the spatiotemporal context created and sustained by the act of utterance and the participation in it, typically, of a single speaker and at least one addressee" (Lyons 1977: 637). The reference of deictic expressions is thus determined by "the spatio-temporal zero-point (the here-and-now)" (Lyons 1977: 638). In contrast, the reference of an anaphoric expression depends on an element mentioned earlier in the preceding discourse (Lyons 1977: 660).

This understanding of the distinction entails a crucial difference in the processing of the two kinds of pronouns. In order to resolve the reference of an anaphoric pronoun, an element from the preceding discourse must be stored in memory. In other words, anaphoric pronouns, unlike deictic pronouns, depend on memory. This means that anaphoric pronouns may be harder to process than deictic ones, especially for people with agrammatism associated with damage to Broca's area, as Broca's area has been claimed to play a role in memory (see e.g. Ullman 2013, on procedural memory, and Rogalsky, Matchin & Hickok 2008, on working memory). Accordingly, we hypothesize that individuals with agrammatic aphasia have more problems producing anaphoric than deictic pronouns.

In order to test this hypothesis, we conducted a case study of one Danish agrammatic subject's use of deictic and anaphoric pronouns. The analysis consists in a comparison of the anaphoric-deictic pronoun ratio of the agrammatic subject with that of the control group. Our hypothesis entails that, in addition to producing fewer pronouns than the controls, the agrammatic person will produce a lower anaphoric-deictic pronoun ration than the controls.

The paper is structured in the following way: Section 2 surveys the research on pronouns in agrammatism relevant to the present study. Section 3 outlines the methodology. In section 4, we present our results, which are discussed in Section 5. Section 6 is a brief conclusion.

2. Previous research on pronouns in agrammatism

The research on pronouns in aphasia has concentrated on the contrast between clause-internally referring pronouns (i.e. reflexives) and clause-externally referring ones. Recently, a number of studies have dealt with a contrast between lexical and grammatical pronouns.

Much of the research on clause-internal vs. clause-external reference has been influenced by a model proposed by Avrutin (2000; 2006) according to which syntax *per se* is not impaired in agrammatism, but rather 'weakened', meaning that processing sentences depending on syntax is no longer the most economical way of processing (Avrutin 2006: 60). Based on Chomsky, Avrutin proposes that sentence processing involves what is termed "narrow syntax" (Avrutin 2006: 52). Narrow syntax is defined as: "a computational system that is isolated and encapsulated with respect to meaning; that is, that such a system conducts symbolic operations on lexical items, putting them together in some specific order that is allowed in a given language" (Avrutin 2006: 52). The information processed through narrow syntax has to be merged with the information of the linguistic discourse or the context which contains information like: "topic, focus, specificity and pronominal anaphora" (Avrutin 2006: 52). In Avrutin's model, the meaning of sentences is thus represented both at the level of narrow syntax and information structure. Avrutin claims that in agrammatic speakers the narrow syntax – since it is weakened – is no longer the cheapest way of processing information, and hence they rely more often on contextual information than their healthy counterparts. Therefore, for agrammatic subjects, deficits arise in those cases where narrow syntax and processing relying on the context are in competition (Avrutin 2006: 57):

(2) Jan zag zich.
'John saw himself.'

(3) Jan zag hem dansen.
'John saw him dance.'

The reflexive in (2) will only be processed by narrow syntax and cannot depend on an antecedent outside the sentence. Hence it does not provide difficulties for agrammatic subjects. The anaphor in (3) depends on discourse linking, i.e. its reference cannot be processed clause internally. Hence it provides problems for agrammatic speakers**:** "Because the syntactic dependency is the less

economical one for [the agrammatic] population they sometimes allow a semantic or discourse dependency between the matrix subject and the pronoun" (Avrutin 2006: 58).

However, the empirical research on clause-internally vs. clause-externally referring pronouns does not give as clear a picture. While some studies show a dissociation between clause-internally referring pronouns (reflexives) and clause-externally ("discourse-linked") referring ones (Grodzinsky et al. 1993; Piñango & Burkhardt 2005), other studies (Avrutin, Lubarsky & Greene 1999; Edward & Varlokosta 2007; Bos et al. 2014) do not show such a dissociation, but show either a deficit in both pronouns and reflexives or no deficit at all. Grodzinsky et al. (1993) carried out a yes/no judgement task, where 15 English-speaking subjects (including 8 agrammatic subjects) had to decide whether a picture fits a sentence or not. The experimenters presented the subjects with a picture that matched the grammatical reading of the sentences (for reflexives, a picture that matched intra-clausal co-reference, and for pronouns, a sentence that did not match intra-clausal co-reference) and a picture that depicted a mismatch with the grammatical reading. The agrammatic subjects performed at chance for the mismatch condition of the pronoun, i.e. they accepted sentences with a pronoun having intra-clausal reference. Reanalysis of the data by Bos et al. (2014: 22) showed, though, that the subjects had a yes-bias. When this is taken into consideration, the agrammatic speakers had an overall poor performance on the pronoun task compared to the reflexives. Interestingly, the task design used by Grodzinsky et al. (1993) was used by Edward and Varlokosta (2007), but did not yield the same result. Rather, it showed no dissociation between pronouns and reflexives. Bos et al. (2014) contrasted (among other things) clause-externally and clause-internally referring pronouns in agrammatic speech and speech produced by individuals diagnosed with fluent aphasia (Wernicke's). Only the fluent aphasic individuals had significantly worse performance on the clause-externally referring pronouns.

Three recent studies have argued that a certain distinction between lexical and grammatical pronouns is significant for the description of grammatically impaired speech. All three studies are based on the theory of the lexical vs. grammatical distinction in Boye and Harder (2012), which defines grammatical elements as elements that are conventionalized as discursively secondary (i.e. carriers of background information) and dependent on a host element. This definition entails that grammatical pronouns can be identified and distinguished from lexical ones by their lack of capacity for being focalized, addressed in subsequent discourse, and modified. Based on these diagnostics, Ishkhanyan et al.

(2017) distinguished grammatical French propositions (e.g. *je* 'first person singular nominative'*, me* 'first person singular accusative') from lexical ones (e.g. *moi* 'first person singular accusative') and found that pronouns classified as grammatical were more severely impaired in agrammatic speech than pronouns classified as lexical. Martínez-Ferreiro et al. (2019) made a similar distinction for Spanish pronouns, and showed a tendency for pronouns classified as grammatical to be more impaired even in cases of mixed aphasias. Messerschmidt et al. (2018) made the distinction for Danish pronouns and like Ishkhanyan et al. (2017) found – in a study of one individual with aphasia – that pronouns classified as grammatical are more impaired in agrammatic speech than pronouns classified as lexical.

What all these studies have in common is that ultimately they assume (with e.g. Kolk 1995) that the patterns of language production observed in aphasia are due to a processing deficit. As pointed out by a reviewer, however, they remain vague as to the nature of the deficit. A study that contrasts the production of deictic and anaphoric pronouns in aphasia can reveal whether this deficit pertains to memory (for instance, working memory, as suggested by Caplan 2012).

3. Methodology

3.1 Participants and speech samples analysed

To test our hypothesis that anaphoric pronouns are more impaired than deictic ones in agrammatism, we consulted The Danish Aphasia Corpus (DAC, Martínez-Ferreiro & Boye 2018), which consists of semi-spontaneous speech samples elicited by three different tasks: 1) a personal interview including questions about the illness story and former occupation, 2) a picture description task (Cookie theft; BDAE: Goodglass & Kaplan 1983), and 3) narrative retelling (The Frog story, Mayer 1969).[1]

After the selection of the samples, we looked at the overall pronoun production and compared anaphoric-deictic pronoun ratios in the semi-spontaneous speech of 6 non-brain-damaged Danish speaking subjects (3 men and 3 women; 50-74 y.o.; mean age: 58 y.o.; SD: 9) with the ratios in the semi-spontaneous speech of one female Danish speaking agrammatic subject (JA). JA was 43 years old at the time of the interview and diagnosed with stroke-induced Broca's aphasia

[1] To make the data comparable to other existing crosslinguistic sources, the DAC adheres to the standard guidelines for administration of the Aphasia Bank protocol.

(WAB-AQ: 68.6; MLU: 5.23). The interview was done 8 years and 7 months post onset.

Only words without repetitions were counted. For JA, our speech sample consisted of altogether 565 words (interview: 185; picture description: 136; narrative: 276); for the control group, the mean sample size was 842.7 words (interview: 284; picture description: 269.8; narrative: 288.8).

3.2 Pronoun classification

First and second person pronouns (*jeg* 'I', *du* 'you') are clear cases of deictic pronouns, as they respectively refer to the speaker and the addressee accessible through the speech situation (Löbner 2013: 64). Other pronoun types were less straightforwardly classified. In particular, demonstratives are ambiguous between a deictic and an anaphoric reading (cf. Hansen & Heltoft 2011: 562), and may be hard to classify in context. A tricky example from the speech sample analysed is (4).

(4) jeg beskriver først det jeg ser umiddelbart
det er <en> sådan en meget stereotyp øh hverdagssituation
'I will first describe what I see initially
it is <a> kind of a very stereotypical uhh everyday situation'

In (4), it is not clear, whether the demonstrative (marked by underscore) in the second line refers deictically to the picture present in the context, or anaphorically to a previously mentioned referent (*det jeg ser umiddelbart* 'what I see initially'). Since demonstratives – when ambiguous in context – can always be read as deictic, we classified them as deictic pronouns. Only in cases where deictic reference is impossible or implausible, did we categorise them as anaphoric pronouns. Results will be presented both including and excluding ambiguous pronouns.

Also, the decision which words to include in the study was not in all cases straightforward. On the one hand, the Danish proform *der* 'there' is in the literature usually analysed as an adverb, and only sometimes as a pronoun. Since it is a relatively frequent proform and behaves just like the analysed pronouns, however, we included it in the study. Like demonstratives, *der* is often ambiguous in context between a deictic and an anaphoric reading. In other cases, it is found in a special *der er*-construction ('there is …'):

(5) Der er en <en> mand (…)
'there is a <a> man'

One might argue that in this construction, *der* is deictic. Alternatively, however it may be analysed as a non-referential part of a fixed expression (e.g. Hansen & Heltoft 2011: 1215). For these reasons, we deal with *der* as if it were a demonstrative pronoun, and also give results where *der* is excluded (cf. the discussion of demonstratives above).

We excluded the word *som*, which is sometimes analysed as a relative pronoun. The reason for this is that there are good arguments for analysing it as a subordinate conjunction (for instance, it readily co-occurs with genuine relative pronouns). We also excluded reflexive pronouns in order not to conflate the distinction we are after with the distinction between intra- and extra-clausal reference discussed by Avrutin and others. That is, we only included clause-externally referring pronouns.

In addition, we excluded pronouns with cataphoric reference. Sometimes a distinction is made between pronouns that follow (anaphoric) and pronouns that precede the antecedent (cataphoric) (e.g. Lyons 1977: 659). Often, however, the term 'anaphoric' is used in a way that subsumes anaphoric and cataphoric reference. Our reason for excluding pronouns with cataphoric reference from the study is that the role of memory in cataphoric reference is less clear than in anaphoric reference. The exclusion of cataphoric pronouns subsumes empty subjects such as those found in *it*-clefts. These are excluded since they should be classified as cataphoric – if they have reference at all.

(6) det er faderen der sidder på tæppet
'it is the father that is sitting on the blanket'

Pronouns used in cited speech were also excluded since – even if they are deictic – they may to some degree depend on memory for reference resolution. Indefinite pronouns, including generic pronouns, like *et eller andet, noget* 'something' and *man* 'one-generic' were excluded because these often neither have deictic nor anaphoric reference. In the case of the generic pronoun *man*, this might imply a source of error and distort the proportion of the use of deictic pronouns since it is in some cases used as an alternative to a first person pronoun (*Jeg ser – man ser* 'I see – one sees').

3.3 Statistical analysis

Our data are limited, but we tentatively used Fisher's exact test to assess whether the anaphoric-deictic pronoun ratios we found in the speech of JA differ significantly from those we found in the speech of the control group.

4. Results

We analysed 584 pronouns, 303 anaphoric and 281 deictic ones. The agrammatic subject produced 10 anaphoric and 29 deictic pronouns, while the controls produced 251 anaphoric and 228 deictic pronouns. These numbers include the ambiguous cases (cf. section 3.2). In a second analysis, we have subtracted the ambiguous cases. The agrammatic subject produced 7 clear (i.e. unambiguous) cases of anaphoric pronouns and 23 clear cases of deictic pronouns. The controls produced 232 clear cases of anaphoric pronouns and 143 clear cases of deictic pronouns. Overall, the controls produced more pronouns (control mean = 9.5 pronouns per 100 words) than JA (6.9 pronouns per 100 words). Hence, there is a general decrease in the number of pronouns produced by JA. This does not tell us, however, whether the distribution of anaphoric and deictic uses is the same.

Table 1 gives the anaphoric-deictic pronoun ratios for JA and the control group overall as well as for the individual tasks. It also gives two-tailed P-values, obtained by Fisher's exact test, for the differences between JA and control ratios. For absolute figures and individual control results, see Appendix and below.

As can be seen in Table 1, the anaphoric-deictic pronoun ratios found for JA were consistently lower than those found for the control group – both overall and in each of the individual tasks. Overall as well as in the picture descriptions and narratives, in fact, JA's ratios were below 1, while the control group ratios were above 1; thus, JA produced fewer anaphoric than deictic pronouns, whereas the control group produced more anaphoric than deictic pronouns. The overall difference in anaphoric-deictic pronoun ratios is highly significant by Fisher's exact test, both when dubious classifications are included and when they are excluded. That is, the anaphoric pronouns are significantly more impaired than the deictic ones. In fact, our results indicate that only the anaphoric pronouns are impaired: JA produced 1.77 anaphoric pronouns per 100 words (1.24 clear cases), while the controls produced, on average, 5.0 anaphoric pronouns per 100 words (4.6 clear cases), that is, more than three times as many as JA. In contrast, the figures for deictic pronouns are comparable across the groups: JA produced 5.13

deictic pronouns per 100 words (4.07 clear cases), whereas the controls produced, on average, 4.5 deictic pronouns per 100 words (2.8 clear cases).

		Anaphoric/deictic ratio – total	Anaphoric/deictic ratio – clear cases
Overall	JA	0,34	0,30
	Controls	1,10	1,62
	Fisher's exact	P=0.0014*	P<0.0001*
Interview	JA	0,50	0,29
	Controls	0,54	0,45
	Fisher's exact	P=1.000	P=0.4362
Picture description	JA	0,67	0,67
	Controls	1,56	4,76
	Fisher's exact	P=0.3861	P=0.0473*
Narrative	JA	0,08	0,17
	Controls	2,36	9,17
	Fisher's exact	P<0.0001*	P<0.0001*

Table 1. Anaphoric-deictic pronoun ratios for the patient and the control group, with two-tailed P-values obtained by Fisher's exact test; * indicates significance at a threshold set to 0.05.

As also shown in Table 1, the anaphoric-deictic pronoun ratios of JA do not differ significantly from those of the control group in all tasks. In particular, while a highly significant difference is found in the narrative task, the difference in the interview task is not significant at all. This variation can be attributed to the nature of the tasks (rather than, for instance, to gender or age differences in the control group). The narrative task calls for anaphoric pronouns to track referents through the narration, and to establish textual coherence. Since our hypothesis is that anaphoric pronoun production is selectively affected in agrammatism, it is natural to expect that the hypothesis is confirmed most clearly in the narrative task. In contrast, the interview task calls for the use of deictic pronouns – especially, 1st person pronouns – and it would therefore seem badly suited for testing a hypothesis centred on anaphoric pronouns.

Above, we have compared JA with the controls as a group. The patterns found at group level hold also, with one exception, for the clear cases of pronouns when JA is compared to each of the controls individually, as can be seen in the Appendix: For each task as well as overall, JA's anaphoric-deictic pronoun ratio JA was consistently lower than the ratios for the control individuals. The exception

is found in the interview task, for which control subject 03 ('CTRL 03') had a ratio which equals that found for JA.

5. Discussion

Our primary hypothesis was that anaphoric pronouns are more impaired than deictic pronouns in the speech of individuals with agrammatism. Therefore, we compared the production of anaphoric and deictic pronouns in a speech sample obtained from one individual with agrammatism, JA, with the production of anaphoric and deictic pronouns in speech samples obtained from six control subjects.

The results support our hypothesis. Firstly, JA produced fewer pronouns than the controls, which indicates that her pronoun production is impaired. Secondly, her anaphoric-deictic pronoun ratios were consistently below one, both overall and in all subsamples, while those of the control group were above one, overall and in all subsamples except the interview sample. Thus, JA consistently produced less anaphoric than deictic pronouns, whereas the control group tended to produce more anaphoric than deictic ones. Thirdly, JA's overall anaphoric-deictic pronoun ratio was significantly lower than that of the controls, which entails that her production of anaphoric pronouns is more impaired than her production of deictic pronouns.

In fact, our results suggest that only the anaphoric pronoun production is impaired at all, and that the deictic pronoun production is unaffected. JA produced less than one third of the anaphoric pronouns produced per 100 words on average by the controls, whereas JA and the controls produced comparable proportions of deictic pronouns.

Our hypothesis was based on the theoretical assumption that only anaphoric pronouns depend on memory for reference resolution. Our results therefore support this assumption, as well as a link between memory and Broca's area (which is damaged in JA's case). More generally, the results support procedural accounts of agrammatism. For instance, they are compatible in general terms with Kolk's (1995) suggestion that individuals with agrammatism adapt their language to prevent processing overload (Kolk 1995: 299), and with Caplan's (2012) claim that agrammatism is due to a reduction of processing resources, possibly a loss of working memory capacity (Caplan 2012: 47).

The overall difference between anaphoric-deictic pronoun ratios seems to be due mainly to the difference in the narrative subsample. In the interview subsample, there was no significant difference between JA and the controls, and in

the picture-description subsample, the difference was significant only when dubious pronoun classifications were excluded (cf. Table 1). This pattern might be expected. The interview as an autobiographic task is a context that would invite the speakers to use a lot of deictic pronouns, in particular forms referring to the 1st person, since the task requires the subject to refer to her- or himself. The lack of a difference in the interview task might thus be due to the fact that the task does not invite the use of a lot of anaphoric pronouns in the first place. In contrast, especially the narrative task and to some degree the picture description task invite for use of anaphoric pronouns, since these tasks require reference to already mentioned referents in constructing a narration.

The results raise the question how JA manages to communicate with so few anaphoric pronouns. A qualitative analysis reveals that in many cases, where one would expect an anaphoric pronoun, JA uses a proper name, a noun or a noun phrase with a noun in it. An example of this is found in (7), where JA consistently uses the proper name *DL* to refer to her ex-boyfriend, also in places where an anaphoric pronoun would be expected.

(7) Ekskæreste hedder DL. Og DL og jeg kommunikerer fordi DL tid
'Ex-boyfriend is called DL. And DL and I communicate because DL time'

It should be noted that proper names, nouns or noun phrases also appear in contexts where one would expect a deictic pronoun. However, deictic pronouns are 'substituted' to a far lesser degree than anaphoric pronouns.

Finally, it should be stressed that our results should be considered with caution as they are based on limited data.

6. Conclusion

Research on pronouns in aphasia has focused on the distinction between clause-internally and clause-externally referring anaphoric pronouns and, recently, the distinction between lexical and grammatical pronouns. The present study is the first to deal with the distinction between anaphoric and deictic pronouns. Based on data from one Danish speaker with agrammatism and six non-brain-damaged controls, it was shown that anaphoric pronouns are more impaired than deictic pronouns – in fact, only anaphoric pronouns seem to be impaired at all.

These findings were expected, based on the assumption that only anaphoric pronouns depend on memory for reference resolution, and based on the link between Broca's area and memory (e.g. working memory or procedural memory).

The findings thus support not only established ideas about pronouns, but also procedural accounts of agrammatism in terms of cognitive resource reduction. They also suggest the contours of yet another piece in the complex puzzle of pronoun production. Together, the distinction between anaphoric and deictic pronouns, the distinction between lexical and grammatical pronouns, and perhaps the distinction between clause-externally and clause-internally referring pronouns may give a detailed idea of the causes of agrammatism and other types of aphasia, and a powerful tool for differential diagnosis. The present study is based on limited data, however, and needs to be followed up by studies of larger data sets and structured tasks designed to control for context-dependent variation.

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