Agrammatic speech is characterized by –among other things- a relatively low number of determiners and pronouns in languages like English, Dutch and German (Menn & Obler, 1988; Ruigendijk, 2002). Determiners and pronouns have several properties in common: *syntactically*, their presence is related to the presence of case-assigning categories such as verb finiteness and transitive verbs (following Chomsky, 1981). Furthermore, determiners and pronouns are in some languages (e.g. Dutch, German) marked for *lexical* features like gender. And finally, both types of elements have *pragmatic* properties (i.e. properties that play a role at discourse level). Indefinite determiners are used for the introduction of new entities and definite determiners and pronouns usually refer to given or known information.

> The central question of this study is if and in how far each of these properties contributes to the problems agrammatic speakers have with the production of determiners and pronouns.

The syntactic and lexical properties have been investigated in some studies. Ruigendijk et al. (1999), for example, show that the presence of determiners and pronouns in Dutch and German agrammatic production is related to the presence of case-assigning categories such as transitive verbs and verb finiteness. They therefore argue that the lack of determiners and pronouns in agrammatic production can at least partly be explained by the problems agrammatic speakers have with these case-assigning categories, such as verbs and verb finiteness. The idea behind this is that when case cannot be assigned due to the absence of a case-assigning category, determiners and pronouns cannot be realized (see Ruigendijk, 2002 for a detailed account).

Gender information, however, does not seem to be problematic in agrammatism. Bastiaanse and others (2003), for example, show that Dutch and German agrammatic speakers did not make many gender errors in the determiners that they produce. The same has been found for pronouns in spontaneous speech (Ruigendijk, 2002).

Less clear results have been obtained on the effect of the pragmatic properties of both determiners and pronouns. Månsson and Ahlsén (2001) demonstrate that Swedish speaking agrammatic patients omit indefinite determiners more often than definite determiners. This can be related to the pragmatic properties of indefinite determiners. However, as Havik & Bastiaanse (2004) pointed out, there is also a morphological difference between the two in Swedish. Swedish definite determiners are bound morphemes, realized after the noun, whereas indefinite determiners are free prenominal morphemes. The different omission rates can very well be due to the difference between bound and free morphemes. Havik & Bastiaanse (2004) have therefore analysed Dutch agrammatic speech production and found a non-significant effect in the opposite direction, higher omission rates for definite than indefinite determiners.

As far as we know, there have been no studies that examined the omission *and* production of determiners *and* pronouns in agrammatism at the same time taking into account the syntactic, lexical and pragmatic similarities of these elements. To unravel the factors that are involved in the agrammatic problems with determiners and pronouns, we replicated the earlier studies described above and in addition analysed the production rates of definite and indefinite articles *and* pronouns in Dutch agrammatic speech production and examined whether these were produced correctly, with respect to gender and definiteness.

We assume that agrammatism is primarily a syntactic disorder[1]. Therefore, and based on earlier findings, we expect to find:

-a high omission and low production rate for both determiners and pronouns,

-a relation between the production of determiners and the production of case-assigning elements,

-no effect of definiteness for determiners, and no pragmatic errors.

Methods

We analysed the spontaneous speech production of eight Dutch individuals (four male, four female, mean age 61.1) who were all diagnosed with agrammatic Broca's aphasia. Their data was compared to that of 12 healthy individuals (mean age 56.3). A speech sample of 300 words from each participant was transcribed and analysed following Saffran and others (1989).

All nouns were scored for the presence or absence of a determiner (definite or indefinite), proper names or fixed expressions, and those containing numerals or quantifiers were not further analysed. It was determined for all nouns whether they required the presence of a determiner. This resulted in the amount of Nouns Requiring Determiners (NRDs). It was then decided whether these determiners should be definite or indefinite or whether this could not be determined, to examine the omission rates of definite and indefinite determiners.

Results

The spontaneous speech analysis replicated earlier results, as can be seen in Table 1. First, agrammatic speakers realized less determiners and pronouns than the controls (Mann Whitney, determiners: $Z=-3,320$, $p<.05$; pronouns: $Z= -3,437$, $p<.05$). Furthermore, a relationship was observed between the realization of a case assigning category and the presence of a determiner. Additionally, the omission rate of the indefinite determiners (65%) was higher than the omission rate of definite determiners (33%, Wilcoxon, $Z=-2,249$, $p<.05$) for the agrammatic speakers. They also produced relatively fewer indefinite determiners than the control group (12.2% vs. 27.7 % of all determiners, Mann Whitney, $Z=-2,087$, $p<.05$), whereas the relative number of definite determiners was the same (47.7% vs. 48.7%, $Z=-0.231$, $p=.817$). Finally, when determiners and pronouns were realized, only few gender and pragmatic errors were made (out of the 10% gender errors, 7% were made by one patient who overused the non-neuter demonstrative 4 times for neuter nouns).

Insert Table 1

Conclusion

As expected and replicating earlier studies, our Dutch agrammatic patients produced less determiners and pronouns than the healthy controls. In line with Ruigendijk et al. (1999), the presence of determiners was found to be related to the production of case-assigning elements. As for the omission and production rates of definite and indefinite determiners, our results seem to be more in line with the Månsson and Ahlsén (2001) study than with Havik and Bastiaanse (2004), since our patients omitted more indefinite determiners and produced fewer indefinite determiners (compared to the control group). A possible explanation for the difference with the Havik and Bastiaanse results is that they did not analyse demonstrative and possessive determiners (which are definite determiners), thus ending up with a relatively low number of definite determiners (Havik, p.c.). This, however, still does not explain their much lower omission rate for indefinite determiners (39%). At the moment, we are following

[1] We deliberately do not specify or discuss the underlying cause of these syntactic problems here. This discussion, although interesting and important is beyond the scope of this study.

up on these results with an elicitation task to investigate the pragmatic properties of determiners and pronouns in a more controlled way.

Summarized, these results indicate that lexical properties, or at least gender information, of determiners and pronouns is not the cause of the agrammatic problems with these elements. The results do suggest that syntactic properties, more specifically the case assignment relationship between on the one hand determiners and pronouns and on the other hand transitive verbs and verb finiteness play a role (cf. Ruigendijk, 2002), play an important role. Unfortunately, it cannot be concluded or excluded on the basis of our results that the pragmatic properties of determiners and pronouns are part of the agrammatic problems' source. The finding that hardly any definite determiners or pronouns were used to refer to new information suggests that pragmatic knowledge is preserved. The difference between omission and production rates may mean, however, that definite determiners are less impaired than indefinite determiners. The cause of this possible difference remains for future research. [word count: 1199]

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	Agrammatics	*Controls*
Mean number of determiners (indefinite and definite)	9.8	22.6
Mean percentage of indefinite determiners	12.2%	28.7%
Mean percentage of definite determiners	47.7%	48.7%
Mean number of (personal) pronouns	10.4	24.4
D/NRD ratio indefinites	0.35	n.a.
D/NRD ratio definites	0.67	n.a.
No. of N with D plus case assigner	34	n.a.
No. of N with D minus case assigner	6	n.a.
Relative no. of gender errors on D	10.2%	n.a.
Relative no. of pragmatic errors on D	5.3%	n.a.

Table 1: mean number of determiners and personal pronouns (in a spontaneous speech sample of 300 words). Mean percentage of indefinite and definite determiners (NB these do not add up to 100%, since quantifiers and numerals were not included in the number of definite determiners, but were included in total number of determiners). D/NRD ratio of determiners (D) from nouns requiring a determiner (NRD) for indefinite and definite determiners. Total number of Nouns (N) with determiners (D) plus and minus case assigner (i.e. finite verb for subjects, transitive verbs for objects and preposition for PPs, following Ruigendijk et al. 1999). Relative number of gender and pragmatic errors on determiners (% of total number of realized determiners). Not analyzed (n.a.) were the variables for which controls performed almost perfect).