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NEGATIVE POLARITY ENVIRONMENTS IN THE SPONTANEOUS SPEECH OF DUTCH INDIVIDUALS WITH APHASIA

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Abstract

In the current study, I will investigate the production of negative polarity items and especially the context in which they occur in a group of 10 non-fluent speakers with Broca's aphasia and compare these with those of a group of 10 fluent speakers (diagnosed with either anomic aphasia or Wernicke's aphasia) and 10 control speakers in spontaneous speech. Although especially non-fluent speakers do have problems in producing grammatical sentences, it has been shown that negation seems to be spared in these speakers. In contrast however to the large number of negations produced by the aphasic speakers, the number of negative polarity environments was strikingly low as compared to the control speakers in this study. Although not all individual control speakers used such environments, this clearly contrasted the number of cases of such environments in the group of control speakers.

Keywords: negative polarity, aphasia, spontaneous speech

1. Introduction

“Why do languages have such odd and complicated things as negative and positive polarity items? Surely, life would be much easier without them, and to be entirely frank, I have not yet

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encountered a single such item that I could not do without, if forced to. They appear to be part of the stylistic icing on the linguistic cake, adding color to texts and speech, making our daily conversations not only more complex than they need to be, but perhaps also a bit more fun.” (Hoeksema 2010, p. 187)

Negative polarity as icing of the linguistic cake, has been a topic of research interest in the work of Hoeksema for about 30 years. In these years, the distribution, grammaticalization historical perspective, multilingual aspects of negative polarity have been covered in his work (e.g. Hoeksema, 1994; 2008a,b; 2010; 2017). The mechanisms that underlie the neural processing of negative and positive polarity items have been studied by Yurchenko et al. (2013). They found a dissociation in these mechanisms between positive and negative polarity items where positive polarity items seem to be more sensitive to a wider discourse context, whereas negative polarity items are expected to be more sensitive to the local lexical context. This was concluded from an EEG-study in which violations to a negative polarity context lead to an N-400 response, which is associated with the absence of an negative context being congruent to the negative polarity item. Violations of positive polarity items resulted in a P600-repsonse, which was related by the authors to a difficulty in integrating the context and the positive polarity item due to a violation of licensing conditions or “a search for a licenser in the wider discourse context” (Yurchenko et al., 2013, p. 132).

What is clear from, for example, the study of Yuchenko et al. (2013) is that both positive and negative polarity items need a licensing environment. Koster and Van der Wal (1996) come up with three approaches of what licensers in these environments have in common as characteristic. A formal semantic approach has been taken by Ladusaw (1979) where the licensing of negative polarity items is related to the logical properties of certain expressions or structures. In other words, this means that these items can only occur in downward entailing environments. A more syntactic/pragmatic approach is taken by Linebarger (1980). According to her a negation is always needed to license the negative polarity environment. If there is no negation, the negative implication of the sentence licenses this environment. Progovac (1994) comes up with a fully syntactic approach, relating the licensing of polarity items to the Binding Theory. Within this approach, negative polarity items must obey Principle A, which means that they have to be bound by a licenser, like a negation.

Koster and Van der Wal (1996) tried to find out what the effect would be of the need for licensing of negative polarity items in a confined grammar, namely in language acquisition. They focused on the use of the Dutch negative polarity verb ‘*hoeven*’ (need to). From their study it was clear that children from a very early age already know that ‘*hoeven*’ is a specific verb that asks for a licensing context. However, young children still have problems in finding out what the specific contexts are to allow licensing.

In the current study, I will focus on the use of negative polarity items and their context in a group of aphasic speakers. Although especially non-fluent speakers with Broca’s aphasia (agrammatic speakers) do have problems in producing grammatical sentences, Bastiaanse et al. (2002) showed that Dutch and Norwegian agrammatic speakers (in contrast to English and Spanish agrammatic speakers) were equally well in producing negative as affirmative sentences. In addition, fMRI studies revealed that activation is shown in the temporo-parietal region for positive polarity items, whereas for the processing of negative polarity items mainly the pre-motor cortex (Brodmann area 6) was activated (Christensen 2020). Based on these outcomes, also Christensen concluded that negation is relatively spared in Broca’s aphasia.

While negation might be spared in Broca’s aphasia, these individuals do seem to have licensing problems, especially in relation to discourse linking. Hickok and Avrutin (1995) found that for agrammatic speakers sentences with *which*-questions that need discourse linking to be interpreted, are more difficult to comprehend than sentences with *who*-questions, being locally bound. Bastiaanse et al. (2011) showed that Broca’s aphasic or agrammatic speakers, concerning time reference, have significantly more problems with reference to the past than with reference to the present or the future in many different languages including Dutch. Following Zagana (2003), they explained these problems with past tense due to the need for discourse linking, whereas present and future tense can be interpreted locally.

In the current study, I will investigate the production of negative polarity items and especially the context in which they occur in a group of 10 non-fluent speakers with Broca’s aphasia and compare these with those of a group of 10 fluent speakers (diagnosed with either anomia or Wernicke’s aphasia) and 10 control speakers in spontaneous speech. Based on Bastiaanse et al. (2002), it was expected that the aphasic individuals will not have problems with negation and in line with Yuchenko et al. (2013), it was expected that the aphasic individuals will also produce a comparable number of negative polarity environments as the control speakers, as for the relation between negative polarity items and its environment no discourse linking is needed.

2. Methods

2.1 Participants

In this study the spontaneous speech of 20 individuals diagnosed with aphasia were analyzed. 10 individuals (5 female, mean age 52,7) were diagnosed with Broca's aphasia on the basis of the Aachen Aphasia Test (Graetz, De Bleser & Willmes, 1992). This diagnosis was confirmed by the clinical judgement of someone who did not know the individual with aphasia. The data of the individuals with non-fluent Broca's aphasia were compared to those of 10 individuals with fluent aphasia (2 female; mean age 57,2), consisting of 6 individuals with anomic aphasia and 4 individuals with Wernicke's aphasia, all diagnosed with the Aachen Aphasia test, again confirmed by clinical judgement. Next, the spontaneous speech of 10 control speakers (5 female, mean age 52,1), was also analyzed for comparison. In table 1, additional participant information can be found.

2.2 Materials and procedure

The spontaneous speech data come from the study of Jonkers (1998). The participants were interviewed at home or in the clinic. All interviews were tape-recorded and transcribed afterwards. Around 300 words of spontaneous speech were selected, which relates to approximately five minutes of speech. 300 words is a norm that is mostly used for spontaneous speech analysis in the Netherlands (c.f. Vermeulen, Bastiaanse & van Wageningen, 1989; Bastiaanse & Jonkers 1998). This norm is based on a study by Brookshire and Nicholas (1994) who showed that smaller samples were less reliable, whereas bigger samples did not lead to a higher reliability.

Table 1: Participant information (m: male, f: female; tpo: time post onset in months; CVA: cerebrovascular accident, CHI: closed head injury)

	age	gender	aphasia type	tpo	etiology
Nonfluent speakers					
B1	45	m	Broca	77	CVA

B2	38	v	Broca	154	CVA
B3	51	v	Broca	10	CVA
B4	63	v	Broca	125	CVA
B5	61	m	Broca	11	CVA
B6	48	v	Broca	15	CVA
B7	54	m	Broca	34	CVA
B8	71	m	Broca	9	CVA
B9	53	m	Broca	12	CVA
B10	43	v	Broca	18	CVA
Fluent speakers					
F1	29	m	Wernicke	3	CHI
F2	35	m	anomic	7	CHI
F3	47	m	anomic	3	Encephalitis
F4	80	m	anomic	6	CVA
F5	53	m	anomic	13	CVA
F6	74	m	anomic	12	CVA
F7	62	v	Wernicke	4	CVA
F8	76	v	Wernicke	12	CVA
F9	35	m	anomic	28	CHI
F10	81	m	Wernicke	35	CVA
C9	51	v			
C10	52	v			
Control speakers					
C1	52	v			
C2	54	m			
C3	58	m			
C4	47	m			
C5	31	m			
C6	59	v			
C7	59	m			
C8	58	v			
C9	51	v			
C10	52	v			

To obtain the spontaneous speech sample, the same questions were asked that were also asked for the analysis of spontaneous speech of the Aachen Aphasia Test (Graetz et al. 1992). The first question addresses what has happened to the individual with aphasia, that lead to his or her language problems. Instead of this, the control speakers were asked to tell about the last time they were ill. The other questions deal with work, family and hobbies.

For the current study every instance of a negation word was noted. The following negations were considered: *niet* (*not*), *niets/niks* (*nothing*), *niemand* (*nobody*), *nauwelijks* (*hardly*), *nergens* (*nowhere*) and *hoeven* (*need to*). The total number of these words, separately and in sum were counted per person. Next, for every negation, the context was analyzed to find out whether there was a negative polarity environment (e.g.: *it is a chance you will never get*) in contrast to for example pure word or sentence negation (*I don't know; I am not 24*). Full repetitions were not considered (*I don't know, don't know*).

2.3 Analysis

The total number of negations was counted. A Kruskal-Wallis test will be used to compare the scores of the different groups. Post-hoc a Mann Whitney U test will analyze the contrast between the groups. Negative polarity environments will be recognized and the number of these contexts will be related to the total number of negations in percentages. The percentages of the different groups will also be analyzed with a Kruskal-Wallis test and post-hoc Mann Whitney U tests.

3. Results

In table 2 an overview is given of all the individual scores for every negative item. The cases where a negative polarity environment was recognized are given as well in numbers. Below the table the actual contexts are presented.

The control speakers used 52 negations (range 1-12), whereas the non-fluent Broca's aphasic speakers produced 76 negations (1-18) and the fluent speakers 65 (1-11). However, the Kruskal-Wallis test did not reveal significant differences between the three groups ($H=1.46$, $df=2$, $p>0,05$).

Table 2: individual number of negations and negative polarity environments (NPE: negative item in the context of a negative polarity environment; *niet* (not), *geen* (no), *niks/niets* (nothing), *niemand* (nobody), *hoeven* (need to), *nooit* (never), *nauwelijks* (hardly), *nergens* (nowhere). *Hoeven* (need to) is addressing a negative environment due to its meaning and therefore also counted as NP context).

Control speaker	Niet	NPE Niet	geen	niks	NPE niks	niemand	hoeven	nooit	NP E nooit	nauwelijks	nergens	sum	% NP context
c1	2	2	2	1			2			1	1	11	0,36
C2	4		2				1					7	0,14
C3	3											3	0
C4	8						1	1	2			12	0,25
C5	4	1										5	0,20
C6									1			1	1,00
C7		1										1	1,00
C8	3		1									4	0
C9	3				1							4	0,25
C10	1		1			1		1				4	0
Total	28	4	6	1	1	1	4	2	3	1	1	52	0,23
Non-fluent speaker													
B1	13		1	4								18	0
B2	3											3	0
B3	5											5	0
B4	10			1								11	0
B5	3			1								4	0
B6	7			1								8	0
B7	1											1	0
B8	6											6	0
B9	4			2								6	0
B10	10			4								14	0
Total	62	0	1	13	0	0	0	0	0	0	0	76	0
Fluent speaker													
F1	7			3		1						11	0
F2	5											5	0

F3	1											1	0
F4	3											3	0
F5	6			3				1				10	0
F6	6		1	2			1					10	0,10
F7	9					1		1				11	0
F8	4			1								5	0
F9	3		1									4	0
F10	4			1								5	0
Total	48	0	2	10	0	2	1	2	0	0	0	65	0,02

In 23% of the cases, the control speakers used a negation in relation with a negative polarity environment. This is in great contrast with the Broca's aphasic speakers who never made use of any negative polarity environment, but also with the fluent speakers, who only show 1 (F6) instance (*hoeven*) of a negative polarity environment (0,02 %). Due to total absence of this environment in the Broca's aphasic speakers and the only 1 instance in the fluent speakers, no statistics were performed to compare these outcomes with the control speakers.

3.1 Overview of the specific negative polarity environments

Below the list of negative polarity environments produced by the control speakers, is presented (1). Also the instances of *hoeven* (need to) were counted as a negative polarity environment due to the meaning of this verb. Between brackets it is mentioned which control speaker uttered the specific phrase.

- (1) *kan absoluut niet* ("can absolutely not"); *ik ga de deur niet uit* ("I do not walk out of the door")(C1)
het is een kans die je nooit meer krijgt ("it's a chance you will never get again"); *ik heb nooit een muts op* ("I never wear a cap")(C4)
niet al te bergachtig ("not too mountainous")(C5)
nog nooit van huis geweest ("never been from home")(C6)
niet te vergeten de sport ("not to forget: sports")(C7)
daar is niets aan ("there is nothing to that")(C9)

4. Discussion

In the current study, I considered the production of negative polarity environments in the spontaneous speech of aphasic speakers. As expected on the basis of earlier studies (Bastiaanse et al. 2002; Christensen, 2020), individuals with aphasia did not show problems in the production of negations. Especially Broca's aphasic speakers even produced much more negations than the control speakers, although this difference was not significant. In contrast however to the large number of negations produced by the aphasic speakers, the number of negative polarity environments was strikingly low as compared to the control speakers in this study. No non-fluent Broca's aphasic speaker produced such a context and in the fluent speakers only one instance of *hoeven* (need to) occurred. Although not all individual control speakers used such environments, this clearly contrasted the number of cases of such environments in the group of control speakers. In the control speakers in 23% of the cases a negation was produced in a negative polarity environment, where the production of *hoeven* (need to) was included in this overview of negative polarity environments.

It was expected that speakers with aphasia would not have problems with licensing contexts if no discourse linking would play a role. In particular this would hold for the Broca's aphasic speakers (cf. Hickok & Avrutin 1995; Bastiaanse et al. 2011). Yurchenko et al. (2013), showed in an ERP-study that a violation of a negative polarity environment lead to an N-400, which these authors related to sensitivity to the local lexical context. From this, and the outcomes of the current study, it might therefore be concluded that aphasic speakers, independent of their type of aphasia are not able to create sensitive negative polarity contexts when producing a negation. This local licensing problem seems to be separate from the discourse linking problems described for Broca's aphasic speakers, and restricted to negative polarity contexts, as for example, Broca's aphasic speakers are able to process local binding as in anaphora, as has been shown by Hickok and Avrutin (1995).

From the almost complete absence of negative polarity contexts in spontaneous speech, I concluded that aphasic speakers have problems in providing such contexts. However, from the outcomes of the control speakers, we must be careful with such a conclusion, as also a few control speakers did not produce a negative polarity context in about 5 minutes (300 words) of speech, despite the production of negations. Spontaneous speech and negative contexts were used in the current study as they give the optimal opportunity to produce negations and a negative polarity environment as was shown by the control speakers. Positive contexts, especially in aphasic speakers are more difficult to consider, as there is no clear opposite to

negations for these contexts. Experimental situations in which negative polarity contexts would be elicited from the aphasic speakers are difficult to implement, due to the many different contexts that may occur and the problems in sentence construction that at least the Broca's aphasic speakers suffer from. Nevertheless, one way to at least find out about the sensitivity of aphasic speakers for a negative polarity context might be considered. Koster and Van der Wal (1996) invented the Elicited Reproduction In Context task (ERIC), based on the paradigm described by Lust, Chien and Finn (1986). With this task children were tested by providing them a negative or positive context after which they had to repeat a final sentence in which there was either a violation or no violation to this context (like **ik hoef wel een appel* (I do want an apple)). In cases with a violation children were often changing the sentence into a context that would fit in this way showing sensitivity for the specific meaning of *hoeven*. In a future study, it would be interesting to use a comparable test to see whether aphasic speakers do have this same sensitivity or not.

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