

The Impact of Interactivity and Modality on Language Performance in agrammatic and non-aphasic Participants

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This study compares Face-to-Face dialogues with Computer-Mediated-Communication and noninteractive oral and written tasks in German-speaking aphasic and non-aphasic persons. The research project follows an interactive and media-specific hypothesis, which refers to the concept of adaptation. It is claimed that variation in agrammatic symptoms does not directly mirror the basic syntactic disorder, but reveals adaptation to various interactive and media-specific demands. Therefore, we compared in an experimental study the impact of different medial practices (Face-to-Face dialogues, Computer-Mediated Communication, oral and written monological texts) in chronic agrammatic patients and matches normal controls. The results of the study show that both interactive and medial factors impact the language performance in agrammatics and normal speakers. A main feature seems to be the visible, permanent and simultaneously presented language signs in written texts, which support the working memory and allow for repeated processes of reformulation. The consequences for communication of identical or like (formal) language impairments vary according to the medial practices, contexts and participants present in a setting, and according to how interlocutors handle the situation.

Introduction

Impairments associated with agrammatism are generally considered to result from problems with syntax and/or morphology, although the exact nature of the syntactic deficit remains unclear. The variation in performance reported for sentence comprehension and production has led to ongoing controversies about the underlying mechanisms of agrammatism and the possibility of computational trade-off effects (e.g. Whitaker, 1997). Due to the adaptation theory (e.g. Kolk & Heeschen, 1990; Kolk, 1994; Springer et al. 2000) omission phenomena in agrammatic spontaneous speech (omissions of finite verbs and grammatical morphemes) can be attributed to the overuse of normal elliptical constructions as a strategy for adapting to limited processing capacities. Another claim is that these patients rely on ‘telegraphic’ style as a form of conversational adaptation (Heeschen and Schegloff, 1999).

Based on the fact that agrammatic utterances show variant symptoms, our research aim was to investigate which factors impact language usage. In our study we followed a media-specific hypothesis, which refers to the concept of adaptation. Our claim is that the variation in agrammatic symptoms does directly mirror the basic syntactic disorder, while also showing adaptation to different interactive and media-specific demands. Therefore, in the present study we compared the impact of interactivity and modality-specific conditions on formulation in persons with agrammatism and non-aphasic speakers.

Methods

Subjects

Eight German-speaking subjects (mean age: 60 yrs. (45-73); mean education: 12 (10-13), gender: six males and two females), affected by vascular infarcts of the left perisylvian region. Initially all patients suffered from severe global aphasia. During the course of rehabilitation, speech and language abilities increased over years (onset of aphasia, mean: 14 years). At the time of assessment according to the Aachen Aphasia Test (AAT, Huber et al. 1984), the impaired

language was classified in seven subjects as moderate-to-mild Broca's, and in one as non-classifiable aphasia. The subjects demonstrated symptoms of moderate agrammatism in spontaneous speech.

In addition, eight age, gender, and education-matched controls participated in the study.

Research design

The effects of *interactivity* (interactive versus monoactive language production) and *modality* (oral versus written) on language production were determined using a crossed experimental research design with four tasks (Face-to-Face-dialogues, Computer-Talk, oral radioreport, written newspaper-report). The situational context and dialogue partner was the same in all four conditions. The dialogues and also the oral and written reports are from short movies (4 scenes of "Mr. Bean").

The data from a collection of video recordings have been transcribed using a German transcript notation oriented to conversation analysis conventions (e.g. Atkinson & Heritage 1999).

The following variables were chosen because they were considered to reflect the variant symptoms in agrammatism, especially in Dutch and German speakers: mean length of utterances (MLU) with and without particles, completeness of utterances, distribution of finite, non-finite and verbless phrases; pauses and repairs within finite phrases; syntactic complexity, percentage of open and closed class words and type-token-ratio of nouns (TTRN) and verbs (TTR-V).

Results and discussion

An ANOVA for repeated measures was performed on MLU and mean percentage of different syntactical and lexical parameters (finite phrases, complete, subordinated sentences, pauses and repairs within phrases as well as percentage of closed class words, type-token-ratio for nouns TTR-N and verbs TTR-V) with *interactivity* (interactive versus monoactive), *modality* (oral versus written) and *group* (agrammatics versus normal controls) as factors.

The results of the study show that *interactivity* and *modality* impact lexical and syntactic parameters and also the repairs in language production of agrammatic and normal speakers:

1. As expected, the agrammatic *group* differs significantly from the normal controls for most of the syntactic parameters: agrammatics show significantly shorter phrases and less finite phrases, more self repairs in finite phrases, more incomplete sentences, only few subordinations, longer pauses within phrases and lower type-token-ratio for nouns. However, as the ANOVA revealed to both groups show similar adaptation patterns with respect to the modality and interactivity factors.
2. As to factor *modality* (oral and written modality) both groups show significant differences for most of the syntactic parameters. Especially in written monoactive text production (written report) in contrast to all other conditions (Face-to-Face, Computer-Talk and oral report) we find the following features: longer mean length of utterances (MLU), more nouns and more complex noun phrases, lower percentage of closed class words; longer pauses within phrases and more repairs within finite phrases. Unlike the normal controls, the agrammatic group needs significantly more and longer pauses and self-repairs (hesitations, particles and corrections) to realize a more complex style. The morphological errors increased dramatically compared to Face-to-Face dialogues.

3. *Interactive* language production (Face-to-Face and Computer-Talk) differs significantly from monoactive oral and written text production; this holds for both groups. Characteristic for the interactive language style are the following features: Short MLU, more hesitations and discourse particles in the Face-to-Face-dialogues, only few long pauses, fewer finite and complete phrases, less subordination, more variability for nouns and less for verbs.
4. In the Computer-Talk, interaction between *interactivity* and *modality* was revealed, i.e. more similarity to the Face-to-Face dialogues than to the written report. Surprisingly, the agrammatic group could handle the Chat-program after a short training period with assistance by the dialogue partner. Of course, the number of interactive repairs, in which the partner has to ask for clarification and/or offer a possible answer, was higher in the Computer-Talk than in Face-to-Face dialogues with agrammatic participants.

The results of the present study demonstrate how *interactivity* and *modality* affect the processing of grammatical knowledge. The written platform with permanent and visible language signs supports the production process and therefore offers the possibility of producing more complex phrase structures and subordinated sentences. Actually, with most of our subjects we found a significant difference between the complexity of phrase and sentence structures and lexical variability in the written reports compared to Computer-Talk and Face-to-Face-dialogues. However, the production of complete sentences in our recovered chronic aphasics seems to require conscious planning and exertion in formulation.

Conclusions

Overall, the results of the study support the hypothesis that the computation and, particularly, the style of utterances in agrammatics as well as normal speakers/writers critically depend on the interactivity with the interlocutor and on the properties of oral versus written modality (e.g. visibility, audibility, simultaneity, sequentially, revocability, co-presence of the partner).

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