

Towards empirical dimensions for the classification of aphasic performance

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Abstract

We present a study of 13 patients with aphasia, not screened by presumed subtype, showing strong correlations among disparate measures of fluency and measures of receptive and expressive grammatical ability related to verb functional categories. The findings are consistent with a single underlying dimension of severity. We suggest that subtyping be re-examined in light of performance patterns and only accepted when patient clustering is empirically derived and theoretically meaningful.

Introduction

Patterns of breakdown in aphasia can be informative about the human cognitive system of language. Classical neurological and aphasiological taxonomy use localization and clinical criteria to distinguish among subtypes; for example, fluent vs. nonfluent, expressive vs. receptive, or structural vs. semantic. These distinctions have important implications for the conceptualization of language ability, implying that distinct dimensions of skill underlie observed performance variance. However, clinical practice suggests that up to 80% of patients with aphasia cannot be clearly classified, depending on the classification scheme and diagnostic instrument (Spreeen & Risser 2003).

Furthermore, cross-linguistic evidence has led to re-evaluation of certain assumptions on which subtyping is typically based, and has highlighted the role of language-specific properties (Bates et al. 2001). The different opportunities for linguistic analysis and performance breakdown patterns offered by different languages have made cross-linguistic research indispensable in aphasia. In the case of Greek, the rich verbal morphology allows the study of functional categories in situations of controlled structural complexity and in relation to more global assessments such as fluency and severity.

An inclusive approach to participant selection permits objective comparisons on the basis of performance patterns rather than a-priori categorization potentially leading to selection bias. If there is a valid categorization of patient performance patterns into clinically useful subtypes, ExLing 2006: Proceedings of 1st Tutorial and Research Workshop on Experimental Linguistics, 28-30 August 2006, Athens, Greece

then this should emerge empirically as a result of clustering and dissociation analyses. In this paper we extend the study of Varlokosta et al. (in press) with measures of speech production and a new group of patients, and we suggest an experimental methodology for the study of aphasia based on patterns of covariance among measures of expressive and receptive language performance.

Method

Participants

Seven Greek-speaking men 42–81 years old diagnosed with aphasia formed patient group A. The details for this group and a control group matched on age, sex, and years of education can be found in Varlokosta et al. (in press). In addition, patient group B included 4 men and 2 women 42–72 years old diagnosed with aphasia. Patients were not screened for aphasia (sub)type.

Test materials and procedure

A grammaticality judgment test included 80 correct and 80 corresponding incorrect active-voice sentences manipulating verbal aspect, tense, and agreement with subject in number and person. A sentence completion test, using the same 80 sentence beginnings as cues and corresponding baseline sentences, was used to measure expressive performance. Verbs were controlled for phonological properties, regularity (in aspectual formation), and frequency (estimated via subjective familiarity). Details about these materials are reported in Varlokosta et al. (in press).

Patient group A and the corresponding control group were administered a brief interview, the sentence completion task, 2 standard picture description tasks (Cookie Theft and the store scene from Wechsler Memory Scale III), and the grammaticality judgment task, in this order. Patient group B was only administered the interview and picture description.

Results

Performance in verb production and reception revealed that aspect was most vulnerable whereas subject-verb agreement was most resistant (Varlokosta et al. in press). There was no dissociation between impairment in production and reception (Figure 1, left). Moreover, analysis of lexical errors separately from grammatical (morphological) errors showed that there was little basis for a dissociation among structural vs. semantic dimensions.

Here we have analyzed production performance (from the picture descriptions) with two quantitative indices: “fluency” and “mean length of utterance”

(MLU). As shown in Figure 1 (right), patient fluency was strongly correlated with MLU, and also with measures of grammatical performance (Table 1), suggesting a common underlying dimension of severity.

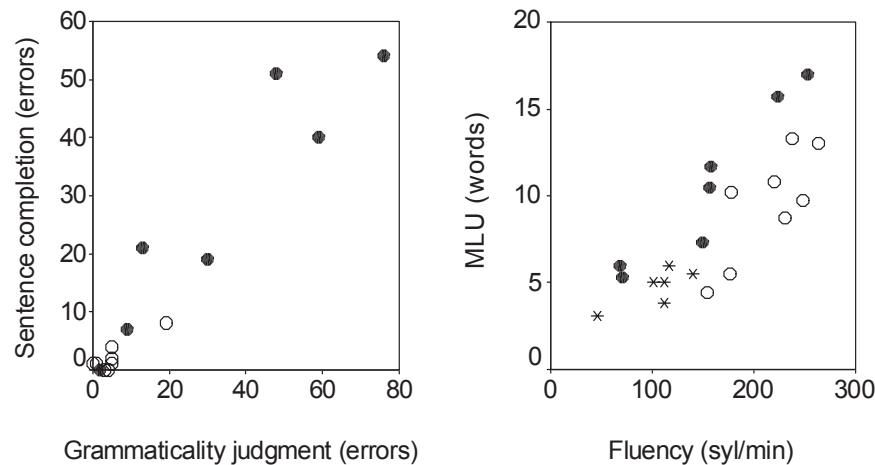


Figure 1. Interrelations among measures of grammatical performance (left) and production volume/rate (right). Filled circles: Patient group A; Open circles: Control group; Asterisks: Patient group B.

Table 1. Correlation coefficients (Pearson's r) among measures. Above the diagonal, for Patient group A only ($N=7$). Below the diagonal, for all participants as available ($N=15$ except between MLU and fluency, where $N=21$).

(* $p<0.05$ ** $p<0.005$)	1	2	3	4	5
1 Fluency		-0.80*	-0.77*	0.96**	-0.41
2 Grammaticality judgment	-0.73**		0.93**	-0.80*	0.39
3 Sentence completion	-0.74**	0.95**		-0.86*	0.69
4 Mean length of utterance	0.80**	-0.37	-0.38		-0.65
5 Number of utterances	-0.40	0.24	0.42	-0.64*	

Discussion

Our findings do not support a dissociation between severity and fluency. Instead, the pattern of correlation among disparate measures of speech production and grammatical performance, both expressive and receptive, calls for a reconsideration of traditional groupings and highlights the need for additional cross-linguistic research, if confirmed with more patients and tests.

Dick et al. (2001) have demonstrated that language processing deficits can be revealed in unimpaired participants if tasks are sufficiently demanding. Extending this line of thinking, one might expect participants with aphasia to lie on

one side of a single language performance continuum instead of forming a qualitatively distinct group. Our data (Figure 1) offer partial support for this prediction in that control performance was largely overlapping with aphasic performance and apparently lying along a single line.

Structural accounts of language breakdown (e.g., Friedmann & Grodzinsky 1997), aiming to explain dissociations based on linguistic type differences, might have difficulty with unidimensional patterns of impairment. In contrast, processing accounts (e.g., Kolk & Hartsuiker 2000) may be at an advantage to the extent that patient performance can be reliably related to independent indices of severity of aphasia, task difficulty and cognitive capacity. Differences in the dynamics of lexical activation is one such attempt to explain the observed co-occurrence of language impairments (Blumstein & Milberg 2000).

We suggest that a wide range of measures, spanning distinct domains of performance, be administered in future studies of aphasia and that patients not be pre-selected by presumed subtype. Instead, aphasia subtyping should be re-examined in light of actual performance patterns, and only accepted when patient clustering is empirically derived and theoretically meaningful.

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References

- Bates, E., Devescovi, A., and Wulfeck, B. 2000. Psycholinguistics: A cross-language perspective. *Annual Review of Psychology* 52, 369–396.
- Blumstein, S. E., and Milberg, W. P. 2000. Neural systems and language processing: Toward a synthetic approach. *Brain and Language* 71, 26–29.
- Dick, F., Bates, E., Wulfeck, B., Utman, J. A., Dronkers, N., and Gernsbacher, M. A. 2001. *Psychological Review* 108, 759–788.
- Friedman, N., and Grodzinsky, Y. 1997. Tense and agreement in agrammatic production. Pruning the syntactic tree. *Brain and Language* 56, 71–90.
- Kolk, H. J., and Hartsuiker, R. J. 2000. Agrammatic sentence processing: Severity, complexity, and priming. *Behavioral and Brain Sciences* 23, 39–40.
- Spree, O., and Risser, A. 2003. *Assessment of Aphasia*. Oxford Univ. Press.
- Varlokosta, S., Valeonti, N., Kakavoulia, M., Lazaridou, M., Economou, A., and Protopapas, A. in press. The breakdown of functional categories in Greek aphasia: Evidence from agreement, tense and aspect. *Aphasiology*.