Grammatical Tense Impairment in Aphasia: a usage-based investigation of verb forms in spontaneous language production

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Introduction and aims

Grammatical tense impairment is commonly observed in people with aphasia (PwA), yet its underlying causes remain debated. Existing accounts have generally attributed these difficulties to syntactic (Friedmann & Grodzinsky, 1997), morphological or semantic factors (Faroqi-Shah & Thompson, 2007). However, relatively little attention has been paid to the role of frequency – particularly beyond single-word level – or to the influence of task type.

The present study replicates previous research (Onofri & Zimmerer, 2024) and adopts a usage-based construction grammar framework (Goldberg, 2003). This framework emphasises the role of usage-frequency effects at the multi-word level while also introducing the notion of lexical bias (i.e., the probability of a word to occur more frequently in a specific syntactic structure). Although these approaches have been adopted in aphasia to investigate passives (Gahl et al., 2003) and plurals (Hatchard & Lieven, 2019), their application to tense remains limited.

In addition, whereas most previous studies have relied on constrained experimental tasks (e.g., sentence completion or sentence-picture matching tasks), the present study examines tense production in samples of semi-spontaneous language, an underexplored context in this domain. We compared the frequency-based, morphological, phonological, and semantic properties of verbs produced by PwA and control participants to assess which factors influence production.

Methods

Participants

A secondary analysis was conducted on the NEURAL database available on AphasiaBank (Stark; MacWhinney et al., 2011). We analysed the responses of 10 PwA (mean age = 62.2, SD = 11.9; mixed aphasia types) and 10 controls (mean age = 56.9, SD = 8.9). Participants were American English native speakers.

Materials and procedure

Data were in the form of transcribed semi-structured interviews of which we selected one question – i.e., whether participants recalled their stroke (PwA) or any illness/injury (controls). All produced verb forms were classified according to their phonological, morphological, and semantic properties using custom R scripts. In addition, four frequency-based variables (i.e., *lexeme frequency, form frequency, tense bias, time bias*) were computed.

Bias was operationalised as the proportion of occurrences in which a given verb appears in a specific tense (tense bias) or generic time reference (time bias). These proportions were automatically calculated from 500 randomly sampled instances per verb drawn from the online *Corpus of Contemporary American English* (COCA; Davies, 2008-), the largest online database of American English encompassing around one billion words collected from 1990 to

2019. For this automated recognition using customised R scripts, we acknowledge an approximate error rate of 15%, which is on a par with other comparable systems.

Lexeme frequency values per verb were also extracted from COCA (Davies, 2008–). Finally, estimated form frequency was derived by tense bias and lexeme frequency. This methodology replicates previous research (Onofri & Zimmerer, 2024).

Results

The analysis found that PwA produced significantly fewer verbs in the past (β = -1.25, p < .001) compared to controls. Additionally, verbs produced by PwA were significantly more aligned to their biased tense (β = 0.10, p < .001) and time reference (β = 0.13, p < .001) compared to controls. Number of phonemes (NoP) was inversely related to all frequency variables (lexeme frequency: β = -0.59, p < .001; form frequency: β = -0.97, p < .001; tense bias: β = -0.04, p < .001; time bias: β = -0.01, p < .001) and there was a significant interaction between Group and NoP for all frequency variables (lexeme frequency: β = 0.12, p = .002; form frequency: β = 0.13, p < .001; tense bias: β = -0.01, p = .037; time bias: β = -0.01, p = .025).

No significant group differences were found for quantity or lexical diversity of verbs, phonological and morphological complexity, semantic weight, or regularity.

Discussion

This study generally replicates previous findings (Onofri & Zimmerer, 2024), confirming that lexical bias and usage-frequency can shape verb production profiles, particularly with respect to tense use, and help differentiate between PwA and control participants. At the same time, some inconsistencies with prior work emerged. In particular, the present data suggest a past tense impairment in this sample of PwA, supporting accounts that propose greater difficulty with past compared to non-past reference.

These results must be interpreted while keeping in mind the limitations of the current study, such as the reduced sample size and the high variability within PwA given by the heterogenous group composition.

Nevertheless, the growing evidence base for lexical bias has clinical implications, indicating that usage-frequency and bias should be considered in aphasia assessments and interventions. Additionally, results underscore the importance of accounting for phonological complexity when researching frequency effects in aphasia.

References

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