

University of Montana

ScholarWorks at University of Montana

University Grant Program Reports

Office of Sponsored Programs

9-2024

Assessing Grammatical Deficit Overlaps in Bilingual People with Aphasia (BWA): Bilingual Agrammatism Pilot Project

Danielle K. Fahey

Follow this and additional works at: <https://scholarworks.umt.edu/ugp-reports>

Let us know how access to this document benefits you.

September 4, 2024

TO: Office of the Vice President for Research and Creative Scholarship

FROM: Danielle Fahey (PI), Assistant Professor, School of Speech, Language, Hearing, & Occupational Sciences

Thank you for funding “Assessing Grammatical Deficit Overlaps in Bilingual People with Aphasia (BWA): Bilingual Agrammatism Pilot Project” (M25289) for the 2023-2024 funding cycle.

BACKGROUND & SIGNIFICANCE

Comprehending and producing sentences requires processing syntactic structures (i.e., grammar), which vary across languages. These structures operate at multiple levels: lexical (words), morphosyntactic (e.g., verb inflections), and phrasal (e.g., word order). Survivors of stroke may develop aphasia, characterized by impairment in grammatical processing (i.e., agrammatism). When bilinguals (i.e., people who have learned more than one language during their lives) have a stroke and acquire agrammatism, their pattern of deficits will be affected by their combination of languages and to their prior pattern of language use. Understanding grammatical deficits in bilingual individuals with aphasia (BWA) is crucial for tailored diagnosis and effective treatment. Unique challenges arise in understanding grammatical deficits in BWA, chiefly the development of tailored studies and recruitment of appropriate participants at scale. There has previously been little research of these populations, so it remains unclear whether these deficits parallel those of monolingual agrammatism or exhibit distinctive patterns.

Additionally, the underlying brain mechanisms contributing to grammatical deficits in BWA need examination. Two theoretical accounts, representational and usage-based, offer explanations for agrammatism. Representational accounts propose vulnerability to impairment in non-canonical structures post-stroke, while usage-based accounts suggest limitations in processing resources. Distinguishing between these accounts is challenging due to the overlap in predictions.

To better understand the unique patterns of bilingual agrammatism and examine the theoretical underpinnings of the syndrome, this project aimed to pilot a large research paradigm that compares English, Spanish, and bilingual English-Spanish aphasia. Specifically, support was sought to pilot two tasks of a larger study and to collect MRI data from those pilot participants. The pilot participants will be asked to complete additional study tasks in future, supported by external funding. Additional participants will also be sought. Achieving the project goals enhances our understanding of grammatical deficits in bilingual aphasia, paving the way for more accurate diagnosis and targeted interventions.

METHODS

Overall Study Design: Participants will include three groups of PWA and one group of controls: group 1 (20 monolingual English-speaking PWA), group 2 (20 monolingual Spanish-speaking PWA), group 3 (20 Spanish-English BWA), and a control group of 20 age- and language background-matched healthy bilinguals. Aphasia diagnosis is conducted using the Western Aphasia Battery (WAB). Recruitment is done through various channels, and MRI scanning was performed to map lesions. Data collection occurs either in-person or via web-based meetings. Monolingual groups receive materials in one language, while bilingual groups receive materials in both languages. Spanish and English tasks are administered separately. MRI scanning is utilized for lesion mapping.

MRI lesion mapping: scanned patients brains using a 1.5T MRI using T1 and T2 images. A team of researchers subsequently hand-maps the lesions in the 3D space. Each set of images for a patient are then normalized to standard-space. Finally, normalized images are correlated to patterns of deficit found in experimental tasks and diagnoses.

Task 1: Investigated grammatical deficits in discourse samples. Participants are asked to complete multiple tasks in which they provide a monologue. These monologues are then transcribed, coded for errors, and analyzed for correlation to their diagnoses and brain lesion locations.

Task 2: Examined the production of pronouns, verbs, and sentence word order in a scripted dialogue task.

Tasks 3-5: are currently being finalized.

SEED GRANT-FUNDED PRELIMINARY RESULTS

Seed Grant funding was obtained to pilot Tasks 1-2 with an initial group of English-speaking PWA (group 1). Recruitment was conducted through a new collaboration between PI Fahey and the UM BRAIN Lab/Big Sky Aphasia Program (BSAP; Directors: Dr. Catherine Off and Dr. Jenna Griffin-Musick). Ten group 1 participants were recruited in Summer 2023 (the grant period). Results from Task 2 have been analyzed and are presented in Figures 1-2 below.

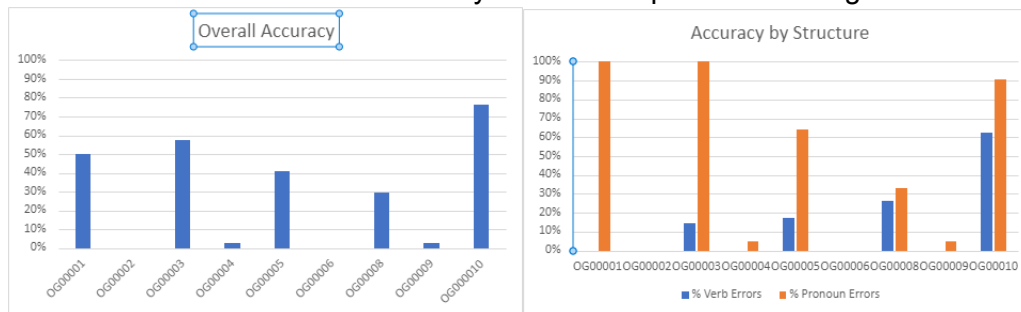


Figure 1. Overall Accuracy of Task 2.

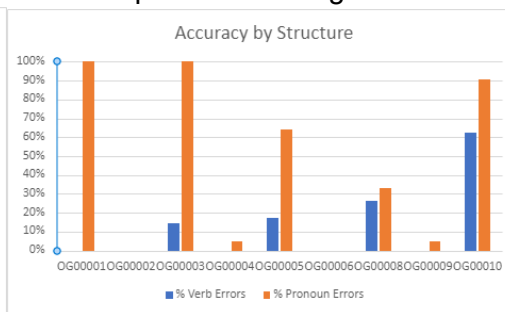


Figure 2. Accuracy of Task 2 by Grammar Structure.

PRODUCTS RESULTING FROM THIS GRANT

The preliminary results and analyses, shown above, were presented by the PI, an undergraduate RA (Ashlynn Everett) and Drs. Off and Griffin-Musick at the 2024 Clinical Aphasiology Conference, an annual international and highly competitive conference on aphasia research in May 2024.¹ Subsequently, PI Fahey submitted an NSF grant (#2440757) in July 2024 for the overall project with co-PIs Off, Griffin-Musick, and Simona Mancini (Basque Center for Cognition, Brain & Language).

CURRENT PROGRESS & FUTURE DIRECTIONS

Between May and July 2024, 5 additional English-speaking PWA have been recruited and completed Tasks 1-2. Analyses for Tasks 1-2 are on-going. Development of Tasks 3-5 is being finalized. Collaboration with Dr. Mancini and BCBL has been formalized through a data sharing agreement. Finally, further NIH grant submission is planned in October 2024.

References

1. Fahey, D., Everett, A., Griffin-Musick, J. & Off, C. (2024, May). Scripted Dialogue Task for English Speakers with Aphasia: Examining of Verb and Sentence Structure on Object Pronoun Production. Poster presented at the 2024 Clinical Aphasiology Conference (CAC). Waikoloa Beach, HI, USA.