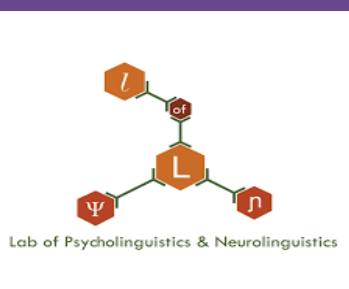


Cognitive intervention in patients with left hemisphere lesions and aphasia. Implications on sentence comprehension



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Introduction

Aphasia is typically restricted to language impairments across modalities in the absence of any other general cognitive impairment or dementia (Obler & Gjerlow, 1999: 38) and is differentiated from aging disorders, developmental language deficits, or speech impairments due to loss of muscle control.

-> However, there is a growing consensus that people with aphasia (PWA) may often present with concomitant cognitive deficits such as **executive function (EF)** (e.g., Helm-Estabrooks & Albert, 1991; Nicholas, Hunsaker, & Guarino, 2017; Purdy, 2002), **attention** (Schumacher, Halai, Lambon Ralph, 2019; Villard & Kiran, 2015; Murray, 2012; Hula & McNeil, 2008), **visuospatial perception** (Marinelli et al., 2017; Seniow et al., 2009), **logical thinking** (El Hachioui et al., 2014), and deficits of **short-term memory, working memory (WM)** (e.g., Friedmann & Gvion, 2003; Mayer, Mitchinson, & Murray, 2016; Nickels, Howard, & Best, 1997), after a left hemispheric stroke.

Methods

Participants: one Greek-speaking non-fluent agrammatic speaker. Neuropsychological assessment prior testing included the Mini Mental State Examination (MMSE) (Folstein et al., 1975) and the 5-Object cognitive screening test (Papageorgiou, Economou & Routsis, 2014), to ensure that his cognitive abilities were within norms.

Language assessment: (a) Narrative elicitation (Kakavoulia et al., 2014), (b) PPVT (Simos et al., 2012), (c) Sentence Repetition (modelled after Theodorou et al., 2017), (d) BDAE & BNT (for Greek: Papathanasiou et al., 2008), and (e) Sentence comprehension subtest of LexiGrAph (for Greek: Varlokosta et al., 2023).

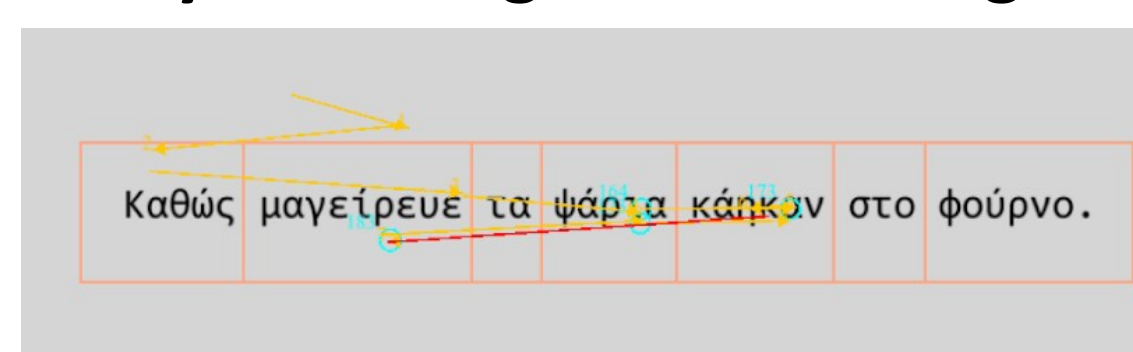
Aims

EF deficits can negatively influence various language processes in aphasia, such as: **lexical-semantic processing** (Martin et al., 2012; Novick, Kan, Trueswell, & Thompson-Schill, 2009; Robinson, Blair, & Cipolotti, 1998), **sentence comprehension** (Novick et al., 2009; Sung et al., 2009), **spoken discourse** (Frankel, Penn, & Ormond-Brown, 2007; Fridriksson et al., 2006; Keil & Kaszniak, 2002; Luna, 2011; Penn et al., 2010), and **reading** (Caspari, Parkinson, LaPointe, & Katz, 1998).

Up to now, the provided treatments in clinical settings have focused on specific grammatical aspects (e.g., Treatment of Underlying Forms; Thompson & Shapiro, 2005), without taking into account that sentence-level difficulties inevitably interfere with other cognitive processes, such as attention, WM, and EFs.

However, the application of a cognitive treatment focusing on the enhancement of EF, might assist individuals with language deficits, facilitating their language performance and providing long-term benefits. The purpose of this study is to present the design and preliminary results of a cognitive training program that is focused on the shared processes between EFs and language tasks.

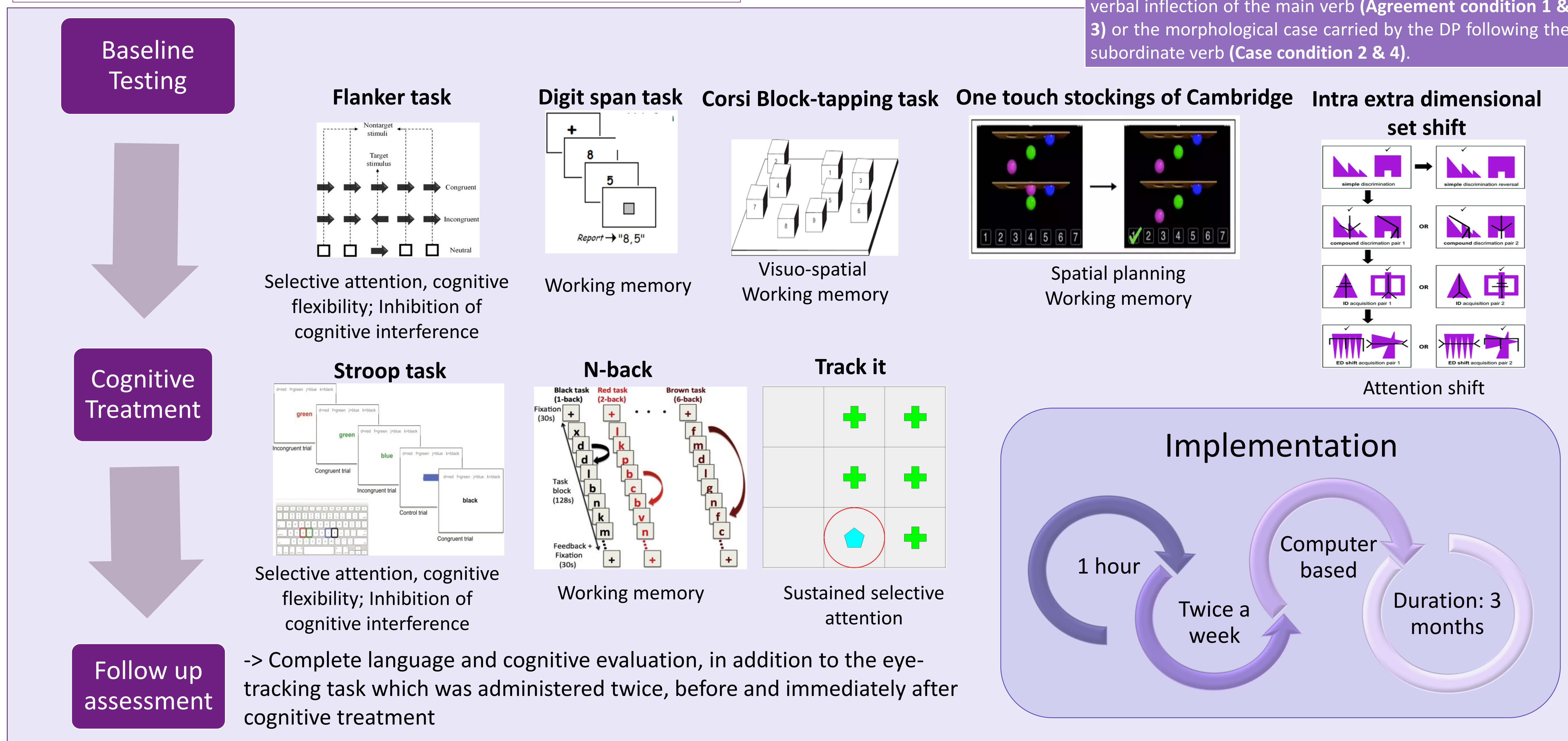
Outcome measure of treatment response:
Syntactic Ambiguity resolution
-> **eye-tracking-while-reading**



We manipulated: the **argument structure of the embedded verb** (optionally transitive vs. intransitive verbs) and the **syntactic function of the DP following the embedded verb** (object vs. subject).

- Conditions
- Optionally transitive verb; object-subject reading; (grammatical) reading in agreement condition
 - "Kathos etrege/ ta revithia/ gemise/ me fuskales", While (s)he was eating/ the chickpeas/ (s)he blistered herself/ with cysts.
 - "Kathos etrege/ ta revithia/ gemisan/ me fuskales", While (s)he was eating/ the chickpeas/ blistered/ with cysts.
 - Optionally transitive verb; object-subject reading; (grammatical) reading in case condition
 - "Kathos etrege/ tus lukumades/ gemise/ me fuskales", While (s)he was eating/ the donuts/ (s)he blistered herself/ with cysts.
 - "Kathos etrege/ o lukumas/ gemise/ me fuskales", While (s)he was eating/ the donut/ blistered/ with cysts.
 - Intransitive verb; object ungrammatical – subject grammatical reading in agreement condition
 - "Kathos etrehe/ ta revithia/ gemise/ me fuskales", While (s)he was running/ the chickpeas/ (s)he blistered herself/ with cysts.
 - "Kathos etrehe/ ta revithia/ gemisan/ me fuskales", While (s)he was running/ the chickpeas/ blistered/ with cysts.
 - Intransitive verb; object ungrammatical – subject grammatical reading in case condition
 - "Kathos etrehe/ tus lukumades/ gemise/ me fuskales", While (s)he was running/ the donuts/ blistered/ with cysts.
 - "Kathos etrehe/ o lukumas/ gemise/ me fuskales", While (s)he was running/ the donut/ (s)he blistered herself/ with cysts.

-> Local syntactic ambiguity was resolved either by the verbal inflection of the main verb (**Agreement condition 1 & 3**) or the morphological case carried by the DP following the subordinate verb (**Case condition 2 & 4**).



References

- Caspari I, Parkinson SR, LaPointe LL, Katz RC. *Working memory and aphasia. Brain Cogn.* 1998 Jul;37(2):205-23. doi: 10.1006/brcg.1997.0970. PMID: 9665743.
- Fridriksson, J., Nettles, C., Davis, M., Morrow, L., & Montgomery, A. (2006). *Functional communication and executive function in aphasia. Clinical Linguistics & Phonetics, 20(6)*, 401–410. doi:10.1080/02699200500075781
- Luna, Christina Z. (2011) *Functional Communication in Chronic Aphasia and Executive Function: The Effect of Treating Cognitive Flexibility.* [Clinical Aphasiology Paper]
- Martin, N., Kohen, F., Kalinyak-Fliszar, M., Soveri, A., & Laine, M. (2012). *Effects of working memory load on processing of sounds and meanings of words in aphasia. Aphasiology, 26(3-4)*, 462–493. doi:10.1080/02687038.2011.619516
- Penn, C., Frankel, T., Watermeyer, J., & Russell, N. (2009). *Executive function and conversational strategies in bilingual aphasia. Aphasiology, 24(2)*, 288–308. doi:10.1080/02687030902958399
- Robinson, G., Blair, J., Cipolotti, L. (1998). *Dynamic aphasia: an inability to select between competing verbal responses? Brain, 121(1)*, 77–89. doi:10.1093/brain/121.1.77
- Sung, J. E., McNeil, M. R., Pratt, S. R., Dickey, M. W., Hula, W. D., Szuminsky, N. J., & Doyle, P. J. (2009). *Verbal working memory and its relationship to sentence-level reading and listening comprehension in persons with aphasia. Aphasiology, 23(7-8)*, 1040–1052. doi:10.1080/02687030802592884

The research work was supported by the Hellenic Foundation for Research and Innovation (H.F.R.I.) under the "First Call for H.F.R.I. Research Projects to support Faculty members and Researchers and the procurement of high-cost research equipment grant" - Project title: LEFIELD: Language and Executive Function Intervention Strategies in Language Disorders; Project Number: 2992; P.I.: S. Varlokosta

