Science of Aphasia 2024 – Book of abstracts

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Monday 9 September	Tuesday 10 September	Wednesday 11 September	Thursday 12 September
8:30 Registration			
9:00 Welcome & coffee 9:40 Introduction SOA	9:00-9:45 Claudia Peñaloza	9:00-10:00 Antonio Benítez Burraco	9:00-10:00 Monica Norvik
9:45-10:45 Beth Jefferies	9:45-10:30 Sofia Vallila-Rohter	10:00-10:30 Coffee break	10:00-10:30 Coffee break
10:45-11:45 Valentina Borghesani	10:30-11:00 Coffee break 11:00-11:45 Vania de Aguiar	10:30-11:30 Peter Turkeltaub	10:30-11:30 Frank Tsiwah
11h:45-12:15 Discussion	11:45-12:15 Discussion	11:30-12:00 Discussion	11:30-12:00 Discussion
12:15-12:45 3-min poster pres.	12:15-12:45 3-min poster pres.	12:00-12:30 3-min poster pres.	12:00-12:30 3-min poster pres.
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Day 1: Semantic processes and impairments in aphasia and svPPA: what do they tell us about cognitive models of semantics?

Oral presentations 1

O1-01: Do immersive virtual reality favour lexical-sematic processing in neurotypical adult word learning and in (re)learning in post-stroke aphasia? Julie Franco et al.

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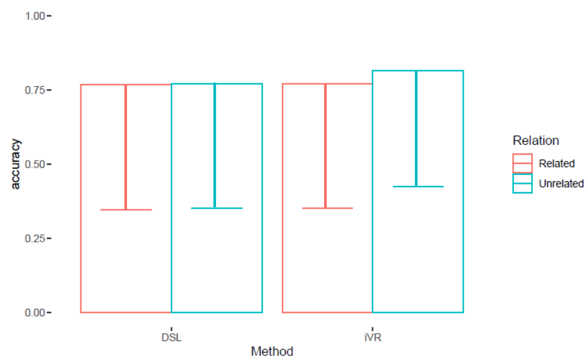
Introduction: Word learning is a cognitive skill that is used every day in adulthood to acquire new words, but also after stroke, especially in people with aphasia, to (re)learn to produce words. Indeed, some people with aphasia show an access deficit caused by a disconnection between intact semantic features and intact lexical representations, and learning skills may help to (re)strengthen connections across the lexical-semantic system (Basso et al., 2001, Coran et al., 2020). Learning may therefore be a good candidate as a recovery mechanism, and therapies that promote this mechanism may lead to better outcomes. New technologies, especially those that take into account the contextual and multisensory integration properties of learning, are therefore of great interest. Immersive virtual reality isolates people in a virtual environment similar to everyday communication, integrating a considerable number of modalities (visual, auditory, sensorimotor, etc.). This method has already shown positive results, firstly in word learning, with better acquisition than non-immersive VR (Dhimolea et al., 2022) and than other (static) digital methods (Franco et al., submitted). Second, in anomia therapy, iVR is associated with a greater reduction in lexical (semantic) errors than a static digital approach (Franco et al., submitted). These findings raise the hypothesis that lexical-semantic processing is improved by iVR. Lexical-semantic processing in word production is usually studied using the Picture-Word Interference (PWI) task. This involves the simultaneous presentation of a picture and a semantically related distractor, which slows down the production latency compared to a control condition. The aim of this study was to investigate whether learning/training with iVR leads to better lexical-semantic integration, as targeted by PWI, compared to a digital static control method (DSL) in neurotypical adults and people with aphasia.

Methods: Experiment 1: 32 neurotypical adults performed a PWI task after a one-week learning period on two matched lists of 30 rare words in their native language from four different semantic categories (fruits, vegetables, tools and musical instruments). Learning was performed using iVR on one list and a static digital control method (DSL) on the other list in a within-subject crossover design. The iVR method consisted of a market scenario in which participants had to purchase each object by asking avatars the corresponding names of the items (presented orally and in writing). The DSL required participants to say aloud the word corresponding to a picture. If they could not produce it, the name of the object was presented (orally and in writing). The PWI consisted of a black and white picture and the presentation of a written word at the same time (Stimulus-Onset Asynchrony = 0). The semantic relationship between the picture and the written word could be semantically related (i.e., a thematic relationship, words from the same semantic category) or unrelated (i.e., a sequence of consonants). Experiment 2: 9 people with aphasia performed a PWI task after a two-week learning/therapy period on two lists of 28 common French words (from the same semantic categories) using an iVR and a DSL method similar to Experiment 1 but adapted for people with aphasia. They all had anomia following a stroke with preserved comprehension, reading and repetition skills as well as intact semantic system. The PWI also consisted of a black and white picture presented simultaneously with a written word. The semantic relationship between the picture and the distractor was either semantically related (i.e. thematic relationship, words from the same semantic categories) or unrelated (i.e. words from different semantic categories).

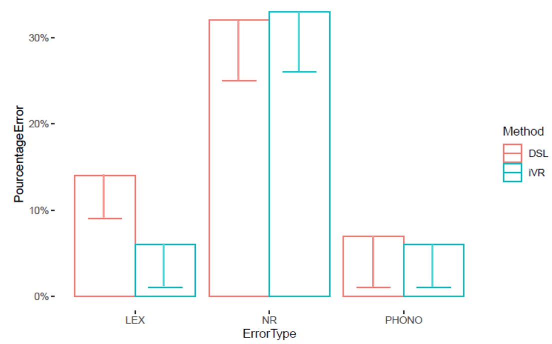
Results: In Experiment 1, in the PWI, neurotypical adults showed overall higher accuracy for words learned with iVR than with the digital static learning method ($X2(1) = 29.07$, $p < .001$), but no difference between the two semantic relationships. For reaction times, a significant interaction was observed between the semantic relationship and the learning approach, with faster reaction times for the unrelated condition than for the related relationship only for words learned with iVR (t(2102) = -2.98, p = .002). For Experiment 2, the results obtained in the PWI task are shown in Figure 1. People with aphasia had higher accuracy in the unrelated condition compared to the related condition only for iVR (β = -0.51, SE = 0.258, z = -1.99, p = .04) (Fig. 1a). In addition, iVR led to a smaller number of lexical errors (out of the total number of errors produced during this task) than the digital static learning method (Friedman test (1) = 4.5, p = .03) (Fig. 1b).

Figure 1: Behavioural results at the picture-word interference task for people with aphasia

A. Accuracy



B. Error Type



Note. (A) Accuracy (correctly produced words in %) in function of learning method (iVR = immersive virtual reality; DSL = digital static learning method) and semantic relationship (related; unrelated). (B) Percentage of error type (% of each type of error on the total of errors produced) (LEX = lexical errors; NR = no-responses; PHONO = phonological errors) according to the learning method.

Discussion: Two studies have been conducted comparing lexical-semantic integration after learning/treatment with iVR or a static digital approach, one in neurotypical adults learning rare words and another in people with aphasia undergoing therapy on common words. The first study suggests that learning with iVR leads to better learning and faster lexical-semantic integration than a static digital learning method. The second experiment found that people with aphasia showed lexical-semantic integration on accuracy only for the words treated with iVR. In addition, iVR enabled a greater reduction in errors, especially lexical errors, as observed by Franco and colleagues (submitted) using a standard picture naming task. These two results therefore suggest that immersive virtual reality is particularly helpful in improving lexical-semantic processes, with better lexical-semantic integration in both word learning and aphasia therapy.

O1-02: Prepositions in Dutch aphasia: outcomes from a new screening instrument, Dörte De Kok et al.

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Introduction: People with aphasia (PMA) often show problems with the use of prepositions (Bastiaanse & Bennis, 2018). Prepositions do, however, not form a homogenous word category. According to Bennis et al. (1983), there are three types of prepositions: Lexical prepositions (a) carry meaning. Syntactic prepositions (b) do not carry meaning and are determined by the sentence structure. Subcategorized prepositions (c) are dependent on the verb but at the same time carry meaning. (a) The cat jumps **onto** the couch; (b) He gives a present **to** her; (c) He counts **on** John. Previous research showed a relation between the aphasia syndrome and the problems with prepositions. Friederici (1982) found specific problems with lexical prepositions for fluent speakers and subcategorized prepositions for non-fluent speakers. She didn't investigate syntactic prepositions. Bennis et al. (1983) found problems with lexical and subcategorized prepositions for fluent speakers and with syntactic prepositions for non-fluent speakers. They, however, used different elicitation methods for lexical prepositions as for the other two types. Recently, we developed a screening tool for prepositions in Dutch (De Kok, 2024; Landsheer, 2024). This screening investigates processing and production of all three preposition types. In the current study we use the data from the norming study for the screening to further analyze the performance of PMA in comprehension and production of all three types of prepositions and evaluate whether the screening can catch the pattern described in the literature. We expect varying performance based on the individual profiles.

Methods: 30 control participants (15 female, mean age 60.9 years) without brain damage and 8 PMA (3 female, mean age 69.3) took part in this study. The PMA presented with various symptoms and degrees of severity. They were selected by their speech- and language therapists because suspected problems with prepositions were suspected. The screening consisted of three different tasks: a sentence-picture matching task (24 items, for lexical prepositions only), a grammaticality judgement task (36 items, all three preposition types) and a fill-in-the-blank task (24 items, with accompanying picture, all three preposition types). For the sentence-picture matching tasks, there were 3 distractor pictures: one with a different preposition (a cat jumping **off** instead of **onto** the table), a picture with different subject but the target preposition and a picture of the same incorrect subject paired with the distractor preposition. In the grammaticality judgment task, half of the items were incorrect. These incorrect sentences included prepositions impossible in the context (e.g. "Lucy cries between her old father").

Results: For all three tasks, one-sided Mann-Whitney-U tests revealed significant differences between the participants with and without aphasia (sentence-picture matching: $U = 30$, $p < .001$, grammaticality judgment: $U = 14.5$ $p < .001$, fill-in-the-blank: $U = 2$, $p < .001$). Participants with aphasia scored lower on all three tasks as shown in Table 1.

Table 1
Results from the three tasks overall and per preposition type

	Sentence -picture matching (max. 24)	Grammaticality judgement (max. 36)			Fill-in-the-blank (max. 24)		
		Lexical (max. 12)	Syntactic (max. 12)	Subcate-gorized (max. 12)	Lexical (max. 8)	Syntactic (max. 8)	Subcate-gorized (max. 8)
PWA1	13	11	12	11	3	8	7
PWA2	19	10	12	12	3	7	7
PWA3	20	7	5	5	2	3	1
PWA4	22	11	12	12	8	7	7
PWA5	24	11	12	12	7	7	5
PWA6	20	7	9	6	5	6	5
PWA7	23	11	11	12	7	8	7
PWA8	22	12	10	10	6	7	4
Group PWA	20.4 (3.4)	10 (1.9)	10.4 (2.5) 30.4 (6.9)	10 (2.9)	5.1 (2.2)	6.6 (1.6) 17.1 (5.0)	5.4 (2.1)
Group NBD	23.5 (0.9)	11.8 (0.5)	11.9 (0.3) 35.6 (0.6)	11.9 (0.3)	8 (0.2)	7.9 (0.3) 23.7 (0.5)	7.9 (0.3)

Note: Group level scores are mean scores and standard deviations (in parantheses)

Regarding the performance per preposition type, we analyzed the data of the PWA group in the grammaticality judgement and fill-in-the-blank tasks. There was a significant very strong correlation on the overall scores, r(6) = .864, p= .003. There were also significant strong correlations for syntactic and subcategorized prepositions, r(6) = .626, p = .048 and r(6) = .748, p = .016, respectively. For the lexical prepositions we found a trend towards a moderate correlation, r(6) = .575 p =.068. Based on a Friedman Anova, we saw no significantly different performance between preposition types on a group-level (PWA only) in the grammaticality judgement task, X2 (2) = 1.28, p = .527. For the production task, the analysis revealed a significant influence of preposition type, X2 (2) = 7.19, p = .028. In post-hoc analyses, both the lexical (median score 5.5) and subcategorized prepositions (median score 6) yielded significantly lower scores than the syntactic prepositions (median score 7), t = 2.401, p = .031 and t = 3.258, p = .006, respectively. There was no difference between lexical and subcategorized prepositions, t = .857, p = .406. Individual Chi2-analyses regarding the difference between preposition types were non-significant for all PWA in the grammaticality judgement task (p > .05). For two PWA we did find significant differences between preposition types in the production task. Both showed a relative weakness for lexical prepositions.

Discussion: The PWA generally perform worse than the NBD control group on all tasks. Overall, their performance is however much better than that of the PWA reported in Bennis et al. (1983), possibly because the severity of aphasia was milder in our group. While the within-group analyses revealed correlations between the performance on different tasks regarding the same preposition type, this might have been driven by overall severity. Further analyses regarding the preposition types showed differences on the group-level but also for a couple of individuals. However, many participants showed almost equal scores between the preposition types. We do not know the individual performance in Bennet et al. (1983), so a comparison is difficult. Overall, differences seem smaller in our sample. This could be due to the overall milder language problems but could also have to do with a methodological peculiarity in the Bennis et al (1983) paper. In their study, production of lexical prepositions was tested with pictures and gap-sentences while the other two preposition types were elicited with a gap-sentence following a short text segment. This might extrapolate the problems of the non-fluent participants with regards to these preposition types. In the current study, we used the same set-up for all three preposition types. Also, we were less restrictive in participant selection. Bennis et al. (1983) recruited participants with Broca's and Wernicke's aphasia, while in the current study no specific syndromes were studied and participants had more mixed forms of aphasia. It remains therefore unclear whether the observed differences in results are due to methodological aspects or participant groups. In order to confirm or reject Bennis et al.'s (1983) findings with regard to the difference in preposition processing between fluent and non-fluent speakers, we will extend our participant group and apply more restrictive selection for the groups in future research.

O1-03: Small words in the picture: The production of discourse particles by Dutch speakers with primary progressive aphasia, Imke Wets et al.

Imke Wets[1], Lize Jiskoot[2], Esther van den Berg[2], Nikki Janssen[3], Lotte Hogeweg[1], Helen de Hoop[1], Vitória Piai[4], Marina B. Ruiter[1]

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Introduction: For most people, language production runs smoothly. However, this does not hold for individuals with primary progressive aphasia (PPA). PPA is a neurodegenerative disorder of which language deficits are the most prominent clinical symptoms (Mesulam, 2001). Semi-spontaneous language analysis is a valuable tool for characterising and diagnosing linguistic deficits in PPA (Boschi et al., 2017). Previous research on semi-spontaneous language production in PPA has mainly focused on linguistic variables at the word and sentence level. Until now, few studies on language production in PPA have been devoted to studying the discourse(-pragmatic) level. However, discourse production in general and discourse particles in particular play a crucial role in everyday life (e.g., for maintaining social relationships). Discourse particles (e.g., ja 'yeah') are a set of words that have a variety of functions such as structuring the discourse and marking the relationship between the hearer and the speaker (Van Bergen & Hogeweg, 2021). Previous research suggests that discourse particles can be used to promote social conversations in persons with aphasia (Simmons & Damico, 1996). Yet it is largely unclear how individuals with PPA use discourse particles in spoken language (Sajjadi et al., 2012). Therefore, the aim of this study is to investigate the production of discourse particles by Dutch speaking individuals with PPA. More specifically, this study aims to answer the following research questions: (1) Does the proportion of produced discourse particles differ between Dutch speaking individuals with and without PPA? (2) If so, how do the proportions of discourse particles produced by Dutch speaking PPA and neurologically healthy speakers (NHS) differ in terms of their distributions?

Methods: The participants of the present study comprised 58 individuals with PPA and 40 NHS. The diagnosis of PPA was based on extensive multidisciplinary assessment. Data consists of the picture description task of the Dutch version of the Comprehensive Aphasia Test (Visch-Brink et al., 2014). The language samples were transcribed by the first author and analysed for discourse particles. We considered different types of Dutch discourse particles, the cognitively more complex ones (e.g., eigenlijk, toch, wel), and the more simple ones (e.g., ja, nee, nou). Proportions of the discourse particles of interest (number of discourse particles in relation to the total amount of spoken language) were contrasted between persons with PPA and controls using a Wilcoxon non-parametric test. Using a linear mixed- effects model, we also explored whether the distributions of the produced discourse particles differed between the two groups.

Results: We found that individuals with PPA produced a larger proportion of discourse particles compared to NHS, $p = .04$. With regard to the distribution, we found a significant interaction between group and the particle ja, suggesting that individuals with PPA produced a larger proportion of ja compared to NHS, $p < .001$ (Figure 1). The effects of group, nee, nou, toch and wel were not significant ($ps > .05$). The interactions between group and the particles nee, nou, toch and wel were not significant ($ps > .05$).

Figure 1

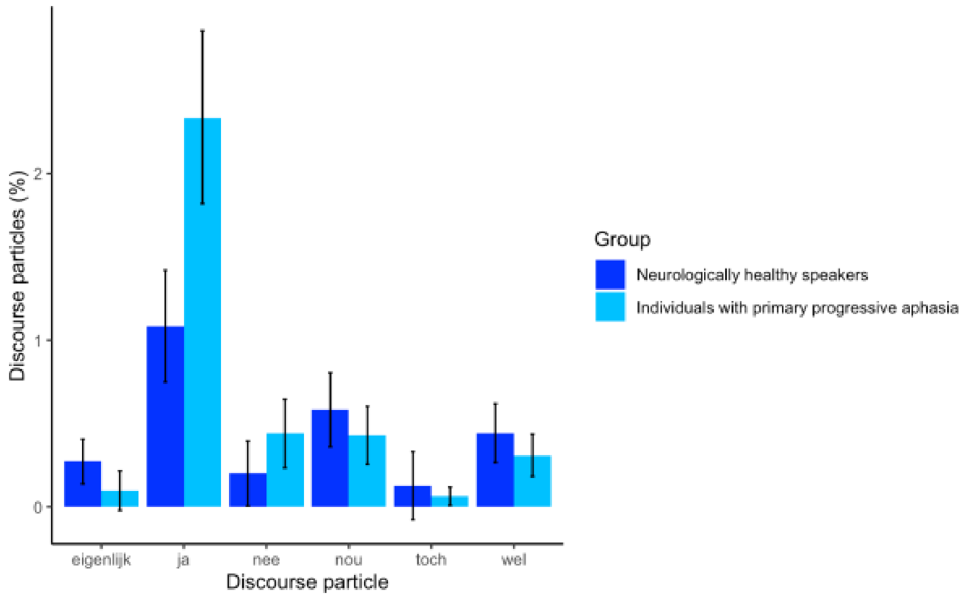

Figure 1. Distribution of the different discourse particles across groups (neurologically healthy speakers (NHS) (dark blue) and individuals with primary progressive aphasia (PPA) (light blue)). Error bars indicate the 95% confidence intervals. Complex discourse particles: *eigenlijk, toch*, and *wel*; simple discourse particles: *ja* 'yeah', *nee* 'no', *nou* 'now'. For NHS, the total amount of spoken language was 153 words. For individuals with PPA, the total amount of spoken language was 165 words.

Discussion: The aim of this study was to investigate the production of discourse particles by individuals with PPA in semi-spontaneous spoken language. We compared the proportion of produced discourse particles of interest between individuals with PPA and NHS. Moreover, we explored the distributions of the discourse particles produced. Our results showed that individuals with PPA significantly differed from NHS in the proportion of discourse particles they produced. This finding is in line with previous research in vascular aphasia (e.g., Van Lancker Sidtis & Postman, 2006) and provides further evidence that the language production of Dutch speaking individuals with PPA is still characterised by discourse particles in the presence of language impairments. The current result needs to be interpreted with caution, however, given that some complex discourse particles (e.g., toch) did not occur frequently in the samples and given the inter-speaker variation within the group of PPA. Furthermore, we found that the distributions of discourse particles produced differed between the two groups. One can speculate that ja is used by individuals with PPA to compensate for word- finding difficulties. Our findings suggest that it is interesting to further investigate the discourse particle production of individuals with language deficits in more experimental settings and that with these findings, the diagnostic process and therapeutic approach for these populations could be improved.

O1-04: The relationship between language disorder and thought disorder: comparing spoken narratives of people with aphasia and people with schizophrenia, Vitor Cesar Zimmerer et al.

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Introduction: Language pathologies have informed theories about the relationship between language and thought. Evidence includes reports of associations and dissociations between performance in verbal and non-verbal tasks in people with aphasia (PwA), who present a primary language impairment often with relatively preserved thought (e.g., Varley, 2014). It also includes investigations of people with schizophrenia (PwS) who can present with disorganized thought, delusions and hallucinations along with negative symptoms, and produce atypical language (e.g., Çokal et al., 2018). A key question is how particular language profiles can be related to thought impairment. We present a direct comparison between spontaneous spoken language production of PwA and PwS. This comparison allows characterization of similarities and differences and a more granular insight into the role of language in cognition.

Our analysis covers both “microstructure” (e.g. lexical and grammatical properties of language production) and “macrostructure” (organization of meaning and context) variables. In both domains, PwA and PwS have previously been shown to be different from healthy controls (Andreetta et al., 2012; Marini et al., 2008).

Methods: At University College London, we recruited 20 PwA (mixed profiles; mean age = 63.7, 80% male) and 30 older healthy controls (oHC; mean age = 70.2, 30% male). At Newcastle University, we recruited 30 PwS (mean age = 43.9, 77% male) and 15 younger healthy controls (yHC, mean age = 45.1, 47% male). Protocols for behavioral profiling were similar with the exception of the Positive and Negative Syndrome Scale (PANSS) for schizophrenia and administered in Newcastle only. All participants spoke English as a native language. Clinical groups differed in age, education (schizophrenia often interferes with education resulting in fewer years of formal education), local dialect, and experimenters. We therefore did not compare PwA and PwS directly, but rather, we compared how they differed from their respective control group. We recorded and transcribed participants’ narration of the “Dinner Party” comic strip (Fletcher & Birt, 1983). For microstructure variables, samples were annotated by hand. For macrostructure variables, individual propositions and their order were categorized and annotated by hand, while proportion of emotion words was determined by computerized analysis. We divided variables into several domains. Microstructure: a) Quantity: word count, utterance count; b) Grammatical complexity and errors: mean length of utterance in words, mean number of grammatical dependents, mean number of clausal embeddings, ratio of morphosyntactic errors; c) Pauses: proportion of within-clause pauses and between clause pauses; d) Verbs: proportions of episodic verbs, stative verbs, copula and modal verbs; e) Reference: ratio between definite and indefinite NPs, ratio of referential errors (within the NP); f) Grammatical factivity: ratio of factive and non-factive clausal embeddings. Macrostructure: a) Propositions: number of propositions, repeated propositions, proportion of accurate propositions. b) Structure: propositional chunk strength (how often the average succession of propositions, e.g., mentioning the couple preparing food before mentioning the fish, was produced by controls). c) Proportion of emotion words. For comparisons between the clinical groups and respective controls, we carried out ANCOVAs with the language variable as the outcome, group as predictor, and age as covariate. Because of the volume of data, we here report only significant group effects. To compare PwA and PwS on a given variable, we normalized the difference between each clinical participant and their respective control group using z-scores. We then compared z-scores between PwA and PwS.

Results: In comparison with oHCs, PwA produced more utterances ($p = .005$), but shorter utterances ($p < .001$), and less complex sentences with fewer dependents ($p < .001$) and clausal embeddings ($p < .001$). They also produced more morphosyntactic errors ($p < .001$). They displayed more pauses both within clauses ($p < .001$) and between clauses ($p = .005$). PwA made more referential errors ($p = .003$). The order of propositions was more unusual ($p = .005$) and there were more inaccurate propositions ($p = .007$). In comparison with yHCs, PwS produced fewer words ($p < .001$), shorter utterances ($p < .001$), and less complex sentences with fewer dependents ($p < .001$) and fewer clausal embeddings ($p = .01$). The proportion of non-factive embeddings was lower ($p = .03$). They made more referential errors ($p = .01$). PwS produced fewer propositions ($p = .003$) and in a more unusual order ($p < .001$). They produced a lower proportion of emotion words ($p = .03$). Finally, we compared PwA and PwS in their differences from their respective controls. PwA showed a greater difference to their controls only on microstructural variables, producing fewer grammatical dependents ($p = .007$) and more morphosyntactic errors ($p = .04$). PwS showed greater difference to their controls only on macrostructural variables, producing fewer propositions ($p < .001$) and fewer emotion words ($p < .001$).

Discussion: While both PwA and PwS displayed substantial differences from controls both at micro- and macrostructural level, patterns of deviation from their controls differed between groups: PwA showing greater microstructural deviation and PwS greater macrostructural deviation. PwA appear to partially compensate for more severe microstructural impairment by producing more utterances, which, in combination with emotion words, make them more efficient narrators than PwS. Given these dissociations and the greater presence of morphosyntactic errors in PwA, but not in PwS, the nature of language impairment in PwA is in lexical-morphological processing, while in PwS it may concern conceptual and propositional organization.

Poster session 1

P1-01: Executive functions and their contribution to language performance in people with aphasia: a systematic review of recent findings, Ana Došen et al.

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Introduction: Executive functions (EFs) are a set of cognitive processes that make it possible to manage daily life. The three main areas of EFs are working memory (WM), inhibitory control and cognitive flexibility that are responsible for many skills, such as reasoning, problem solving, planning, prioritising, organising, etc. (Diamond, 2013). Previous studies have shown that individuals with language disorders, such as aphasia, have deficits in EFs (e.g., Murray, 2012; Schumacher et al., 2019), which suggests that EFs are involved in a variety of language abilities. For example, problems retaining information in WM and inhibiting distractions can have a negative impact on language comprehension in both children and adults (Šimleša et al., 2017; Zakariás et al., 2016). However, the relationship between language and EFs in PWA is very complex, and it is still unclear how and to what extent EFs interfere with language abilities in this population. Due to the evident lack of unambiguous data on the contribution of EFs to language performance of PWA and the overabundance of different approaches to this complex topic, current study aims to systematically address the following questions: 1) what are the most commonly used tests and tasks to measure EFs in PWA; 2) which EF contributes to a specific language ability, i.e. in which way is the EF performance related to performance on specific language comprehension and production tasks in PWA.

Methods: To address the above-mentioned research questions, we conducted a systematic review of the recent literature, published in the past 20 years. For this, two databases were inspected: Web of Science and Scopus. The search was based on the pre-defined keywords and the following search strings: 1) aphasia and executive functions (or working memory) and communication; 2) aphasia and executive functions (or working memory) and language performance; 3) aphasia and executive functions (or working memory) and language production; 4) aphasia and executive functions (or working memory) and language comprehension. The .ris files of the detected papers have been exported to the Rayyan programme for conducting systematic reviews and the exclusion criteria have been determined. A PRISMA-ScR flow diagram will eventually be used to present the process of search, exclusion, and selection of studies.

Preliminary results: This is an ongoing study that takes place in several steps. So far, 2585 papers have been identified, 1470 were resolved as duplicates, and the remaining 1115 are currently being inspected. Reasons for exclusion mostly include the participating population (children with language disorders, dementia patients, patients with Alzheimer's or Parkinson's disease, patients with epilepsy), the focus and the design of the study (e.g., if only reading and writing abilities are addressed) or publication type (meta-analyses and systematic reviews). When this step is finalised, the authors will extract the key findings and the obtained data will be presented by means of synthesis method according to the research questions.

Discussion: This study has the potential to summarise the data on EFs in PWA and provide a clearer picture on the contribution of EFs to language performance in this population. Due to the systematic approach undertaken, the study will identify common methodological approaches on the one hand and the remaining knowledge gaps on the other, and may thus serve as a guide for future research. Furthermore, the gathered findings could eventually be transferred into practise and help clinicians to conduct a comprehensive assessment of language and EFs, and to organise an individualised approach to therapy for PWA.

P1-02: MRI-based neuroanatomical predictors of phonological interference under dual-task conditions in participants with post stroke aphasia, Cyrielle Demierre et al.

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Introduction: Even though speech production may appear effortless, it typically encounters disruptions when engaged in dual-task conditions, such as cooking while speaking, or within dual-task paradigms. The dual-task experimental paradigm has been used to induce different types of errors in patients with aphasia (PWA) (Demierre et al., 2023). Different clinical studies (Murray, 2000; Laganaro et al., 2019) investigated the interference of dual-task on word production and reported an increase of errors. In Murray (2000), mainly lexical errors were reported and by contrast mainly phonological errors in Laganaro et al. (2019). The study by Demierre et al. (2023) has tried to disentangle this contradiction by showing that omission and phonological errors increased at different stimulus onset asynchrony (SOA) of the concurrent stimuli, with phonological errors increasing only at SOA+300 and +450. However, the different patterns of errors (omission versus phonological) might also be linked to the PWA, and their underlying impairment and lesions. The brain correlates of various error types investigated with lesion-symptom mapping show that semantic/lexical errors have been associated mainly with lesions of the left anterior temporal lobe (Halais et al., 2018) and of more posterior regions (posterior middle and superior temporal gyrus, angular gyrus and the occipital cortex (Bruffaerts et al., 2018). Phonological errors have been associated to lesions in left inferior parietal and frontal regions (Halai et al., 2018). Finally, omission errors have been linked to lesions in the left mid-anterior to posterior temporal cortex (Halais et al., 2018) and the left frontal cortex (Chen et al., 2019). The lesion may therefore underpin the different patterns of increased errors observed in dual-task studies.The aim of the present study is to investigate the neuroanatomical correlate of the interference observed under dual-task conditions on word production in our previous study (Demierre et al., 2023).

Methods: Seventeen PWA (mean age:63.24, SD:12.74) suffering from aphasia following a left hemispheric stroke were recruited in Bordeaux Hospital and underwent clinical brain magnetic resonance imaging (MRI) during the acute phase. They all participated to the dual-task study of Demierre et al. (2023). The lesion mapping was conducted on axial diffusion-weighted images acquired in the acute phase that were imported with the software MRIcro. Lesions were drawn manually as region of interest by a trained neurologist and images were normalized to a standard brain template. Regions of interest (according to Tzourio-Mazoyer et al. (2002)) were determined by calculating the ratio between the lesion size in voxels and the size of the area in voxels. Only regions with at least 10% of damage were retained (central region, frontal, frontotemporal, insula, parietal, parietotemporal and temporal. Participants underwent a picture naming task and an auditory detection task separately and under dual-task conditions. The auditory detection was composed of four syllables. Participants were instructed to name the pictures as quickly and accurately as possible, while pressing a key when they heard the target syllables (syllable “fo” associated with filler pictures, discarded from the analyses).

Results: In Demierre et al (2023), behavioral results indicated a decrease of accuracy under dual-task conditions as compared to naming in isolation. Errors produced by PWA were classified in three different categories: lexical (semantic paraphasias, unrelated lexical errors, perseveration), omission (non-responses) and phonological errors (phonological paraphasias, neologism). Analyses by type of error showed that the rate of lexical errors was not significantly different between the single and dual-task conditions. An increase of phonological and omission errors was found under dual-task conditions as compared to naming in isolation. As for the neuroimaging results, dual-task cost (DTc) in accuracy, phonological and omission errors were calculated using the following formula:

$$\text{DTc (\%)} = \frac{\text{Dual}-\text{task performance}-\text{Single task performance}}{\text{Single task performance}}$$

Spearman's rank correlation was computed to assess the relationship between DTc and the ratio of the lesion size in the different region of interest. DTc on accuracy did not show significant correlation neither with the total lesion size nor with any region of interest. There was a positive correlation between the DTc in phonological errors and the temporal lobe, r(15) = 0.80, p <.001. DTc in omission errors did not correlate with any region of interest (see results of all the correlations in Figure 1.a). As there was a clear link between the DTc in phonological errors and the temporal lobe. Correlations were also assessed with the different subregions of the temporal lobe. There was a positive correlation between the DTc in phonological errors and the temporal inferior lobe, r(15) = 0.66, p =.004, the middle temporal gyrus, r(15) = 0.72, p =.001, and the superior temporal gyrus, r(15) = 0.68, p =.003 (all correlations are presented in Figure 1.b).

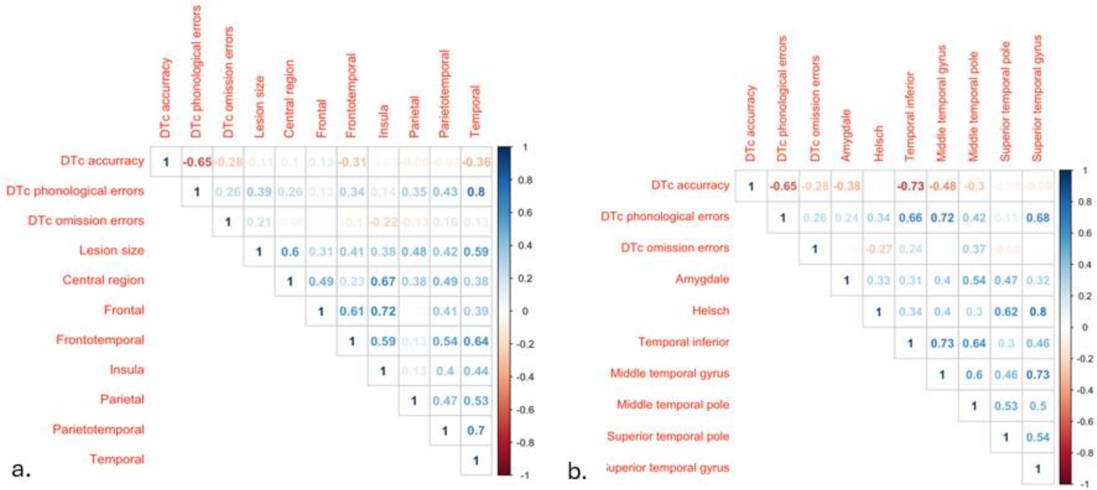

Figure 1. Results of the correlations between the different brain (a) area, the different part of the temporal lobe (b) and the dual-task cost in accuracy, phonological errors and omission errors.

Discussion: None of the DTc correlate with the lesion size, meaning that the impact of dual-task is not related to the overall lesion size as it has been suggested (Thye & Mirman, 2018), but possibly to specific locations. There was a positive correlation between the DTc in phonological errors and the temporal lobe, more precisely with the inferior temporal lobe, the middle and the superior temporal gyrus, meaning that the cost of the dual-task increases with the lesion size in these regions. This might be surprising as these regions were more associated with omission and semantic errors in lesion-symptom mapping studies (Halai et al., 2018). However, some other studies suggested that phonological errors were linked to the superior temporal lobe (Fridiksson et al., 2018). This result was confirmed by a study using direct electrical stimulation (Perrone-Bertolotti et al., 2020). Data analyses are still ongoing and further analyses need to be performed with the results of the dual-task performed under focused attention (meaning that the auditory stimuli could be ignored), to investigate if there is some change with a different attentional requirement. Therefore, caution is needed when attempting to generalize findings from lesion data as they may subject to variations.

P1-03: Helping hands? Gesture production does not (necessarily) facilitate naming in aphasia, Isobel Chick et al.

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Introduction: Anomia, or word-finding difficulty, is common in people with post-stroke aphasia (PWA). The Lexical Retrieval Hypothesis proposes that gesture production has a speaker-oriented effect of facilitating word retrieval, while constraining gestures results in impaired word retrieval (Krauss, 1998; Rauscher et al., 1996). However, evidence is inconclusive with studies comparing measures of word retrieval when gesture use is constrained in both neurologically healthy adults and PWA yielding mixed results (Frick-Horbury et al., 1998; Kısa et al., 2022). It is also unclear whether production of certain types of gesture, such as iconic gestures which are semantically related to the target word, may be more facilitatory of word retrieval than other gesture types. We hypothesised that if lexical items and gestures are stored in an (at least partially) shared semantic repository, gesture production by PWA may facilitate word retrieval by enhancing semantic activation of target words. In contrast, constraining gesture use could result in poorer word retrieval, by constraining the spreading activation effect of gestures on retrieval of target words. Therefore, we aimed to answer the following research questions: Do PWA exhibit higher naming accuracy when they are free to produce gestures (of all types), than when they are constrained from gesturing? When PWA produce iconic gestures specifically, does this facilitate the production of words more closely semantically aligned to the target word, as measured by cosine similarity?

Methods: We recruited 24 English-speaking PWA with mild-moderate aphasia (18 males, 6 females) from the UK (mean WAB-R Aphasia Quotient: 80.2, SD: 12.0). All PWA presented with Broca's, conduction or anomic aphasia and were at least 12 months post-stroke (mean: 95.5 months, SD: 43.6 months). PWA played an interactive picture naming game ("Go Fish!") with the researcher, where players took turns asking each other for cards depicting everyday objects and actions. In half of trials, PWA and the researcher were free to gesture when asking for cards (gesture permitted condition); in the other half, players were constrained from gesturing (gesture constrained condition). PWA were not instructed to gesture in the permitted condition, but were informed that they were free to do so. Gesture condition was blocked and counterbalanced across participants. Interactions were videoed to capture PWA gesture production. We coded the following gestures produced by PWA: iconic gestures, beat gestures (small rhythmic up and down movements not semantically related to speech), pragmatic gestures (gestures moderating the flow of discourse), and points. Naming accuracy was measured based on PWA correctly naming the images on their playing cards.

Results: Analysis 1: 749 observations were included in a logistic mixed effects regression analysis. Our results indicated no significant effect of gesture condition (i.e. gesture permitted vs. gesture constrained) on naming accuracy ($b = -0.179$, $SE = 0.288$, $z = -0.621$, $p = 0.535$). We simulated power for a range of effect sizes following the procedure for GLMM outlined by Cabiddu et al. (2022). We determined that the sample size was sufficient to detect small effects (0.3) at 0.8 power. Analysis 2: Given that PWA did not produce gestures in every trial in the gesture permitted condition, we carried out a further logistic mixed effects regression analysis of 372 trials which directly compared naming accuracy in trials in which PWA produced gestures, with trials in which they did not. All gesture types were included in the analysis. We found no significant effect of gesture production, regardless of gesture type, on naming accuracy ($b = -0.52$, $SE = 0.35$, $z = -1.51$, $p = 0.132$). We simulated power for a range of effect sizes and determined that the sample size was sufficient to detect large effects (> 1.0) at 0.8 power (Cabiddu et al., 2022). Analysis 3: Finally, we carried out a linear mixed effects regression analysis to determine if production of iconic gestures by PWA facilitated production of words that were more closely semantically aligned to the target word (measured by cosine similarity), compared with when other types of gestures were produced by PWA. We found no significant effect of iconic gesture production on cosine similarity ($b = 0.06506$, $SE = 0.18459$, $t(6.78376) = 0.352$, $p = 0.735$). We simulated power for a range of effect sizes following the procedure for LMM outlined by Morey et al. (2022). We determined that the sample size was sufficient to detect moderate effects (0.8) at 0.8 power. In all analyses we controlled for aphasia severity, target word frequency and length, lexical semantic, object semantic and action semantic processing abilities. We entered a random intercept of participant and a random slope and intercept for the gesture variable in each analysis to capture individual variability in gesture response.

Discussion: We found that neither potential to gesture nor gesture production by PWA facilitated their naming accuracy in a gamified semi-naturalistic interaction. Moreover, we found that production of iconic gestures by PWA did not result in production of lexical items more closely semantically aligned to the target word. We determined that for all analyses there was adequate power to detect at least large effects. Interestingly, we observed a high degree of individual variability in the number of gestures produced by PWA and the degree of benefit conferred by gesture production on naming accuracy; while gesture production overall was not significantly predictive of naming accuracy, some PWA did benefit (range 1%-22% improvement in naming accuracy with gestures) while others performed more poorly (range 2%-55% decrement with gestures), suggesting that individual differences may affect gesture production benefit. We therefore plan to collect additional data and run further analyses to explore how individual differences in lesion characteristics, limb apraxia (praxis) severity and cognitive functioning may moderate gesture benefit. Going forward, identification of the factors which predict gesture benefit for word retrieval may have important implications for the development of personalised rehabilitation approaches for PWA.

P1-04: Investigating the Effects of Stroke Infarct: Comparisons between Simulated and Real Lesions and Understanding Post-Stroke Semantic Aphasia in Gradient Space, Ramya Balakrishnan et al.

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Introduction: One-third of stroke patients are affected by aphasia, a language disorder (Falconer et al., 2024). Functional connectivity studies show decreased activity in both language-specific networks and non-language networks including default and dorsal attention networks (Siegel et al., 2016; Zhang et al., 2021). In line with these findings, semantic aphasia following stroke is not solely the result of focal lesions, but rather a manifestation of more distributed network-level disruptions or heteromodal deficits affecting brain regions beyond the infarct location (Jefferies et al., 2008; Dyson et al., 2021; Xiao et al., 2024). In this way, understanding semantic deficits in aphasia requires analyses of large-scale connectivity changes. Connectivity gradients are a promising method that can effectively capture functional connectivity disruptions caused by infarcts, both locally and remotely from the lesion location (Margulies et al., 2016). These gradients are the principal components of functional variation derived from intrinsic connectivity, with the first gradient capturing the distinction between unimodal and heteromodal cortex, while gradient 2 relates to the differences between visual and auditory-motor cortex. Since resting-state scans are not widely available for stroke survivors in clinical practice, we conducted a lesion simulation study. We had two objectives: Study 1: To establish the extent to which a structural scan, delineating a patient's lesion, is sufficient for predicting changes in connectivity gradients, comparing the simulated effects of stroke lesions with real effects of stroke lesions in gradient space. Study 2: To relate these simulated changes connectivity gradients to semantic cognition.

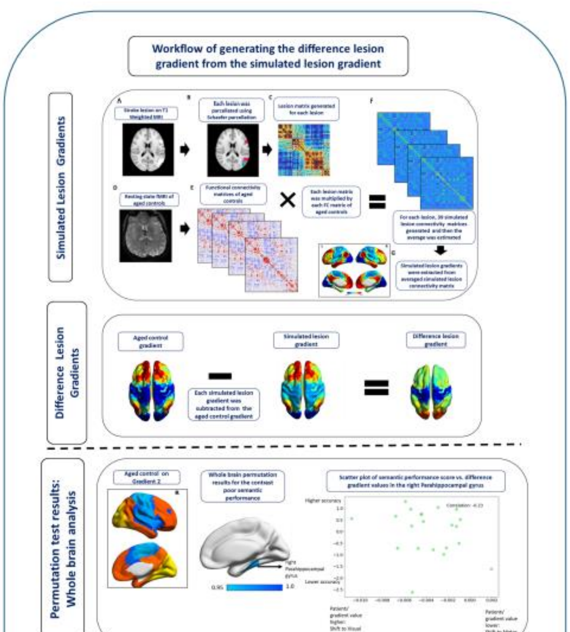

Figure 1: Workflow of the analysis: T1-weighted lesion brain maps were multiplied with the Schaefer parcellation assigned to 400 parcels. The intensity value in each parcel was subtracted from 1 to calculate the complement. Using the lesion complement, an outer product operation was performed on the 1D vector to produce a 400 x 400 lesion matrix. Each lesion matrix was element-wise multiplied with 39 functional connectivity matrices corresponding to the aged control group. The element-wise average from the 39 simulated lesion connectivity matrices for each lesion was estimated. Simulated lesion gradients were then extracted for each lesion using the average simulated lesion functional connectivity matrix. Each simulated lesion gradient was subtracted from the aged control gradients to obtain difference lesion gradients. This subtraction operation removed the normal baseline gradient. Permutation test results: Poor semantic performance was associated with the right parahippocampal gyrus, showing a shift towards motor regions on Gradient 2.

Methods: Study 1: Intrinsic connectivity data were available from a 9-minute resting-state fMRI scan for 8 left hemispheric infarct patients with semantic control deficits and 39 age matched-controls. Connectivity gradients were extracted from functional connectivity matrices for each participant. Lesions were manually segmented, and the extent of damage was estimated for 400 parcels. We estimated the disruption to functional gradients from each lesion by multiplying each lesion matrix with the functional connectivity matrices derived from each control participant and then averaged them (Fig1).

We then compared these simulated effects of lesions on connectivity gradients with the real effects, derived from the resting-state fMRI data directly, to evaluate the extent to which the simulated lesion gradients were able to capture the gradient changes induced by the actual stroke lesions. Study 2: The same methods were used to generate simulated gradient changes for

23 participants with semantic aphasia following left-hemisphere stroke. Permutation testing was used to identify brain regions in which gradient changes predicted performance on semantic tasks.

Results: Gradient data for each lesion were subtracted from the age-matched controls' data to isolate the specific effects of stroke in gradient space. This was performed for both real gradient changes in Study 1 and simulated gradient changes in Study 2. We found that simulated lesion gradient changes were significantly correlated with real lesion gradient changes (Gradient 1: mean 0.36, SD ± 0.17; Gradient 2: mean 0.207 , SD± 0.22). A one sample t-test with bootstrapping showed these simulated gradient changes were more similar to real gradient changes than expected by chance ($p<.001$). In Study 2, motor regions showed a shift towards DMN on Gradient 1 in participants with aphasia relative to age-matched controls, suggesting the heteromodal-unimodal distinction is disrupted in some networks. On gradient 2, the visual cortex showed a shift towards the motor end of this gradient, suggesting the visual-motor distinction is also disrupted. Permutation tests revealed that worse semantic performance was associated with a shift towards the motor end of Gradient 2 in right parahippocampal gyrus (Fig1). Poor semantic cognition was also linked to a shift towards the unimodal end of Gradient 1 in left frontal pole/inferior frontal gyrus using a semantic control mask.

Discussion: By employing a multidimensional hierarchical framework of connectivity gradients, we observed that semantic impairment is associated with connectivity changes induced by lesions in Gradients 1 and 2. We propose that the gradient decomposition approach may be useful in detecting changes in intrinsic connectivity patterns after stroke and predicting recovery from post-stroke semantic impairment. The results also suggest that gradient changes may be simulated from lesion shape/size alone, although not every participant showed this similarity for every gradient. Poor semantic performance associated with right parahippocampal gyrus is in line with the suggestion that visual connectivity to anterior medial temporal cortex is important for accessing the meanings of written words and pictures. In addition, semantic processing is associated with heteromodal memory and control regions; Gradient 1 captures the separation of transmodal and unimodal cortex (Wang et al., 2020), with better semantic performance associated with greater separation.

P1-05: Phonological processes and capacity constraints in consonant substitution errors: Insights from Individuals with Conduction Aphasia, Aviah Gvion et al.

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Introduction: Individuals with conduction aphasia (CA), characterized by phonological output buffer (POB) impairments, frequently generate phonemic errors due to the sub-lexical nature of the processing units (Butterworth, 1992). Phonetic errors, unlike phonemic errors, stem from impairments in phonetic encoding or articulatory programming as seen in Apraxia of Speech (AOS) or Dysarthria. Phonetic errors often entail simplifications at phonemic and syllabic levels (Ballard et al., 2000). In contrast, individuals with CA, typically produce well-formed sounds, albeit erroneous phonemes. Phonological principles govern how, and how often, phonemes occur and co-occur within specific positions through a system of hierarchically ranked violable phonological constraints. These principles affect syllabic and segmental levels (Prince & Smolensky, 2004). Segmental markedness, referring to the relative complexity of speech sounds, is determined by perceptual and articulatory factors (Jakobson, 1968; Rice, 2007). The sonority Sequencing Principle (SSP. Clements, 1990) establishes the relative complexity of syllable types based on sonority profiles. In addition, there are phonological processes that facilitate production, such as speech sound assimilations that occur when a sound in a word is influenced or modified by a neighboring sound. There is scarce evidence concerning the modulation of phonemic errors in people with aphasia (PWA) by phonological principles. Some report that substitution errors are motivated partially by the complexity of the syllabic context, and some report otherwise (Black, & Nozari, 2023; Romani, & Calabrese, 1998; Romani et al., 2002). Phonemic errors may also be motivated by limited phonological capacity. The POB is responsible for maintaining phonological representations in short-term memory. Conceptually, phonemes are stored as bundle features, activating corresponding phonemic specifications. These bundles encompass relevant phonemic feature distinctions (place and manner of articulation, voicing). The POB not only temporarily holds activated phonemes but also facilitates co-articulation and assimilation effects. Recently, Black and Nozari (2023) analyzed phonemic errors produced by PWA demonstrating that the phonological proximity of the error to the target phoneme decreased with increased working memory load aligning with predictions from resource models. As the number of phonemes to remember increases, each phoneme receives a diminished share of memory resources, leading to less precise recollection. Accuracy was assessed based on the number of shared phonetic features between the error and the target phoneme. The current study investigated what governs phonemic substitution errors – whether they are directed by phonological principles and processes or capacity limitations. If errors adhere to intact phonological principles, they are expected to be phonologically less complex than the target phonemes, favoring less marked syllabic patterns and showing a tendency toward assimilation errors. Conversely, if errors stem from partial retention of distinctive features of target phonemes, they may closely resemble the target phonemes, potentially disregarding simplicity in perception and production.

Method: A total of 347 consonant substitution errors produced by 14 Hebrew-speaking individuals with output CA, without AOS and/or dysarthria were analyzed. These errors were extracted from the participants' responses to stimuli comprising 60 phonetically balanced words administered three times in three different tasks: picture naming, repetition, and reading aloud. Additional responses were collected from a nonwords repetition task, comprising a list of 33 nonwords that were generated by modifying phonemes in the word list.

Results: The initial analysis comprised 342 substitution errors, excluding assimilations, metathesis, or movement of a single phoneme. Subsequently, we conducted a separate analysis focusing on assimilation substitution errors. Sonority. Significant higher rate of errors (77.6%) ($\chi2 = 202$, $p < .0001$) adhered to the SSP principle. Only

78(22.4%) substitutions – 48 occurring at the onset and 30 at the coda, violated this principle. Specifically, these substitution errors involved a rise in sonority at the onset and a reduction in sonority at the coda, in comparison to the target phoneme. Markedness. Out of the 342 substitution errors we were able to determine the direction of the substitution errors in 298 cases. In 165 (55.4%) of the cases, errors were toward the marked, hence the more complex phoneme, while 135 (44.6%) errors were toward the simpler, unmarked phonemes – a difference that was not significant. Assimilation. There were only five assimilation substitution errors. For instance: /barvaz/-/barbat/ (duck-nonword). However, there were twice as many de-assimilation errors, such as: /buba/-/bupa/ (doll-nonword). Yet, this difference did not reach significance. Capacity constraints. The distances between the target phoneme and the response were analyzed by counting the number of features shared between them. For instance: /balon/-/palon/ (baloon-nonword) was considered as one distinctive feature (voicing) as opposed to a distance of two features: /ec/-/ef/ (tree-nonword; place and manner of articulation), or three features /sakin/-/sakif/ (knife-nonword; place, manner of articulation and voicing). In 160 (49.2%) of the substitution errors, the distance between the target phoneme and the erroneous phoneme was one distinctive feature. In 129 (39.7%) errors, the distance was two features, and only in 36 (11.1%) instances, the distance was three distinctive features. Significant differences were found between distances of one feature compared to two and three features ($\chi 2 = 5.98$, $p = .01$; $\chi 2 = 112.32$, $p < .0001$, respectively) and between distances of two features and three features ($\chi 2 = 70.25$, $p < .0001$). Finally, we analyzed the substitution errors according to the distinctive features that were changed: place of articulation (229 of the errors: e.g., s/f; t/p), manner of articulation (210 errors: e.g., t/ts; d/z), and voicing (91 errors: e.g., t/d; b/k). Significant differences were found between the place of articulation, manner of articulation, and voicing ($\chi 2 = 85.25$, $p < .0001$; $\chi 2 = 65.7$, $p < .0001$, respectively) but not between place and manner of articulation.

Discussion: The main findings suggest that substitution errors produced by individuals with CA are only partially governed by phonological principles and simplification processes. Although these errors adhere to the sonority principle, they do not follow the segmental markedness principle and are not prone to assimilation errors. Nonetheless, these errors appear to be indicative of restricted phonological capacity constraints as they exhibit partial retention of the phonetic features of the target phonemes, even at the expense of violating some of the phonological principles and processes that are hierarchically lower.

P1-06: Lexical diversity in the spoken discourse of people with aphasia: a comparison of different discourse types, Marija Jozipović et al.

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Introduction: Discourse analysis provides information about production abilities beyond the sentence level (Schiffrin, 1994), both for typical speakers (TD) and for clinical groups. For discourse production to be successful, vocabulary plays a crucial role. Vocabulary is assessed by lexical diversity (LD) - the number of different words used in a language sample. A higher number of different words means a higher LD (McCarthy & Jarvis, 2010). In a discourse with a high LD, many different words are used with few lexical repetitions (Johansson, 2008). In addition, discourse types differ in their structure and content, imposing different cognitive and linguistic demands (Ulatowska et al., 1990). Previous studies have shown that in TS, the greatest LD is in narrative discourse (telling a personal or fictional story) and greater LD is in expositional discourse (eventcasts based on sequential images) compared to procedural discourse (describing a procedure) (Fergadiotis & Wright, 2011). Aphasia is an acquired language disorder resulting from brain injury (ASHA, 2024). Discourse analysis, including LD, can be used as an ecologically valid tool in clinical work with PwA (Stark, 2019). However, it is challenging to measure LD in PwA, who often have difficulties with lexical recall (Wright et al., 2003). In the discourse of PwA, these difficulties can manifest themselves in frequent pauses, the use of filler words, unfinished words, lexical perseveration, verbal stereotypy and paraphasia (Hallowell, 2017). Only a limited number of studies investigated LD in the discourse of PwA – some of the studies found no difference in LD between different discourse types (e.g., Fergadiotis & Wright, 2011), while others found that the narrative discourse of PwA contains significantly more different words compared to picture description (e.g., Schnur & Wang, 2024). In the present study, we aim to contribute to the body of evidence by comparing LD in different discourse types in speakers of Croatian, both PwA and TS. We expected that: H1: In the group of TS, there will be a statistically significant difference in LD between different discourse types, i.e. LD will be highest in narrative discourse, followed by expositional and then procedural discourse. H2: In the group of PwA, there will be no statistically significant difference in LD between different discourse types, i.e. narrative, expositional, and procedural discourse.

Method: The sample consisted of 34 participants (17 PwA and 17 TS) balanced in terms of age and gender, all monolingual Croatian speakers. Narrative samples of PwA were extracted from the Croatian discourse corpus of speakers with aphasia (CroDA; Kuvač Kraljević et al., 2017), which is part of an open-access computerized database of discourse samples from PwA (AphasiaBank: MacWhinney et al., 2011). Data were collected using the AphasiaBank protocol (MacWhinney et al., 2011), which was adapted and translated into Croatian (Kuvač Kraljević et al., 2017). The protocol includes four tasks on spoken language that provide information on the participants' language abilities in everyday situations: personal narratives, picture descriptions, storytelling, and the explanation of a procedure. For the purposes of this study, the three tasks were used: Narrative discourse: Cinderella story; Expositional discourse: Refused Umbrella; Procedural discourse: Making a sandwich. Each transcript was hand-coded by one of the researchers and double checked by others. Since Croatian is a morphologically rich language, which could potentially affect the increase in LD in the samples, all inflected words in the samples were returned to lemmatical form. LD was then calculated in Computerized Language Analysis of Transcripts (CLAN) program (MacWhinney, 2000) using measure D (short for diversity; Malvern & Richards, 1997; Wright et al., 2003). D was used because its result is independent of the language sample length, which is important when researching PwA, whose productivity is often limited due to language difficulties. Data was analyzed in IBM SPSS Statistics 26 using non-parametric Kruskal-Wallis test, Dunn post-hoc test and descriptive statistics data.

Results: The results of the Kruskal-Walis test confirmed H1 and showed significant differences in LD between different discourse types produced by TS ($H(2) = 31.351$, $p < .01$). The post-hoc Dunn test showed significant differences between all discourse types ($p > .01$); LD in narrative discourse was highest, followed by expositional and then procedural (see Table 1). The Kruskal-Walis test also showed significant differences in LD between different discourse types produced by PwA ($H(2) = 30.688$, $p < .01$). The post-hoc Dunn only showed significant differences in LD between narrative and procedural ($p < .01$) and narrative and procedural discourse ($p < .01$), while no significant differences were found between procedural and expositional discourse (see descriptive statistics data in Table 1). This result only partially confirmed our H2.

Table 1. *Descriptive statistics data for LD in different discourse types produced by TS and PwA*

	GROUP							
	TS				PwA			
TYPE OF DISCOURSE	*C*	*Q*	Min	Max	*C*	*Q*	Min	Max
Narrative	50.65	14.42	7.37	68.16	31.16	6.19	12.25	41.91
Expositional	16.90	4.24	7.01	32.10	8.89	2.75	3.99	24.20
Procedural	5.39	4.03	1.21	27.83	9.45	2.96	2.47	21.48

Discussion: The results for the TS group are in line with previous studies (e.g. Fergadiotis & Wright, 2011) and show that LD can vary considerably depending on discourse type. The results for the PwA group are only partially consistent with the results of previous studies (Fergadiotis & Wright, 2011). It is possible that the influence of language disorders such as aphasia on language production, and here on LD, is greater than the influence of discourse type, such that difficulties in lexical recall persist across discourse types. However, contrary to our expectations, LD in PwA is significantly higher in narratives than in other discourse types, which in this case could be a consequence of the use of a very well-known and familiar story such as Cinderella, a story that can be easily retrieved from long-term memory, including the lexical items associated with it. These findings are in line with some other studies that have measured LD by the number of different words (e.g. Schnur & Wang, 2024), in which significantly more different words were found in narratives compared to picture descriptions. This is a preliminary study which has already shown that the methodology for measuring LD needs to be reconsidered and elaborated in detail, especially in morphologically rich languages and when working with PwA, where a large proportion of the words actually produced are (due to) different errors. Therefore, further work will also include a qualitative analysis of errors.

P1-07: The relative contribution of acoustic, syntactic and semantic variables to automated analyses of the language of persons with Primary Progressive Aphasia, Roelant Ossewaarde et al.

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Introduction: Primary Progressive Aphasia (PPA; Gorno-Tempini et al., 2011) is a neurodegenerative condition in which the primary, dominant symptom is a progressive language disorder. Three variants of Primary Progressive Aphasia are commonly distinguished (Gorno-Tempini et al., 2011): the non-fluent variant of Primary Progressive Aphasia (nfvPPA) which is associated with agrammatism and/or slow, labored speech, the semantic variant (svPPA) which involves increasingly empty, but fluent, speech, with affected naming and word comprehension, and the logopenic variant (lvPPA), which is aphasia with anomia, poor repetition and relatively spared word comprehension. The first two variants are most often associated with frontotemporal lobar degeneration (FTLD), whereas the logopenic variant is commonly associated with Alzheimer's disease pathology (Rohrer, Rossor, and Warren, 2012). Between and within the subgroups, clinical manifestations are heterogeneous (Louwersheimer et al., 2016; Bergeron et al., 2018; Leyton et al., 2015). Given the crucial role of language analysis in the diagnosis of the disease and its subtypes, a range of linguistic variables must be considered for a valid contribution to the diagnosis. Software may facilitate the analysis of variables that are costly or difficult to quantify by hand. Several language based automated dementia detection pipelines exist, mostly trained on English (Qin, Lee, and Kong, 2019; Balagopalan et al., 2020). However, not all can be applied cross-linguistically (Chatzoudis et al., 2022) and there is also variation in the types of variables that they can measure. There is a varying degree to which variable measurements depend on language specific technology: acoustics variables may be measured without knowledge of the language, syntactic variables require at least part of speech tagging, and semantic variables require knowledge of the meaning of words and phrases in the language. If applied cross-linguistically, not all components of the standard pipeline for English may be available for the target language. We present a comparison of the relative contributions of variable categories in the context of a connected speech study of Dutch speakers with PPA.

Methods: Language was elicited using the connected speech stimulus of the Comprehensive Aphasia Test (CAT-NL; Swinburn, Porter, and Howard, 2004, Dutch adaptation: Visch-Brink et al., 2014) from three different groups of speakers of Dutch: one group of persons with PPA, (n=16), divided between persons with the non-fluent variant (nfvPPA, n=8) and persons with the semantic variant (svPPA, n=8). Participants in the PPA groups were under the care of neurologists at the Alzheimer Center of the Amsterdam University Medical Center. They were asked to be included in the study after a neurologist's assessment of probable PPA according to the diagnostic criteria of Gorno-Tempini et al. (2011). Participants in the control group form a demographically similar group. If participants visited the clinic for followup, they were asked to participate again. Elicitation from control participants was done using video conferencing, and from nfvPPA and svPPA participants in-person during clinic visits. The language of the participants was analyzed using a pipeline similar to that of BatchAlign (Liu et al., 2023). We replaced the acoustic alignment with our own Voice Activation Detection algorithm, and added a component to derive semantic distance measures to the topics of the description. Variables: The variables are grouped into those that have a general scope, variables that are detected through acoustics analysis (pause duration, rates of long and short pauses), part-of-speech tagging (rates of nouns, verbs, interjectives, closed class vs open class words), and semantic related (degree to which elements of the story are referenced, specificity of used vocabulary). Analysis: A probabilistic model (the 'classifier', implemented using SVM; Cortes and Vapnik, 1995) was used to predict class membership (PPA vs control; svPPA vs nfvPPA vs control) of the participant that contributed the language fragment. Variable categories were analyzed using ablation to estimate their relative contribution to the final disease prediction. SVM hyperparameters were determined using a grid search over a 10-fold cross validation sampling strategy. The performance evaluation metric reported is the balanced accuracy.

For the three class problem, this was computed as the average of the recall of each of the classes. Metrics are computed based on Leave-One-Out k-fold cross-validation.

Results: The optimal SVM parameters were C = 10 and γ = 0.4, with a radial kernel. Classification results for the two-class and three-class tasks (cf. Table 1) indicate that each variable category contributes to the best final prediction.

	Two-class		*Three-class*	
Categories	*Balanced Accuracy*	p	*Balanced Accuracy*	p
General	0.70	0.13	0.46	< 0.01
General + Acoustic	0.73	0.03	0.59	< 0.01
General + Acoustic + Syntactic	0.83	0.01	0.69	< 0.01
General + Acoustic + Syntactic + Semantic	**0.88**	< 0.01	**0.81**	< 0.01

Table 1.: Results for the two class and three class classification. The Balanced Accuracy is computed as Average Recall for the three class classifier. The p-value indicates the likelihood that the accuracy is better than the no information rate. The best scoring combination of categories is indicated in bold.

Classifying between groups indicates clear differences between control speakers and speakers with PPA. The classification algorithm is also able to discriminate between speakers from the nfvPPA and the svPPA groups. The addition of each of the variable categories adds to the predictive strength of the classifier. The sum of all of the available categories yields the best results. For the three class problem, there is a particular increase in performance with the addition of the semantics category. General and acoustic variables alone can yield accuracy that is significantly better than an informed guess; however, their accuracy is relatively low in absolute sense. Predictions made by the classifier show that persons with nfvPPA are classified with the highest accuracy, then followed by control participants, then by persons with svPPA. Misclassified svPPA speakers are almost never erroneously labeled as control participants but always as nfvPPA participants. This indicates the language of svPPA participants is perceptually close to the language of controls, but not close to the language of nfvPPA.

Discussion: The outcomes of this study may be used to make informed decisions about which variables to include in a predictive model that can distinguish between control and PPA speakers, and within the group of PPA speakers between those with the non-fluent and with the semantic variant. The results suggest that the combination of variable categories yields the best results.

P1-08: Validation of a new semantic property verification task allowing speech and language therapists to discriminate between different primary progressive aphasia variants: preliminary results, Alessa Hausmann et al.

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Introduction: Primary progressive aphasia (PPA) is a neurodegenerative syndrome marked by a gradual deterioration of speech and language abilities (Gorno-Tempini, 2011). Presently, three distinct variants have been identified: semantic variant primary progressive aphasia (svPPA), nonfluent variant primary progressive aphasia (nfvPPA) and logopenic variant primary progressive aphasia (lvPPA). Each variant exhibits unique clinical features and patterns of brain atrophy or hypometabolism. Speech and language therapists (SLTs) employ various validated assessment batteries to evaluate language and speech in PPA patients. One such battery, the Grémots (Bézy, Renard, & Pariente, 2016) language assessment battery in French, includes tasks like verbal fluency, lexical access, oral/written comprehension, repetition, and written language. Although very useful in the differential diagnosis of PPA, Grémots lacks tasks to comprehensively evaluate and characterize the nature of semantic impairments. Semantic impairment in PPA can manifest as either semantic degradation or deregulation (Warrington & McCarthy, 1983; Shallice, 1988). Semantic degradation involves consistent errors within tasks, unaffected by time intervals, and often exhibits a frequency effect. In contrast, semantic deregulation entails temporarily accessible semantic concepts, influenced by time intervals, and is associated with executive functions. While svPPA typically presents with degradation of conceptual knowledge (Chapman et al., 2020; Jefferies et al., 2020), semantic deregulation may occur in lvPPA (Ramanan et al., 2022). These impairments correlate with specific brain regions, with degradation linked to anterior temporal lobe atrophy and deregulation to posterior middle temporal gyrus involvement (Jefferies et al., 2020). Moreover, semantic impairment can affect different concept features, such as sensorial/perceptual or functional attributes. Perceptual features involve sensory aspects such as vision, while functional/conceptual features pertain to how concepts are utilized (Rogers et al., 2004). Currently, there is no French language task capable of delineating the nature (degradation vs. deregulation) and affected features (sensorial vs. functional) of semantic impairments in PPA patients. Such a task is essential to the development of specific therapeutic interventions for semantic disorders in svPPA. Therefore, the purpose of our study was to create a semantic property verification task and to validate it across the three distinct variants of PPA.

Methods: Creation of the semantic property verification task: From the Grémots lexical access and word–picture verification tasks, we selected 18 items, half of which are artificial and the other half living entities. For each item, four verbal statements were generated, with two stating sensorial properties (one true and one false) and two stating functional features (one true and one false). False statements were constructed by assigning to a given item a true property of its close semantic distractor used in the word–picture verification.

For instance:

"Un âne a des rayures noires et blanches (a donkey has black and white stripes) exemplifies an incorrect sensorial feature.

“Un seau est de forme cylindrique" (a bucket has a cylindrical shape) illustrates a correct sensorial feature.

“Un marteau sert à enfoncer des clous" (a hammer is used to drive nails) exemplifies a correct functional feature.

« L'avocat se mange généralement au dessert" (avocado is usually eaten for dessert) ilustrates an incorrect functional feature.

These statements underwent an evaluation with a sample of 9 healthy individuals without neurological conditions (mean age = 25.67; socio-economic level 1 (N=1), level 2 (N = 1), level 3 (N=7)).

Participants: The semantic property verification task underwent initial evaluation with a cohort of 9 healthy subjects. Following this preliminary evaluation, sentences not comprehended by 80% of the subjects were excluded. Following the completion of this preliminary evaluation phase, the semantic property verification task will undergo under a psychometric validation with participants diagnosed with PPA (10 svPPA, 10 nfvPPA, and 10 lvPPA). Recruitment of participants will be conducted at the Leenaards Memory Clinic, CHUV. 30 controls matched with age, sex, education will be recruited.

Procedure and statistics: All participants will undergo a complete language assessment using these tasks:

- Lexical access (nouns, verbs, proper nouns) from Grémots;
- Word, non-words and sentence repetition from Grémots or CHUV;
- Phonemic fluency task from Grémots;
- Words, non-words and sentences spelling from Grémots;
- Words and non-words reading from Grémots;
- Digit-spans forwards and backwards from WAIS-IV or word-spans from Majerus (2011);
- Oral/written sentence comprehension from TICSf.

In order to evaluate convergent validity, the following tasks will be administrated to the 3 PPA groups and the control group:

- A semantic fluency task (animals, vegetables and tools);
- Two non-verbal semantic tasks: semantic pictures association task from BECLA and Pyramid and Palm Trees

Test ;

- Two verbal semantic tasks: semantic judgement task from MEC and semantic questionnaire (QueSQ);
- Oral/written word-picture association from Grémots.

Discriminant validity, convergence validity, sensibility/specificity (AUC) and internal consistency (α de Cronbach) will be assessed using the tasks cited above.

Results: We anticipate that our semantic judgment task will enable us to achieve the three following objectives:

1. to have good psychometrics qualities: differentiate between PPA variants: We expect that individuals with svPPA will exhibit more pronounced impairments compared to those with lvPPA and nfvPPA. And within the svPPA group, we expected a good convergence validity, sensibility/specificity and internal consistency.

2. Characterize the nature of semantic impairment: We hypothesize that svPPA patients will demonstrate semantic degradation, characterized by consistent errors across language tasks utilizing the same items. Alternatively, lvPPA patients are expected to exhibit semantic deregulation.

3. Analyze impaired properties: We aim to determine if specific features are more affected in the different PPA variant, providing insights into the distinctive patterns of impairment within each group.

Discussion: Speech and language therapists (SLTs) require enhanced diagnostic instruments to facilitate more effective therapeutic interventions for semantic impairment in PPA. Additionally, to the best of our knowledge, this task would be the inaugural validated tool for PPA patients in French, enabling SLTs to more precisely delineate semantic impairments (degradation vs. deregulation), pinpoint the affected semantic features in each variant, and differentiate between variants. Our future research would aim to broaden our sample size to better understand the effects.

P1-09: Semantic richness and prototypicality effects of the lexical-semantic network on Tip of the Tongue states, Marie Couvreu et al.

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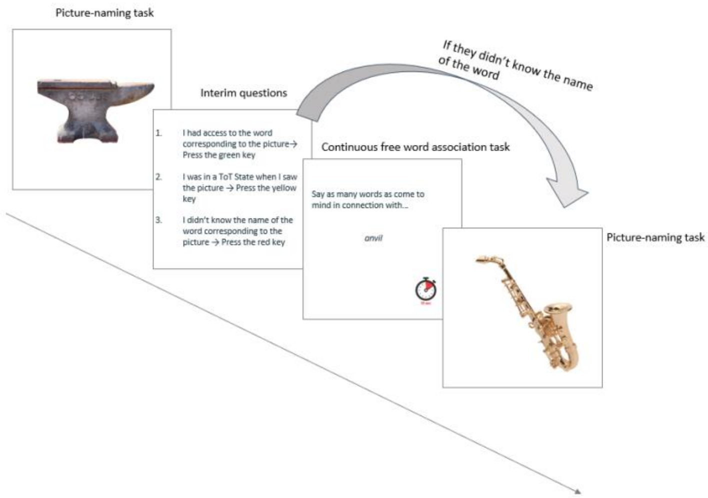
Introduction: When a speaker wants to express a specific concept, semantic activation spreads through the mental lexicon until one word receives enough activation to be selected. However, sometimes, due to various factors, this activation fails to propagate sufficiently, resulting in a deficit in the selection of the intended word. This occurs in some forms of anomia in aphasia or in the semantic variant of primary progressive aphasia (svPPA), but also temporarily in a Tip of the Tongue (ToT) state in neurotypical speakers. According to the ToT hypotheses, this might be explained either by a transmission deficit (Burke et al., 1991) from the lexical to the phonological level or by the difficulty to inhibit the competing words of the target word in the mental lexicon (Brown, 1979). Nonetheless, this phenomenon could also be investigated using a different approach i.e. the network perspective (Baronchelli et al., 2013). This perspective considers other factors, such as the semantic richness (number of associates) and prototypicality (the type of semantic relation) of the word network, which could influence word production. The impact of the semantic properties on lexical selection has been investigated in anomia (Lampe et al., 2021; Nickels et al., 2022), highlighting thus the importance of studying these factors, such as semantic richness and typicality, in a ToT phenomenon. To our knowledge, no study has attempted to determine the influence of the semantic richness and the typicality of the lexical-semantic network in a ToT state at the speaker level. Hence, here our aim is to investigate the following research question: is the lexical-semantic network weaker in terms of semantic associates of the target word and less prototypical in a ToT state than in an accessible word ("accessible state") in neurotypical adults?

Method: To this end, 46 neurotypical French-speaking adults, with no diagnosed language impairment, delay or neurological disease were included in the study (mean age = 21.24 years). In this paradigm, participants performed a picture-naming task with 80 infrequent words in French, followed by a continuous free word association task for each word that triggered a ToT state or that was correctly retrieved (see fig 1). Within the continuous free word association task, participants say all the words that come to mind in relation to a target word for a limited period of time (De Deyne & Storms, 2008), here 10 seconds. In between the two tasks, participants have to answer 3 questions about their knowledge of the word corresponding to the picture during the picture-naming task. The associates given during the continuous free word association task have been categorised based on a classical taxonomic classification (superordinate-coordinate-subordinate) enriched with some features from the Semantic Features Analysis (SFA) (Boyle, 2010; Miller, 1995) classification (spatiotemporal – perceptive – functional – other).

Figure 1



Results: Overall, the task elicited ToTs on 42% of the trials. In terms of the richness of the lexical-semantic network, results showed that participants gave more associates when they had direct access to the word than when they were in a ToT state (x2(1) = 19.58, p<0.001). In terms of prototypicality, participants gave more superordinate associates when they had direct access to the word (X2(1) = 7.63, p= 0.005) than when they were in a ToT state. By contrast, participants produced more coordinate words in a ToT state (X2(1) = 12.15, p=0.000) than when they had access to the word. No significant differences were found for the other categories. Finally, the associates were more heterogeneous across participants for the ToT words than for the accessible words (X2(1) = 6.30, p = 0.012).

Discussion: The aim of the present study was to investigate the organisation of the lexical-semantic network in a ToT state compared to an "accessible state". We focused our research on two factors that influence word production, namely the semantic richness and the prototypicality of the lexical-semantic network using a picture-naming task and a continuous free word association task performed by the participants immediately after naming the pictures. The results of richness availability confirm that production is facilitated when the word has a rich associative network (Krethlow et al., 2020), even in a temporary state, as in a ToT. Regarding prototypicality, we found that participants that were in a ToT state gave more coordinates, but participant that had access to the word gave more superordinates. These results raise the question of whether the lexical-semantic organisation changes even temporarily, or whether the lexical-semantic network of a word itself is weaker, leading to a ToT state in neurotypical adults. Thus, the present research suggests the importance of considering the organisation of the lexical-semantic network of words from a network perspective in order to study the access deficit. Indeed, one of the aims of this work is to transfer these results to gain a more detailed comprehension of the factors leading to an access deficit in anomia by considering a possible continuum between ToT states and some forms of anomia in svPPA and in people with aphasia. A better understanding of the lexical-semantic organisation and its changes across the lifespan may also represent a cue to early detection of some neurodegenerative diseases.

Day 2: Verbal learning, treatment and recovery throughout the lifespan

Oral presentations 2

O2-01: The neural architecture of word learning: A study in developmental language disorder, Cheyenne Svaldi et al.

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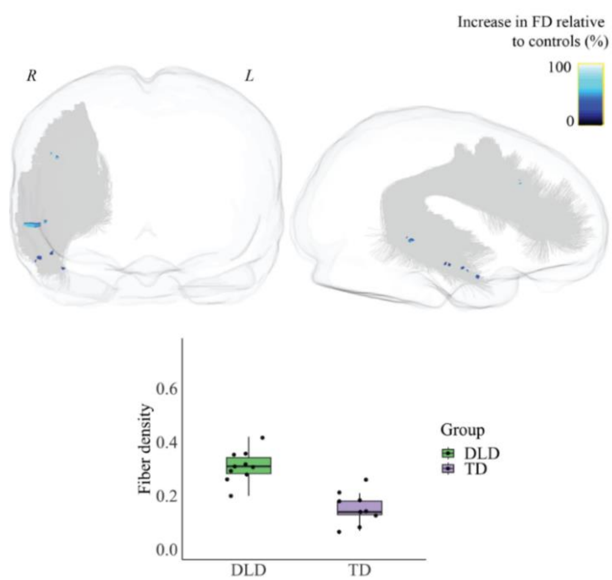
Introduction: Word learning impairments are observed in children with acquired and neurodevelopmental disorders, such as children with developmental language disorder (DLD) or children with brain tumors (Kan & Windsor, 2010; Levitch et al., 2022). Several gray matter regions (e.g., inferior frontal gyrus, hippocampus; Balthazar et al., 2010) and white matter tracts (e.g., uncinate fasciculus, arcuate fasciculus; Mabbott et al., 2009; Wang et al., 2021) have been related to learning familiar (i.e., verbal or word list learning) and novel words (i.e., forming novel word-referent associations), but the neural architecture of word learning has scarcely been investigated in children with language impairment. Children with DLD present with consistent verbal and novel word learning impairments which are largely limited to the encoding of words (Kan & Windsor, 2010; McGregor et al., 2017). Further, verbs seem to be particularly prone to impairment (Kan & Windsor, 2010; McGregor et al., 2017). Children with DLD may also have neuro-anatomical atypicalities, including language-relevant white matter tracts (e.g., arcuate fasciculus, inferior longitudinal fasciculus; Lee, Dick, et al., 2020). Previous findings regarding white matter differences in DLD have been inconsistent, however, both in terms of location and functional relevance. The aims of the present study were twofold. First, we wanted to structurally compare differences in white matter language tracts between children with DLD and typically developing control children. For this aim, we conducted a fixel-based analysis, a novel analysis technique with increased biological specificity as compared to diffusion tensor imaging (DTI) (Raffelt et al., 2017). Second, we investigated the relationship between the observed tract-specific differences and word learning performance (i.e., for verbal learning and novel verb learning) in children with DLD and typically developing control children.

Methods: A preliminary analysis was conducted, including 10 children with DLD (M(SD) = 9;6(1;4) years) and nine age- and gender-matched typically developing control children (M(SD) = 10;0(1;3) years) between eight and 13 years of age. All participants were right-handed and native speakers of Dutch. Verbal learning was assessed using the 15-word test (15WT; Kingma & van den Burg, 2003) which assesses the encoding of familiar words after repeated exposure and long-term retention and retrieval of these words. A newly developed verb learning task assessed the fast mapping of 20 novel labels (i.e., nonwords) for existing change-of-state actions. The number of items was split up across two testing sessions. Verb learning performance was assessed using a nonword-animation matching and animation naming task. In total, testing comprised three testing sessions. Magnetic resonance imaging (MRI) was conducted during the third testing session. To answer aim 1, supratentorial language tracts and white matter of the cerebellar peduncles were compared between groups using fixel-based analysis, which was applied to the diffusion data to increase the biological specificity of our findings (Raffelt et al., 2017). Three diffusion metrics were derived from each fiber bundle: (1) fiber density (i.e., a microstructural property reflecting intra-axonal volume); (2) fiber cross-section (i.e., a macrostructural property reflecting fiber bundle diameter); and (3) fiber density cross-section (i.e., a combined property reflecting the overall capacity of the fiber bundle to relay information). To answer aim 2, verbal and verb learning performance were statistically compared between groups and fixel-based metrics of the informative tracts (> 50 significant fixels) were correlated with word learning performance.

Results: Structural differences between children with DLD and typically developing control children were found in several of the included white matter tracts with non-parametric comparisons (uncorrected p-values). More specifically, children with DLD showed an increase in fiber density and fiber density cross-section in the left middle longitudinal fasciculus and an increase in fiber density in the right arcuate fasciculus. On the other hand, children with DLD showed a decrease in fiber density in the left arcuate fasciculus and in fiber density cross-section in the right superior longitudinal fasciculus (part III). See Figure 1 for an example of the localization of fixel-based differences between children with DLD and typically developing children for the right arcuate fasciculus. Behaviorally, there were no significant group differences in verbal learning. For verb learning, children with DLD performed worse than typically developing children for both the nonword-animation matching ($U = 16.5$; $p = .021$) and animation naming ($t = -2.57$; $p = .029$) post-tests. Further, increased fiber density in the right arcuate fasciculus was negatively correlated with immediate total recall (i.e., encoding) on the verbal learning task ($r = -.70$; $q = .023$). The other correlations were not significant after false discovery rate corrections.

Figure 1: Fiber-specific increases in fiber density of the right arcuate fasciculus in children with DLD compared to the control group. Cropped streamlines of the whole-brain tractogram are shown to only include streamlines transversing significant fixels ($p < .001$). The cropped streamlines are colored according to the percentage of increase in fiber density relative to the control children. The boxplot illustrates the variability in fiber density for each group.



Note. R, Right; L, Left; FD, Fiber density; DLD, Developmental language disorder; TD, Typically developing.

Discussion: In accordance with previous DTI studies in DLD (e.g., Lee, Dick, et al., 2020), white matter differences were found in several language tracts in this preliminary analysis. These results suggest an atypical white matter development in children with DLD. The observed white matter differences seemed to be driven by fiber density, implying that these could be explained by microstructural differences in axonal count or intra-axonal volume. Further, atypical structural properties of the right arcuate fasciculus were negatively correlated with verbal learning performance in our participant group. The arcuate fasciculus has been implicated in verbal learning in a previous DTI study (Wang et al., 2021) which suggested that this tract may be relevant in encoding familiar words after repeated exposure. No significant correlations were found between verb learning performance and white matter in our participant group, even though children with DLD demonstrated verb learning problems. Possibly, other white matter structures that have been implicated in novel word learning, such as the fornix (Lee, Nopoulos, et al., 2020), would be more informative when investigating the neural correlates of fast mapping. Overall, the findings of this preliminary analysis suggest that fixel-based analysis is a promising technique to model white matter in children with language impairment and may identify neural correlates of language performance. Nonetheless, these results should be interpreted with caution since analyses were conducted with a smaller participant group than needed for sufficient power. Therefore, additional data are currently being collected and a more comprehensive analysis with a larger participant group will be conducted by September.

O2-02: Verb processing and verb learning in children with posterior fossa tumors: task pilot results from typically developing controls and language impaired children, Aliene Reinders et al.

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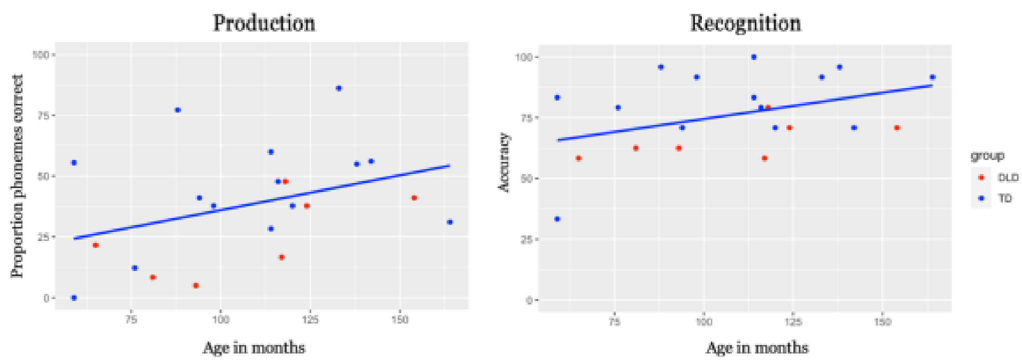
Introduction: Intracranial tumors are the most frequent solid neoplasms in childhood, and posterior fossa tumors (PPFTs) account for up to 60% of the cases. The majority of the PPFTs are located in the cerebellum (Brandão & Young Poussaint, 2017), which is often associated with motor control, but increasingly recognized for its involvement in language (Murdoch, 2010). Treatments of the tumor or secondary complications have improved over the past decades, resulting in increased survival rates (Lassaletta et al., 2015). These improved prognoses draw more attention to the neurological damage caused by either the tumor, treatment or secondary complications, which could result in cognitive decline in the longer term. Children treated for PPFTs present with a broad spectrum of cognitive impairments, including language difficulties. They show impairments in receptive and expressive vocabulary and sentence formulation and comprehension (Riva & Giorgi, 2000), and in semantics and syntax in receptive and expressive language (Lewis & Murdoch, 2011). Furthermore, they show impairments in verbal learning (Kingma et al., 2022). To date, their abilities to learn new words, essential for expanding the vocabulary, have not been examined. However, given that vocabulary knowledge is a strong predictor of cognitive and language abilities (Marchman & Fernald, 2008), their vocabulary difficulties could be related to the reduced rates of academic outcome and employment these children experience later in life (Lassaletta et al., 2015). It should therefore be further investigated what difficulties children with PPFTs encounter in learning new words. Compared to nouns, verbs are generally more semantically and syntactically complex, which makes them harder to process (Vigliocco et al., 2011). The acquisition of new verbs has been proven to be problematic for language impaired children. Children with a language disorder learn fewer words and at a slower rate (Svaldi et al., 2024). More specifically, they have difficulties learning the phonologic form and semantic features and are less efficient in using syntactic cues in the learning process (Jackson et al., 2019). No research has been conducted on how these verb learning mechanisms, and the syntactic, semantic, and phonological complexities that impact them, function in survivors of PPFTs. In this project, we will therefore investigate those mechanisms and impacting factors, comparing the performance of childhood survivors of PPFTs to the performance of typically developing children as well. With this, we hope to gain insight into the difficulties survivors of PPFTs experience in language processing and development, allowing for targeted interventions improving the language outcomes and academic and professional potential later in life. To assess verb learning and syntactic, semantic, and phonological complexity impacting this, a new verb learning task was developed and piloted on typically developing (TD) controls and language impaired children, to assess its feasibility and sensitivity to detect individual differences.

Methods: Twenty-one children aged four to 13 (9M), of whom seven were diagnosed with a developmental language disorder (DLD), were tested with a newly developed verb learning task. In the task, children were presented with 12 animations illustrating existing actions (e.g., floating), accompanied by novel non-verbs (e.g., the nonword prillen). To examine the effect of syntactic complexity on verb learning, the actions in the task either represented unergative verbs (i.e., verbs with an agent in the subject position) or unaccusative verbs (i.e., verbs with a non-agent in the subject position). To assess semantic complexity, verbs with a varying degree of concreteness were used. Additionally, the effect of word length was assessed using non-words of varying numbers of syllables. The 12 animations were divided into two blocks of each six animations. For each block the following phases were carried out. During a training phase, participants were familiarized with the novel verbs by repeating sentences containing the verb. Next, in a post-test, the production and recognition of the verbs was assessed. For the production and recognition post-test, the proportion of correctly produced phonemes and correctness of the yes/no answer was determined, respectively. In the analysis, the scores on both post-tests and the effect of semantic, syntactic, and phonological complexity were compared between the two groups.

Results: Overall, both TD children and children with DLD engaged in the task and were able to finish it, except for one four-year-old TD child who was only able to finish the first block, due to difficulty attending to the task. (see Figure 1 for the overview of test-results on the post-tests). For the production post-test, TD children scored 0-86% proportion phonemes correct, with a mean score of 45%. Children with DLD scored within the range of 5-48% proportion of phonemes correct with a mean of 26%, thereby significantly underperforming the TD group ($t = -2.16$, $p = .045$). For the recognition post-test, typically developing children scored with 33-100% accuracy, with a mean score of 81%. Children with DLD scored within the range of 58-71% accuracy, and with a mean of 66% significantly lower than that of the TD group ($W = 13.5$, $p < .001$).

Figure 1

Test scores for TD children and children with a Developmental Language Disorder on both the production and the recognition post-test



Discussion: The results of the production task indicate a good sensitivity to individual differences in verb learning; except for one TD child, none of the scores fell at either floor or ceiling level. Although children with DLD scored significantly lower than the typically developing group, which is in line with previous findings by Svaldi et al. (2024), none of them scored at floor level, indicating that the sensitivity to individual differences also extends to language impaired children. Similar results were found for the recognition task: most scores exceeded chance level but did not reach ceiling, apart from the scores of two TD children. Also in the recognition task, as expected, children with DLD scored significantly lower than the TD group. Due to an attention deficit, one child was only able to finish the first block. Attention span is something that needs to be taken into consideration when administering the task to children treated for PPFTs. Due to their medical condition and treatment affecting cognitive abilities, sufficient breaks are necessary during task administration. At the conference, the results of the analysis of semantic, syntactic, and phonological complexity will be discussed.

O2-03: Aphasia in children; a national long-term follow up study, Femke Nouwens et al.

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Introduction: In adults, aphasia occurs in approximately 30% of stroke patients (M. C. Brady, Kelly, Godwin, Enderby, & Campbell, 2016). Though less common, aphasia can occur in children too. Aphasia in children is different from aphasia in adults, as children are still acquiring language (Murdoch, 2011). We therefore speak of acquired childhood aphasia (ACA). Much is unknown in ACA, as large longitudinal observational studies and intervention studies are scarce (Gilardone et al., 2023). However, we do know that the group of children with ACA is heterogeneous, that ACA is a chronic condition, and that ACA has a large impact on the children and their parents (de Montferrand et al., 2019; Martins, 2021). Most children receive speech and language treatment (SLT). Due to the lack of research in this field, it is unknown what types of treatment are provided in ACA and whether these treatments are effective. Consequently, in order to improve language rehabilitation in this seriously limiting condition, we need more insight into this phenomenon and recovery from ACA. Here, we present our ongoing study on language recovery in ACA, to contribute to a better understanding and treatment of ACA.

Methods: We are conducting a multicenter prospective observational study with a follow up of five years. Nineteen health care centers treating children with ACA participate in the study. The first step was to establish consensus about which language tests to use as outcome measures. This was done via an e-Delphi procedure with three rounds among 75 clinicians of over 20 Dutch health care institutions from January to May 2017. The following language constructs are examined by different language tests depending on the age of the child: spontaneous communication, sentence production, auditory sentence comprehension, auditory story comprehension, word finding, story retelling and pragmatics. Data on etiology, language function and SLT (dosage, intensity, type of intervention, satisfaction of SL-therapists, parents, and children) are collected through Gemstracker®, a tool for safe online data collection. Language tests are performed directly after inclusion, six months later and afterwards yearly until five years after inclusion. In addition, we collected data on satisfaction with the provided SLT. Online satisfaction questionnaires are sent via Gemstracker to SL-therapists and parents at, respectively three and two points in the first year after inclusion. The study was approved by the Medical Ethical Committee of Erasmus MC (MEC-2017-469). We include children from two to eighteen years old with language deficits after acquired brain damage. Candidates must receive SLT for their acquired language and communication problems. Informed consent is acquired from parents and from children aged twelve years and older.

Results: Recruitment is still ongoing. We will present updated results at the conference. Up until now, we have included 51 children. The group so far is heterogeneous with regards to age at onset, etiology, and language deficits. ACA was caused by trauma in 37% of the cases, by stroke in 35% and by various other brain injuries (e.g. epilepsy, brain tumor). The majority of children shows language recovery in the first six months post onset. The constructs auditory sentence comprehension, pragmatics, and spontaneous speech showed the largest improvement, whereas performance on story comprehension tasks deteriorated (table 1). At six months post onset 68% of the group still had ACA. SLT was provided on average with an intensity of 30 to 90 minutes per week. Four months post onset 47% of the parents reported that ACA had a large or massive impact on the daily family life. One year post onset, this was still the case for 50% of the parents and/or children.

Impaired constructs	T1 (1 month p.o.) valid%	T2 (6 months p.o.) valid%
Communication		
Spontaneous communication; overall impression	74%	68%
Pragmatics; language use	60%	29%
Language comprehension		
Sentence level	53%	29%
Text level	31%	53%
Language production		
Word level; wordfinding	63%	45%
Sentence level	45%	33%
Story telling	60%	25%
Yes ACA, according to language tests and/or SLT's impression	81%	68%

Table 1: Percentage of Impaired constructs and change over six months.

Discussion: This is already the largest longitudinal observational study in ACA and recruitment is still ongoing. In line with earlier findings (Baillieux, Bundervoet, Mariën, & Paquier, 2006; Gilardone et al., 2023), our sample of children with ACA is very heterogeneous. This heterogeneity is one of the challenges in ACA research. Language improvement was seen on many language constructs. Yet, the majority of children still needed SLT after six months, as they were not fully recovered. The decline observed on story comprehension tasks may reflect the so-called growing into deficit phenomenon, where a child's performance deteriorates over time compared to its peers. On average, children received 1,5 hours of SLT per week. For ACA, the optimal treatment dosage is unknown. Yet, the current dosage seems rather low, as it has been shown in adults that aphasia rehabilitation is only effective with a minimum treatment intensity of two hours per week (Marian C. Brady et al., 2022). With this study we will gain more insight into ACA and the clinical practice of SLT provided to the children with ACA. We strive for a large sample of children with ACA in order to make more precise inferences.

O2-04: Spoken picture naming accuracy in bilingual speakers with aphasia: Influence of phonological neighbourhood within and across languages, Mareike Moormann et al.

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Introduction: Lexical access difficulties are a common feature of aphasia. Although these difficulties have been systematically studied in monolinguals, research is limited in the context of bilinguals, leaving open questions such as the influence of similar sounding words on lexical retrieval in bilingual speakers with aphasia. Similar sounding words include phonological neighbours, words that differ from the target word in only one phoneme (e.g., rain, pain). Phonological neighbourhood can be further specified by its density (PND) and frequency (PNF). PND describes the number and PNF the frequency of a target's phonological neighbours. Bilinguals have phonological neighbours not only within a language, but also across languages. For example, for a German-English bilingual, shower has neighbours in English (e.g., tower) and in German (e.g., Bauer [farmer]). Research on the influence of phonological neighbourhood within and across languages on word retrieval accuracy in both monolinguals and bilinguals with aphasia is rare and inconclusive. In monolingual aphasia research, studies have found facilitative (Gordon, 2002; Goldrick et al., 2010; Middleton & Schwartz, 2010; Mirman et al., 2010) and inhibitory effects (Laganaro et al., 2013). In bilinguals, evidence is scarce. Our own single case pilot data found no effects of PND/PNF within and across languages on accuracy in a person with bilingual aphasia. The present study built on that study by improving material sets across languages and examining factors our pilot study had not considered. This included, for example, the investigation of the influence of phonological similarity (PS) of the translation equivalent to the target word with the question of how the phonological similarity between these two words influences picture naming accuracy. In addition, the examination of the influence of the bilingual language profile such as factors like language age-of-acquisition and language dominance (a multifactorial construct that includes language proficiency, language use, environmental and individual factors, e.g., Martin et al., 2020) was included.

Methods: Eight bilingual speakers with aphasia, who had different language combinations (age: M=66.1, SD=6.27; languages: Dutch-German [P1+P3], Polish-German [P2] English-German [P4], English-Italian [P5] English-French [P6], French-English [P7+P8]), participated in this study. Seven of the participants were late bilinguals (second language acquisition after age 12, e.g., Akbari, 2014), while one participant was an early bilingual speaker (P5). All individuals exhibited difficulties with lexical access across their languages. Aphasia batteries were administered in each language for each participant. Background assessments including questionnaires were used to determine the participants' bilingual language profile, such as their language age-of-acquisition and language dominance. The experimental spoken picture naming task included ~350 object images with at least 80% name agreement (Duñabeitia et al., 2018) in each language. Participants named these items in each of their languages, counterbalanced over at least four sessions. Responses were coded for accuracy. Logistic regression was conducted to investigate whether phonological neighbourhood (within- and across-language PND and PNF, and PS) affected accuracy. Separate models were run that included either within (PND within, PNF within) or across (PND across, PNF across) language neighbourhood measures, but all models included PS. Predictor values for PND and PNF were obtained from CLEARPOND (Marian et al., 2012), while predictor values for PS were calculated using alineR (Downey et al., 2017).

Results: Five bilingual participants (P2, P3, P6, P7, P8) demonstrated a significant effect of within-language phonological neighbourhood (PNF and/or PS), with an increase in picture naming accuracy with higher phonological neighbourhood (see table). The effect in the within-language analyses was evident in the participants' non-dominant language in four participants (P3 [L1, non-dominant]: PS; P6 [L2, non-dominant]: PS; P7 [L1, non-dominant]: PS, PNF; P8 [L1, non-dominant]: PNF). For one participant, P2, who showed a balanced dominance across his two languages, the effect of the within-language analyses was evident in the L2 (PNF, PS). The across-language analyses showed an increased accuracy when phonological similarity between languages was high for one participant, P6, again for the non-dominant language (PS).

Figure or Table *(optional, max 1)*

Phonological neighbourhood effects on accuracy in all bilingual speakers with aphasia

Participants			N items	Accuracy		Phonological neighbourhood effects: Within-language analyses (always including PS)		Phonological neighbourhood effects: Across-language analyses (always including PS)	
				N items correct	% correct	PND within/PS (p-value)[a]	PNF within/PS (p-value)[a]	PND across/PS (p-value)[a]	PNF across/PS (p-value)[a]
P1	L1	Dutch	347	142	40.92	×	×	×	×
	L2	German^	347	203	58.50	×	×	×	×
P2	L1	Polish^	422	285	67.54	×	×	×	×
	L2	German^	422	168	39.81	×	PNF=.042, PS=.023	×	×
P3	L1	Dutch	347	186	53.60	PS=.049	PS=.043	×	×
	L2	German^	347	209	60.23	×	×	×	×
P4	L1	English^	331	265	80.06	×	×	×	×
	L2	German	331	195	58.91	×	×	×	×
P5	L1	English^	356	72	20.22	×	×	×	×
	L1	Italian	356	0	0	×	×	×	×
P6	L1	English^	365	314	86.03	×	×	×	×
	L2	French	365	189	51.78	PS=.005	PS=.008	PS=.005	PS=.007
P7	L1	French	365	254	69.59	PS=.043	PNF=.033, PS=.020	×	×
	L2	English^	365	262	71.78	×	×	×	×
P8	L1	French	365	240	65.75	×	PNF=.040	×	×
	L2	English^	365	293	80.27	×	×	×	×

Note. ^ = Dominant language, × = No effect on picture naming accuracy, PS = Phonological similarity, PND = Phonological neighbourhood density, PNF = Phonological neighbourhood frequency, [a] = Logistic regression analysis

Discussion: Some bilingual speakers with aphasia appear to benefit from the activation of phonological neighbours (high PNF and/or high PS) within their languages when speaking in their non-dominant language. This could be due to the activation of the words and phonemes of the neighbourhood words, which may enhance the activation of the target word. Language dominance may play a crucial role when investigating neighbourhood effects in bilingual speakers with aphasia. As such, it seems sensible to consider these factors when enhancing picture naming accuracy and diagnosing and treating bilingual speakers with aphasia in speech pathology. Material for assessment and/or treatment in the non-dominant language of bilingual speakers with aphasia can be consciously chosen, e.g., holding phonological neighbourhood features that facilitate naming accuracy.

Poster session 2

P2-01: Does the severity of language impairments determine quality of life in chronic aphasia? Gregoire Python et al.

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Introduction: Aphasia and secondary post-stroke symptoms (such as mood disorders, functional limitations, fatigue) have generally a negative impact on the quality of life (QoL) (Bullier et al., 2020; Doogan et al., 2018; Hilari et al., 2012). However, the relationship between aphasia severity and QoL remains ambiguous (see for example Cruice et al., 2003; Dvorak et al., 2021 in favor of a correlation; but Ross & Wertz, 2002; Tucker et al., 2012 reporting no correlation). This ambiguity could be due to several factors which are difficult to compare across studies, such as the way of defining/assessing QoL (e.g., health-related QoL vs overall QoL covering all domains of life), recruitment bias (e.g., excluding people with comprehension deficits due to the verbal nature of most QoL scales), or the tools used to assess aphasia severity (e.g., short screenings vs full language batteries vs severity scales). In the present study, we aimed to have a broader overview of the relationship between the severity of language impairments and quality of life in chronic aphasia by using multiple tools to assess these concepts.

Methods:32 persons with aphasia (PWA) participated in this study, 15 females and 17 males. They were French-speaking and suffered a left hemispheric stroke (ischemic or hemorrhagic) at least 3 months prior their enrolment (range 3-330, mean 90). Their mean age was 61 (range 29-82), the mean years of education was 13 (range 9-18). Participants were recruited in Switzerland and in France, as part of larger research protocols validated by local ethics committees. The participants underwent an extensive assessment of aphasia, quality of life, and mood, comprising: 2 measures of aphasia severity and related cognitive deficits: the Comprehensive Aphasia Test (CAT, Swinburn et al., 2012) and the Montreal Cognitive Assessment (MOCA, Nasreddine et al., 2005); 2 measures of health-related quality of life (HRQoL) specific to aphasia, investigating the impact of aphasia on communication, social participation and emotions (the Aphasia Impact Questionnaire, AIQ, Swinburn et al., 2019), and the impact of stroke on physical, communication, psychosocial and energy domains (Stroke and Aphasia Quality of Life Scale 39, SAQOL39, Hilari et al., 2003); 2 measures of overall quality of life assessed in a generic way (Life Satisfaction Scale 11, LISAT11, Fugl-Meyer et al., 2002) or in an individual way (Schedule for the Evaluation of Individual Quality of Life Scale, SEIQOL, O'Boyle, 1994); 2 measures of mood: a verbal measure to detect depression symptoms (short Geriatric Depression Scale 4, GDS4, Shah et al., 1997) and a non-verbal measure covering a range of emotions especially designed for aphasia (Dynamic Visual Analog Mood Scale, DVAMS, Barrows & Thomas, 2018).

Results: The total score at the language assessment of the CAT significantly correlated with the total score at the MOCA ($r=.826$, $p<.001$) and with the mean score at the SAQOL39 ($r=.373$, $p=.04$), but did not correlate with other QoL and mood measures. A principal components analysis confirmed that only the SAQOL39 was to some extent related to the language/cognitive deficits. The two measures of quality of life specific to aphasia (AIQ and SAQOL39) significantly correlated ($r=-.672$, $p<.001$), as did the two generic measures of QoL (LISAT11 and SEIQOL) ($r=.526$, $p=.002$). The depression screening (GDS4) correlated with all HRQoL and QoL measures, except the individual quality of life scale (SEIQOL). The non-verbal mood assessment (DVAMS) correlated with all HRQoL and QoL measures.

Discussion: To some extent, aphasia severity seems to have an impact on health-related quality of life. Indeed, HRQoL as defined/assessed in the SAQOL39 (covering physical, communication, psychosocial and energy domains) seems to be influenced by the severity of persistent aphasia symptoms. The SAQOL39 is the only scale of the present sample of QoL scales to include explicit questions about physical limitations and fatigue, but is also the longest questionnaire with 39 items. However, QoL as defined/assessed in the AIQ (covering communication, social participation and emotions), LISAT11 (overall generic scale) and SEIQOL (overall individual scale) might not be primarily related to language deficits. They might thus add complementary information about the well-being of PWA that are not reflected in language assessment or in the SAQOL39. Additionally, the mood state screened verbally (GDS4) and non-verbally (DVAMS) also failed to show a strong relationship with aphasia severity, but was related to (HR)QoL measures. The present results suggest that quality of life in PWA could be reduced either directly by aphasia, but also by secondary factors (such as low mood). Therefore, therapies targeting aphasia but also post-stroke related factors should be implemented to ultimately improve quality of life in PWA.

P2-02: Computer and Smart Tablet-Based Self-Administered Interventions in Post-Stroke Aphasia, Célia Ericson et al.

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Introduction: In the current clinical reality, where clinical resources are limited and insufficient to meet the needs of post-stroke aphasic individuals, there is a proliferation of studies proposing computer or smart tablet-based self-administered therapies (Katsuno et al., 2022; Plamer et al., 2019; Trevittaya et al., 2023). In addition to enabling more intensive and prolonged treatment, computer and smart tablet-delivered therapies can be highly enjoyable and motivating for participants who can choose when, where, and for how long they practice. Home-based self-administered treatments also widen access to therapy for patients who cannot travel to a clinic due to physical or geographical constraints. While several systematic reviews have compiled literature proposing computer-based therapies for aphasia treatment (Zheng et al., 2015; Repetto et al., 2021), none have specifically focused on self-administered computer or smart tablet-based therapies. The purpose of this paper is to present a comprehensive review of the literature on self-administered interventions using a computer or smart tablet. It aims to address three key questions: To what extent are clinicians involved in the proposed interventions? What are the objectives of these interventions? And, how effective are these interventions in terms of specificity, generalization, transfer, and maintenance of targeted aphasic symptoms?

Methods: A systematic review was conducted across three databases (Scopus, PubMed, and PsycINFO). Keywords related to rehabilitation, self-administration, and population (persons with aphasia) were combined. Eligibility and inclusion processes were conducted independently by two examiners.

Results: Thirty-eight self-administered computerized studies met the review criteria and were analyzed. Clinician involvement during self-administered therapy varies significantly, ranging from no session to weekly sessions with the therapist or only a few training sessions before the start of self-administered therapy. The interventions could be grouped into four distinct categories based on the targeted objectives of the treatment: (1) anomia (nouns and/or verbs); (2) agrammatism (preposition use, syntactical structure, verbs flexion); (3) script recalling (with or without reading them); (4) overall (multi-modality language). While the effectiveness of therapies has been demonstrated for trained items with maintenance of the gains in most studies, the generalization to untrained items and transfer to other contexts has been rarely proven.

Discussion: The results of this systematic review confirm that self-administered computer or smart tablet-based interventions are an effective approach for rehabilitating various troubles in post-stroke aphasia. Indeed, due to individually tailored materials and user-friendly applications, home training is effective. While anomia is the most treated symptom in published studies, the presence of promising studies targeting other disorders allows the expansion of targets. Moreover, the results of different studies show that persons with aphasia can feel more active in their care due to autonomous exercise. On the other hand, less contact with a clinician might negatively influence patients' motivation. In any case, the role of speech-language pathologists remains crucial, especially in defining therapeutic goals, adapting therapy, and measuring progress.

P2-03: Does picture naming performance correlate with word retrieval in connected speech and self-report measures on communication and well-being? Cross-linguistic evidence from Hebrew, Finnish and Australian-English, Kati Renvall et al.

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Introduction: Standardised language assessments (e.g., the PALPA, Kay et al., 1992) include mainly structured tasks, which are relatively easy to score. However, everyday communication requires more complex abilities including creative discourse generation with infinite possibilities based on a finite pool of language elements. Therefore, the psycho-social approach to aphasia treatment emphasises the need to include less structured tasks, such as conversation, narration and discourse during assessment (Simmons-Mackie et al., 2005). An important clinical question is therefore whether the performance of a person with aphasia (PwA) in structured language tasks can predict the performance and participation in everyday communication. Lexical retrieval deficits provide an opportunity to compare structured tasks with less structured tasks. Previous studies revealed contradicting findings concerning the difference between single word retrieval and retrieval in connected speech (e.g., Best et al., 2008; Conroy et al, 2009; Pashek & Tompkins, 2002). The aim of this study is to showcase whether cross-linguistic evidence from Hebrew (Biran et al., 2023), Finnish and Australian-English on spoken picture naming, connected speech and self-report measures on communication difficulties impact on participation in everyday communication when living with aphasia. Biran's et al. (2023) study serves as a reference point for our cross-linguistic comparison. The authors found that nouns were retrieved significantly better in conversation compared to picture naming and story-telling, and confirmed moderate correlations between spoken word retrieval during picture naming and the less structured conversational tasks. In addition, scores in a self-report questionnaire (AIQ-21) were correlated with success in word retrieval in connected speech. The rationale of this study is to explore whether the same pattern observed in Hebrew can also be observed in structurally different languages. Both Finnish and English differ in language family and are both different from Hebrew in language typology. Following Biran et al., using the same tasks and procedure, this study explores whether the pattern between picture naming performance, connected speech performance and PwA's perception of the impact of aphasia on their well-being can be found beyond Hebrew.

Methods: We used a case-series design including 20 Hebrew-speaking PwA (Biran et al., 2023) and compared this data to one Finnish-speaking and one English-speaking PwA, who underwent the same tasks as described in Biran et al. The Finnish PwA is a 63 years old female, 13 months post-stroke. She presented with severe anomia (11/60 correct in the Boston Naming Test) with relatively preserved comprehension. She produced relatively long sentences (5-7 words) with correct case inflections in spontaneous speech on familiar topics. However, picture narration tasks with specific objects and characters to be named were harder leaving also sentences shorter and syntactically less complex. The English-speaking PwA is a 69 years old Caucasian Australian male, 15 years post-stroke. He presented with non-fluent Broca's aphasia. He showed moderate word-finding difficulties according to the PALPA sub-test 53 (29/40) but presented with good verbal comprehension. A picture description task revealed only simple syntactic sentence structures (S-V-O) and did not exceed more than four sentences in total. Both, the Finnish and the Australian-English PwAs, were compared in their language patterns on spoken word retrieval, story-telling and conversation, and self-reported participation in everyday communication to the 20 Hebrew-speaking PwAs, who participated in Biran's et al. (2023) study (mean age: 69 years, range: 55-76 years), with 10-19 years of education (mean: 15 years). They were 19-36 months post-stroke (mean time: 28 months), and all lived in their homes at the time of testing. Inclusion criteria: (a) Normal or corrected to normal vision and hearing; (b) Preserved or only mildly impaired comprehension to ensure understanding of the tasks as evidenced by at least 90 % correct responses on the WAB auditory yes/no questions subtest. Cross-linguistic Measures: (1)

Spoken picture naming was assessed by the Finnish version of the Boston Naming Test (Laine et al., 1997) for the Finnish PWA, the PALPA spoken picture naming task (subtest 53, Kay et al., 1992) for the Australian-English speaker, and the SHEMESH naming test (Biran & Friedmann, 2005) for the Hebrew speakers. (2) Story-telling was tested with a series of six pictures (Gagarina et al., 2012) and (for the Finnish and Australian-English speakers also) with the scarecrow comic narration task using the silent comic strip by Henning Dahl Mikkelsen (see Korpijaakko-Huuhka, 2003). (3) Conversation on initiated topic (structured conversation) included five topic questions about the place in which the participants were living. Finally, (4) the AIQ-21 questionnaire (Swinburn et al., 2018) was administered to all PwAs. Word retrieval in connected speech (tasks 3+4) was assessed using two measures: (a) the %WR (Mayer & Murray, 2010), calculating the percent of correctly produced nouns and verbs out of their total number; and (b) the Measure of Participation in Conversation (MPC. Kagan et al., 2004, 2018), measuring interaction and transaction on a scale of 0-4.

Results: We are currently analysing data from the Finnish and the Australian-English speakers and will compare this data to the Hebrew language patterns reported by Biran et al. (2023). Findings of this study will be two-fold: Firstly, they shed light on the question whether the performance on clinically commonly used structured tests represent the individual's participation in everyday communication, and secondly, they enhance our knowledge around generalisability of patterns across structurally different languages. Both possibilities – that the pattern found in Hebrew is language specific or the pattern found in Hebrew generalises to other structurally different languages – are plausible based on the current evidence base.

Discussion: Our findings may shed light on the relationship between structured single word retrieval and word production in unstructured everyday communication. Further, they may enhance our understanding concerning the relations between the PwAs self-reports about their language, communication and well-being and their performance on structured and unstructured tasks. In addition, our data may indicate whether structurally different languages show a similar pattern as has been demonstrated in Hebrew thus far. We are currently testing additional participants to establish the findings and to examine correlations between the different tasks.

P2-04: Linguistic processing in posterior fossa tumour patients: Psycholinguistic insights into the picture naming task, Rida Ahmed et al.

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Introduction: Language deficits have frequently been reported for patients who undergo posterior fossa tumour (PFT) surgery regardless of the occurrence of transient cerebellar mutism (Cámara et al., 2020). However, it is yet unknown if specific language processes are more susceptible to damage than others, and there is a noticeable variance in the presentation and degree of language impairments (Lewis & Murdoch, 2013). A recent meta-analysis of studies that reviewed language abilities in the PFT population revealed that out of the 46 included research studies, 29 showed lexical-semantic deficits, which was the focus of the existing literature, followed by the reports of reading and verbal learning impairments (Svaldi et al., 2024). However, after doing a group-level analysis with the controls, some studies did not report any detectable language problems in their PFT patients. For instance, Arsen et al. (2004) found differences in language abilities within the subgroups of patients, but their patient group as a whole did not differ significantly from the control group. Similarly, Richter et al. (2005) found no indication of aphasia among children and adolescents with cerebellar lesions, except for slight increases in the patients' reaction times to generating verbs. Given the variability in the results of previous studies, further research into the linguistic processes that drive performance in this patient population is warranted. PFT patients frequently experience naming difficulties, as Persson et al. (2023) noted. However, the exact nature of these difficulties remains unknown, and there is a scarcity of longitudinal studies that look at their persistence after surgery (Svaldi et al., 2024). Among the factors that influence the speed and accuracy of naming in individuals with language disorders are the psycholinguistic properties of words to be named. These include word frequency, age of acquisition, familiarity, etc. Some of them are said to accelerate the retrieval of words, e.g., word frequency (Oldfield & Wingfield, 1965), age of acquisition (Carroll & White, 1973), while others slow it down, e.g., phonological neighbourhood density (Gordon & Kurczek, 2014), word length (Meyer et al., 2003). We explore the linguistic processes that underlie naming abilities by rating nouns produced by patients on psycholinguistic properties corresponding to various linguistic processing levels. Moreover, the early post-operative stage in patients who undergo surgery in language-eloquent areas is characterized by a decline in all language functions, including lexical retrieval (Antonsson et al., 2018; Satoer et al., 2016). This is attributed to the significant lesioned tissue as a result of surgery. Since several studies have identified the role of the cerebellum in language and tumours in the region being suggestive of subsequent language impairments, we also explore whether linguistic processing behind naming in PFT patients differs before and shortly after they are treated with surgery.

Methods: The participant group for this study comprises 42 English-speaking patients (23 males and 19 females) with a mean age of 09;08 (yy;mm) from the United Kingdom within the European Study of Cerebellar Mutism

Syndrome (CMS) database. All participants were treated with surgery for a tumour in the posterior cranial fossa. The study used retrospective audio recordings of the Wordrace task to determine accuracy and reaction times. The Wordrace task is a picture naming task especially designed for the Nordic-European study of CMS to test the word-finding ability. It contains 25 images that are shown either on screen or paper one by one and need to be named as fast as possible. The current study uses data from two assessment points, i.e., preoperatively and 1 – 4 weeks postoperatively. Reaction time and accuracy were determined for each item on the Wordrace task using Praat, which helps precisely mark pause boundaries between words. Two modes, i.e., paper or screen, were primarily used to administer the naming task across different centers in the UK. We considered the total pause duration between the articulation of two words for screen mode because the exact presentation of the items was not audible. For centers where the task was administered on paper, we considered the duration between the start of the page flipping sound and the start of articulation of the first phoneme of the succeeding word. Moreover, the study considered the word property norms for British English, including norms for word frequency, familiarity, age of acquisition (AoA), imageability, phonological neighbourhood density, etc. Statistical analyses will constitute a principal component analysis (PCA) in the first stage and regression analyses in the second stage. First, a PCA will be performed for every language processing level in order to consolidate the variables into a smaller number of overlapping components. Next, multiple regression analysis will be employed to investigate the potential correlation of naming reaction times with consolidated measures of semantic, phonological, and lexical language processing levels. A logistic regression analysis will also be carried out with a similar set of predictor variables to investigate their correlation with the binary outcome variable of naming accuracy. Finally, to see if these potential associations vary from one assessment point to the next, both logistic and multiple regression models will be run with interaction terms for the assessment point included.

Discussion: Our findings will contribute to identifying the linguistic processing levels that best predict lexical retrieval in PFT patients, which may help find the locus of difficulties that this population faces in language-related tasks, particularly naming. Given the increasing evidence for cerebellar involvement in higher-order cognitive functions, including language, studies like ours can further the understanding of this region's role in specific linguistic processes. Overall, this study addresses critical gaps in knowledge and has implications for the prognosis and clinical management of communication disorders in this population.

P2-05: Development and norming of a new process-oriented word-level assessment for aphasia, Judith Feiken et al.

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Introduction: Aphasia manifests itself in many different ways. This is due to the fact that it can be caused by a damage to several underlying linguistic processes. Each of these processes can be affected independently. Which processes are affected and to what extent varies from one individual with aphasia (IWA) to the next (Whitworth et al., 2014). The process-oriented treatment approach focusses on the affected processes identified in an IWA. It consists of reactivation or compensation of the affected processes through targeted stimulation therapy and strategy training (Schevenels et al., 2020; Whitworth et al., 2014). Process-oriented treatment is thought to be particularly important in the (sub-)acute and rehabilitation stages following a stroke, as it stimulates the neural networks that control the affected processes more precisely (Kiran & Thompson, 2019). Until now, there has been limited evidence on the effectiveness of process-oriented treatment at these early stages (Kiran & Thompson, 2019). Our hypothesis is that one of the reasons for this is the lack of an instrument that can validly monitor the progress of individual processes in early post-stroke stages, when rehabilitation generally takes place (Schevenels et al., 2022). Commonly used assessment instruments such as the CAT (Swinburn et al., 2004) are not developed to determine in the early post-stroke period whether process-level progress is the result of treatment or spontaneous (neural) recovery. In addition, the most widely used process-oriented instruments for identifying underlying deficits internationally, PALPA (Kay et al., 1996) and Lemo 2.0 (Stadie et al., 2013) are less suitable for monitoring progress in the early post-stroke period in a strict research design (such as a crossover) where assessment takes place every 2 to 3 weeks, partly because the tasks are relatively long and there is a chance of learning effects. Therefore, we have developed an instrument (online webtool) to sensitively monitor the effectiveness of a process-oriented treatment for each underlying process during early post-stroke period. For such a measurement instrument at word-level, we have drawn up several requirements, namely: Measurement of severity for each underlying linguistic process; clear criteria for identifying each underlying linguistic process; clinically feasible (tasks must be relatively short so that it is possible to repeat the instrument at short intervals (after 2-3 weeks); have a matched A and B version and randomised order of items to minimise learning effects when tasks are repeated relatively soon after each other (after 2-3 weeks); integration of digital functionalities such as digital speech, automatic registration and second screen.

Methods: 1. Development process-oriented assessment tasks: In order to develop new process-oriented assessment tasks, a literature search was conducted to determine which criteria researchers use in clinical trials to identify impairments of underlying word-level processes in IWA following unilateral left hemisphere stroke. The results were classified following the three main sources of evidence that together provide convincing evidence to identify disturbed underlying linguistic processes (Starrfelt & Shallice, 2014; Whitworth et al., 2014). These sources are 1. nature of errors, 2. influence of linguistic features (such as effect of word length) or other specific characteristics (e.g. benefit from lip reading) and 3. comparison across tasks assessing a. an entire modality, b. a same underlying function (such as phoneme encoding) and c. performance on specifically constructed tasks (process-oriented). Based on the results, 16 different process-oriented tasks, each of 24 items, (see table 1) were compiled and integrated into an online tool to assess together 14 individual underlying linguistic processes at the word level, with the aim of collecting the necessary sources of evidence as mentioned above. In practice, this means measuring levels of performance on a series of process-oriented tasks, capturing specific symptoms and characteristics (such as linguistic features), and comparing results between specific tasks. A 3-point scoring system (0-2 points) was introduced for each item, making the maximum score for every task

48. The total score is used to assess overall functioning on the task (severity score). In addition, a feature scoring system has been integrated, which makes it possible to measure whether the unique linguistic variables are influential (features scores). To avoid learning effects when tasks need to be taken more frequently in a relatively short period of time, similar A and B versions were constructed to ensure that they could be used interchangeably. In addition, to guarantee consistent delivery (unaffected by differences in intelligibility between testers), the spoken test items consist of a digital voice. Also, responses are automatically recorded where possible. After compiling the tasks, several pilot studies were conducted to ensure that non-brain-damaged participants achieve maximum scores while maintaining the required difficulty factor. This means that non-brain-damaged participants should also perform well on target words with low concreteness or frequency. Based on the recommendations from the results of the last pilot study, further adjustments were made, such as replacing items that proved too difficult, making pictures more specific, and improving the sound quality of items.

Table 1

Process		Task	Variables to be measured
Auditory phonological analysis	1.	Auditory discrimination *minimal pairs (digital speech)*	- Lexicality - Frequency
Phonological input lexicon	2.	Auditory lexical decision *words and non-words (digital speech)*	- Lexicality - Frequency - Length
Auditory input semantic system	3.	Spoken word-picture matching *4 pictures – 1 word (digital speech)*	- Distractors: semantic/ unrelated - Frequency
	4.	Auditory synonym judgment *word pairs (digital speech)*	- Concreteness
Visual orthographic analysis	5.	Visual discrimination *minimal pairs (written, with font difference)*	- Lexicality - Length
Orthographic input lexicon	6.	Visual lexical decision *words and non-words, incl. homophones (written)*	- Lexicality - Frequency
Visual input semantic system	7.	Written word-picture matching *4 pictures – 1 word (written)*	- Distractors: semantic/ unrelated
	8.	Spoken and written word association *4 words (written)*	- Concreteness
Grapheme-phoneme conversion	9.	Reading aloud *non-words (written)*	- Length
Phoneme -grapheme conversion	10.	Writing on dictation *non-words (digital speech)*	- Length
Output semantic system	11.	Spoken or written naming *descriptions (written and digital speech)*	- Concreteness
Phonological output lexicon	12.	Spoken picture naming *pictures*	- Frequency
Phonemic encoding	13.	Reading aloud/ repeating words and non-words *(written and digital speech)*	- Lexicality - Length
Graphemic output lexicon	14	Writing on dictation *words and non-words*	- Regularity - Frequency - Concreteness
Graphemic encoding	15.	Writing on dictation *words and non-words (flash written presentation and digital speech)*	- Length - Lexicality
Articulatory motor programming	16.	Reading aloud/ repeating *words and non-words (written and digital speech)*	- Articulation complexity

2. Current norming study: Having made adjustments based on the recommendations from the pilot studies, a norming study is currently being conducted with 40 non-brain-damaged participants. For each task, both a severity score (3-point score) and feature score (the extent to which an effect is present with respect to a particular linguistic feature, such as word length) are determined. Unique symptoms and specific characteristics are registered. Alternative responses to the naming tasks are collected and then scored for correctness (e.g. whether or not they are synonymous with the target word). Performance on versions A and B of the tasks will be compared using paired t-tests.

Discussion: At the SoA conference we will demonstrate the online tool with the measurement instrument consisting of 16 different tasks and present the results of the norming study.

P2-06: Preoperative and Postoperative Assessment of Word-Finding Difficulties in Italian Pediatric Patients with Posterior Fossa Tumors, Elisa Gottardi et al.

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Introduction: Central nervous system (CNS) tumors are the most common solid neoplasm in pediatric patients, frequently occurring in the posterior cranial fossa (Fabozzi et al., 2022). Posterior fossa tumors (PFT) are preferably treated through surgical resection, with the eventual combination of chemotherapy and radiotherapy (Muzumdar & Ventureyra, 2010; Cohen, 2022). However, tumor resection and post-operative treatments may entail several severe and persistent sequelae at neuropsychological and cognitive levels, impacting the quality of life of PFT survivors (Cámara et al., 2020; Fabozzi et al., 2022). In particular, approximately 25% of children present with cerebellar mutism syndrome (CMS) after cerebellar tumor resection. The CMS is a momentary absence of speech, frequently combined with emotional lability and neurological deficits (Robertson et al., 2006). However, independently from developing CMS, all PFT survivors may present language impairments possibly affecting all language processing levels (e.g., lexical access, semantics, morphosyntax, phonology), with a large interindividual heterogeneity (Svaldi et al., 2023; 2024). As highlighted by Svaldi and colleagues (2024) in their systematic review of postoperative language outcomes in children with PFT, many studies lack a preoperative assessment of language impairments. Indeed, language difficulties can also occur at a postoperative stage and their correct identification would promote a more accurate interpretation of the postoperative linguistic profile of the patient (Di Rocco et al., 2010, Svaldi et al., 2024). In this line of research, by means of a picture-naming test, Persson and colleagues (2023) observed that children with PFT are slower and less accurate in word-finding tasks at the preoperative stage, with the influence of tumor location and sex. In their study, they analyzed a sample comprising children from different countries (Sweden, Denmark, Norway, UK, Hungary, Italy, Netherlands, and Lithuania), performing an error analysis for Swedish, English, Danish, and Norwegian speakers. However, it remains uncertain whether and how this impairment persists in the year following the surgery. The present study aims to investigate and compare pre- and postoperative word-finding difficulties in Italian-speaking children with PFT. As in Persson and colleagues (2023), we will deploy the picture-naming test "Wordrace" (Grillner & Zetterqvist, 2014), measuring accuracy and naming speed. An error analysis will also be performed, and psycholinguistic variables of the stimuli (e.g., frequency, concreteness, word length) will be used as predictors for accuracy and speed.

Methods: The data for this research are collected within the multicentered study on the cerebellar mutism syndrome (CMS) in children with posterior fossa tumors, named the Nordic-European CMS Study (Grønbæk et al., 2021; Wibroe et al., 2017). The patient group consists of Italian-speaking children with PFT between the ages of 3 and 17, recruited at the Children's Hospital Bambino Gesù in Italy. They are tested at several assessment points, namely at the preoperative stage and different postoperative stages (1-4 weeks, 2 months, and 1 year after surgery). On the other hand, the control group consists of typically developing Italian-speaking children, between the ages of 3 and 17, recruited and tested in Rome (Italy). To allow statistical comparison, for every considered point in time, the patient group and the control group will be matched based on age and gender. In order to evaluate word-finding abilities, we use the "Wordrace" picture-naming test (Grillner & Zetterqvist, 2014), which is the designed tool for the Nordic-European CMS Study to assess word-finding accuracy and speed (Wibroe et al., 2017). This test consists of 25 colored pictures of objects and animals, presented one at a time on a screen by the examiner. The participant is asked to name the picture as fast as possible, preferably by using only one word, while the examiner switches to the next picture as soon as the target picture is named. Given that normative data for this test is available only for Swedish, a sample of 12 healthy adults, all native speakers of Italian, performed the "Wordrace" test to obtain naming agreement for the Italian language. All the participants are audio-recorded to allow subsequent analysis. Indeed, each test is scored for accuracy (number of correct responses) and speed (reaction times). A lexical error analysis is performed, classifying alternative responses into different categories, according to previous research (Brusewitz & Tallberg, 2010). Finally, we will compare naming speed and accuracy of the patient group at different assessment points with the control group.

Predictions: We expect to observe that children with PFT will be slower and/or less accurate than typically developing children at every assessment point (i.e., preoperatively, and 1-4 weeks, 2 months, and one year after surgery), given the results obtained by Persson and colleagues (2023) with preoperative assessment. Possibly, children with PFT will present more severe word-finding difficulties at the acute stage right after surgery, followed by slight improvement after one year from tumor resection.

Discussion: As previously anticipated, children with PFT may present language impairments possibly affecting all language processing levels. However, great interindividual heterogeneity is observed, requiring further research to investigate similarities among patients' linguistic profiles, with possible predictors and risk factors. Following this direction, it is fundamental to assess the effects of cerebellar tumors on lexical retrieval, and whether and how this impairment varies immediately after surgery and one year after surgery. This allows a better comprehension of the role of the cerebellum in language processing and aids in devising more efficient rehabilitation strategies for PFT survivors.

P2-07: Virtual individualized therapy of aphasia (VITA) platform for cognitive neuropsychological approach in SMARTER model, Oksana Lyalka et al.

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Introduction: When selecting the goals for chronic aphasia interventions, many Ukrainian adults with aphasia acquired due to various brain accidents prefer to recover their language as much as possible to be able to communicate independently again. Given that aphasia therapy is objectively a long process, individualised and evidence-based interventions are crucial to enhance improvements generalized in real life social interactions. In the light of ongoing aggressive war of Russia against Ukraine, the number of people with acquired aphasia is steeply growing and majority of them are working-age adults. At the same time speech and language therapy in health care system is a nascent field and the number professionals remain extremely low for such a demand. Therefore, the goal of the project presented here is to present a platform that would equip clinicians with a tool to design and manage individualized therapeutic interventions as well as monitor the progress their efficiency. To date, one of the ways of overcoming inaccessibility of speech and language therapy is usage of aphasia apps that allow self-paced training to people with aphasia (e.g. Palmer et al., 2020). Unfortunately, these tools have been developed mainly in English and are not applicable to the Ukrainian language and context. However, even in English, there is still a great variability of outcomes in computerized therapy due to the lack of control for numerous variables that could be substantial for the therapy such as: intensity of practice, frequency, the application of cognitive neuropsychological approach to intervention. Brady et al. (2021) reported in their meta-analysis that frequent, functionally-oriented interventions with intensive home practice showed higher outcomes. Whitworth et al. (2014) showed the importance of considering psycholinguistic characteristics in task designs such as: frequency, imageability, length. For instance, for people with auditory impairment minimally related pairs of long words might be easier to process than maximally related short words. Unfortunately, the existing tools may focus on functionality, but they do not allow one to control for the psycholinguistic characteristics of items selected for the intervention, they do not collect data from the patient performance (e.g. frequency, intensity, and progress of individual practice). This in turn does not allow to develop computerised intervention following SMARTER model (e.g. Hersh et al., 2011) that would allow continuous monitoring of the improvement. Therefore, we decided to develop a new virtual individualized therapy of aphasia that would address the existing issues and incorporating best technological advancements with dedicated modules for both speech and language therapist and the patient.

Methods: Virtual individualized aphasia therapy is a platform with dedicated modules for clinician and a patient to enable SMARTER model of intervention and incorporation of psycholinguistic characteristics in task design, monitoring, and controlling the progress. Clinician's module allows to add patients, design tasks, monitor frequency and intensity of practice as well as the progress in performance via dedicated data dashboard and raw data. The patient module contains tasks with easy to navigate UI/UX design interface and encouragement for moving on as well as acknowledgement of their progress and simplified dashboard of personal progress. The security of the recorded data will follow best industry standards for data protection and existing regulation to protect privacy and avoid data breach. The platform aims to provide a variety of templates for designing various tasks at word and sentence levels (e.g., word/sentence picture matching, discrimination, naming etc.) as well as texts in modalities of comprehension, reading, speaking, and writing. Every task will be created and stored in a library and will be available for reusage or remodification as well as sharing with colleagues and export to excel. In creating a list of items at word level, the platform will provide psycholinguistic characteristics of frequency, length, semantic category to every item. In selecting the distractors to the target item, it will be possible to define the types of relations. Once finalized, the task can be added to the patient profile ready for practice. Procedure of intervention: Every intervention will include phase of assessment and intervention. Assessment will allow to measure reference point in task performance and based on this clinician can select the task for the intervention. During assessment, no feedback will be provided, and all the items will be presented. During therapy, only selected items will be available for practice, and with every next iteration only items responses to which were incorrect will be prioritised. Every task will include familarisation and practice phases. Data analysis: All the responses will be recorded and available to speech and language therapist in a raw table as well as processed dashboard with key components. In comprehension tasks, the platform will record every response and automatically classify the accuracy by considering the type and the time of response. These responses will be preprocessed and preanalised and report will present key results of descriptive and inferential analysis. The tasks that require motor output will be recorded and available to the clinician for the analysis. However, the usage of AI and deep reinforced learning aims to support and facilitate this analysis in the future.

Results and discussion: The aim of this project to pilot online individualized therapy of aphasia platform that incorporates cognitive neuropsychological approach to the aphasia therapy and technological advancement in cloud computing and machine learning. It will allow clinician to design tasks taking manipulating psycholinguistic characteristics and relations between the items, monitor the progress of the patient by observing, frequency, intensity, and accuracy of the responses. For a person with aphasia, it will be an opportunity to practice as much as possible to reach a goal and achieve either generalisation or relearning effect of the intervention. The alpha version as well as primary results of the piloting will be presented in a poster.

P2-08: Cortical tracking of speech in aphasia, Emily Upton et al.

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Introduction: Healthy individuals display neural tracking of speech in which the phase and frequency of neural oscillations synchronise to low frequency acoustic fluctuations in the speech stream (Di Liberto et al., 2022). Tracking aligns the high excitability oscillatory phase with linguistically relevant acoustic information (Peelle et al., 2013), enhancing sensory sensitivity and supporting the temporal analysis of speech (Giraud & Poeppel, 2012). The auditory cortices generate tracking activity in the delta and theta bands, reflecting "bottom-up" analysis which is critical to speech perception and comprehension. Additional delta band tracking is observed in frontal regions and reflects analysis of higher-order linguistic information (ten Oever et al., 2022). Frontal delta activity refines the phase of auditory cortex oscillations during intelligible speech processing; a "top-down" process which supports tracking of the auditory signal (Park et al., 2015). Initial evidence indicates that speech tracking is impaired in people with aphasia (PWA) as auditory and linguistic processing impairments impact the ability to establish and maintain phase-locked oscillatory activity. Recent EEG evidence has found PWA have reduced tracking of the speech amplitude envelope and word onsets (Kries et al., 2023). This study explores whether speech comprehension impairments are associated with speech envelope tracking at theta and delta frequencies.

Methods: 12 PWA with left superior temporal lobe lesions (Wernicke's-type aphasia) and 12 healthy control (HC) participants have been recruited. Experimental paradigm: EEG was recorded whilst participants listened to stories from a learn to read book series (Oxford Reading Tree: Oxford University Press). Each story was divided into four parts, lasting approximately 1.5 mins, interspersed with comprehension trials. Speech intelligibility was manipulated, with two conditions for the PWA: (1) intelligible, clear speech (four stories); (2) unintelligible, 1-channel vocoded speech (two stories); and an additional third condition for the HC group: reduced intelligibility, 4-channel vocoded speech (four stories). This third condition was included to match to the PWA, both in terms of behavioural impairment and listening effort. Condition presentation order was pseudorandomised. Analysis: Cortical tracking at delta (0.5-2 Hz) and theta (2-9 Hz) bands is analysed using encoding models in the multivariate Temporal Response Function (mTRF) toolbox (Crosse et al., 2016). EEGs are first pre-processed by high-pass filtering at 0.3 Hz followed by Independent Component Analysis (ICA) to reject movement artefacts (vertical and horizontal eye-movements and motor movements). Broadband acoustic envelopes are extracted based on the Hilbert envelopes of speech (100-5000 Hz). Both EEG and acoustic envelopes are then bandpass filtered at delta and theta bands and EEG is used to track the envelopes at the corresponding frequency bands (i.e., delta-band EEG tracks the delta-band envelopes and theta-band EEG tracks the theta-band envelopes). The stories are divided into multiple segments or trials (24 trials for each condition, ~30 seconds' long for each trial) and were partitioned into subsets for training (20 trials) and testing (4 trials). Leave-one-out cross-validation is conducted during training to obtain the mTRF model that is subsequently tested on the testing trials to obtain sensor-wise EEG reconstruction accuracies to quantify cortical tracking. Furthermore, chance-level tracking is obtained by permuting the trials correspondence between EEG and the speech stimuli during testing. The final tracking values are obtained by subtracting the chance-level tracking. At the time of submission, analysis has been completed for two PWA (one with a mild comprehension impairment, and one with a severe comprehension impairment) and one HC.

Results: PWA demonstrated significant comprehension impairments on the story listening task in clear speech, in comparison to HC participants (t(22)=-3.84, p=<0.001). Both groups performed at chance in the unintelligible speech condition. No significant difference was found between HC's performance in listening to reduced intelligibility (4-channel) speech and PWA's performance listening to clear speech (t(22)=-0.97, p=0.34). EEG results (Figure 1) showed enhanced delta-band tracking in PWA compared to the HC in clear but not reduced intelligible speech. Theta-band tracking was reduced in the PWA with a severe comprehension impairment (PWA 01) but retained in PWA with a mild impairment (PWA 02).

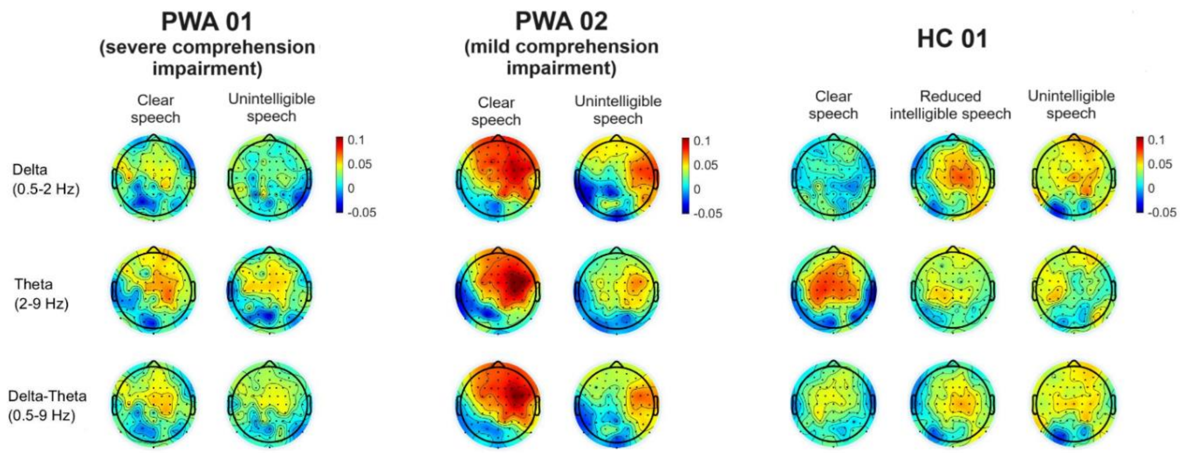

Figure 1. Results for EEG Delta and Theta envelope tracking in example participants (PWA 01, PWA 02 and HC 01). Topographs illustrate EEG reconstruction accuracies (in contrast with chance-level accuracies based on permuting trial correspondence between EEG and speech stimuli). Top: Delta (0.5-2 Hz); Mid: Theta (2-9 Hz); Bottom: Delta-Theta (0.5-9 Hz).

Discussion: Cortical speech tracking offers the potential to assess online continuous speech processing in aphasia. Future analyses will extend results to the group level and explore tracking of additional, complex acoustic features (acoustic onsets, spectrogram and spectrotemporal modulations). These preliminary results suggest that the severity of a comprehension impairment is reflected in delta and theta envelope tracking, indicating that this may be one mechanism supporting retained or recovered comprehension. Intelligibility effects were observable in all participants, suggesting the capacity to use linguistic information to modulate tracking of acoustic fluctuations. Subsequent analyses will investigate whether delta-tracking enhancement in PWA remains at the group level and the extent to which this is replicated in HCs listening to degraded speech.

P2-09: Efficacy of rTMS Stimulation in Post-Stroke Bilingual Aphasia: A Clinical Study, Ioanna-Prodromia Siklafidou

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Introduction: Aphasia affects one-third of stroke survivors, mostly due to a lesion in the left hemisphere (Dickey et al., 2010; Josse et al., 2004). In bilinguals with aphasia, cerebral lesions impact language processing, leading to pathological language switching (Abutalebi et al., 2008a; Fabbro et al., 2000). Neuroimaging data reveals shared brain structures supporting language representation in bilinguals (Abutalebi et al., 2008a), with data showing variability (Goral et al., 2007,6; Radman et al., 2016). Cross-language therapy effects depend on language status, with higher activation in dominant languages (Abutalebi et al., 2008a; Abutalebi et al., 2008b; Kroll et al., 2010; Miertsch et al., 2009). However, studies imply that cross-linguistic effects could be language-specific (Goral et al., 2007; Miertsch et al., 2009; Radman et al., 2016). The disrupted post-stroke language networks require neuroplastic mechanisms for recovery. According to the systematic review of Arheix-Parras et al., (2021), studies have indicated that non-invasive brain stimulation (NIBS), like repetitive transcranial magnetic stimulation (rTMS) aids aphasia rehabilitation (Arheix-Parras et al., 2021). Studies have, also, highlighted the participation of the motor cortex of the lips in word production, indicating a possible rTMS target (Glize et al., 2019; Hesling et al., 2019). In bilingual aphasia individuals there is limited literature regarding NIBS for rehabilitation. A study used anodal transcranial direct current stimulation (tDCS), demonstrating promising results in enhancing cross-linguistic effects in participants with bilingual aphasia (Coemans et al., 2023). In the present study, we aimed to investigate the effects of inhibitory rTMS targeting the right lip motor cortex in picture naming task on the second language of a single bilingual individual with aphasia.

Methods: A bilingual French-English woman (P) experiencing chronic aphasia following a left hemispheric aneurism. Pre-protocol evaluations included Comprehensive Aphasia Test (CAT) and Language History Questionnaire. In L1 (first language), she exhibited fluent aphasia, anomia, and speech disruptions marked by pauses and phonetic errors. Difficulties in word and non-word repetition and phonological errors during picture naming were noted, indicating mild to moderate aphasia. In L2 (second language), challenges included distant semantic memory, word fluency, comprehension of written and spoken language, and repetition tasks, indicating severe aphasia. Memory and cognitive skills remained intact. The three-phased study comprised baseline assessment, rTMS intervention targeting the motor cortex of the lips, and follow-up evaluations. P benefited from six inhibitory rTMS sessions targeting the right motor cortex of the lips. During the study, a picture naming task was conducted three times a week during each phase (baseline, intervention, follow-up), resulting in 18 measures in total. P followed her usual speech therapy sessions, two times a week only in her first language. The SCED recommendations were followed using both statistical analysis and visual analysis. We initially analyzed the monotonic trend of the baseline. In cases of a baseline noted significant positive or negative trend, a baseline-corrected Tau-U was calculated. We, also, use typical SCED visual analysis based on the changes between baseline and intervention with mean and 2SD envelope as it is shown in the figure.

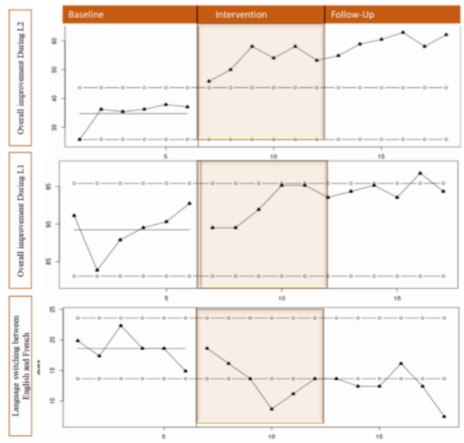

Fig: In the first figure, we demonstrate the overall post-stroke improvement of P's during L2. In the second figure, there is a demonstration of the improvement in her L1. The last one illustrates the reduction of language switching between the languages during the examination of L2. There is a clear and statistically significant improvement evident in all of the figures, with two points above or below the SD band indicating the significant improvement post-stimulation.

Results: In our previous study, while evaluating L1, P demonstrated significant improvement post-rTMS sessions in language scores, with reduced phonological errors. During L2 examination, significant enhancements were observed across various conditions indicated by both statistical and visual analysis. Specifically, significant improvements were noted in overall language switching (no baseline corrected Tau = -0.611, p = 0.004, SETau = 0.264), in accuracy (no baseline corrected Tau was 0.695, p = 0.001 SETau of 0.24), and in decrease of phonological errors (Baseline Corrected Tau = 0.697, p = 0.001 (SETau = 0.239), which was not significant in visual analysis. From P's perspective, there was a noticeable improvement in communication and comprehension.

Discussion: Our findings revealed significant and similar improvements in picture naming accuracy in both languages post-rTMS, suggesting that stimulation of the motor cortex of the lips can facilitate cross-therapy effects. Indeed, language production and selection in bilingual individuals involves a large neural network, including the left inferior frontal gyrus (LIFG) and the pre-supplementary motor area (Abutalebi et al., 2008a; Abutalebi et al., 2012; Branzi et al., 2015). Interhemispheric and intrahemispheric connections facilitate communication within this network (Ridding et al., 2007). The stimulation in the motor cortex of the lips can influence the left dorsal phonological pathway, through structures like the corpus callosum and the arcuate fasciculus within the context of language processing that primarily engages bilateral fronto-temporal cortices (Duffau et al., 2014; Stefaniak et al., 2020; Turker et al., 2023). That could suggest the presence of shared neural pathways in bilinguals (Abutalebi et al., 2008a). However, the similarities between French and English could have, also, facilitated the cross-linguistic generalization (Goral et al., 2007; Hameau et al., 2023; Radman et al., 2016). Regarding the reduction of pathological switching, rTMS could impact on specific and impaired neural processes involved, such as inhibition or other executive functions (Abutalebi et al., 2007; Abutalebi et al., 2008b; Green et al., 2013). Hodotopical and dynamic models of language processing suggest that language functions are organized in large-scale cortico-subcortical sub-networks, which include the prefrontal cortex (Duffau et al., 2014). The role of the prefrontal cortex in higher cognitive functions and language processing is well established in both bilinguals and monolinguals, especially in language selection (i.e. Abutalebi et al., 2008b; Branzi et al., 2015; Branzi et al., 2015). Therefore, stimulating the motor cortex of the lips may indirectly enhance activation in the prefrontal cortex, contributing to language processing and cognitive control. These findings suggest that inhibitory rTMS can enhance language recovery in bilingual aphasia rehabilitation impacting through many pathways, including linguistic and cognitive networks.

Day 3: How brain injury informs theories of language evolution

Poster session 3

P3-01: Back to the future: when time reference takes people with aphasia on a mental journey through time, Natacha Cordonier et al.

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Introduction: People with aphasia (PWA) frequently have difficulties with time reference, the linguistic expression of time (see Cordonier et al., 2024, for a review and meta-analysis). These difficulties substantially impact communication, particularly the informativeness of speech (Bastiaanse et al., 2006). Indeed, time reference is essential to indicate whether an event is occurring before (past), during (present), or after (future) the speech time (Reichenbach, 1947). A growing body of literature has thus focused on these time reference deficits in PWA, and several theoretical models have emerged to explain them (e.g., Bastiaanse et al., 2011; Faroqi-Shah & Thompson, 2007; Pinker, 1998). However, these studies and models tend to overlook a potentially important explanatory factor: cognitive factors. The PAst DIscourse LInking Hypothesis (PADILIH - Bastiaanse et al., 2011) suggests that verb inflection, especially for past tenses, may be cognitively costly because of the discourse linking that must be established between the speech time and the prior event time. The cognitive cost of time reference has been analyzed in a few rare studies, which have demonstrated an effect of verbal working memory on verb inflection in PWA (Auclair-Ouellet et al., 2019; Fyndanis et al., 2018a, 2018b). However, to our knowledge, no study has investigated whether this effect of working memory was more pronounced in the past tense, as suggested by the PADILIH. Furthermore, the role of other cognitive functions (e.g., nonverbal working memory, inhibition, mental flexibility, and the conceptual-semantic notion of temporality) has never been investigated. Therefore, the present study aimed to fill this gap by analyzing, for the first time, the impact of different cognitive factors on time reference performance and their interaction with tense in PWA.

Methods: Twenty-one French-speaking participants with fluent and non-fluent aphasia took part in the study. They performed three tasks assessing time reference. The first task (T1 – verb inflection production) consisted of inflecting a verb in a sentence beginning with an adverb inducing past, present, or future (e.g., eat – Five years ago, you ____; expected response: ate). The second task (T2 – verb inflection selection) was similar to the first but offered three forced-choice answers (e.g., gather – Now, he ____; forced-choice answers: gathered, gathers, will gather). In the third task (T3 – adverb selection), participants had to select the correct temporal adverb to complete a sentence containing a verb inflected in the past, present, or future tense (e.g., leave – _____, he will leave; forced-choice answers: Five years ago, Now, In several years). Participants also completed neuropsychological tests assessing verbal and nonverbal working memory (digit and block span backward; Wechsler, 2001, 2008), mental flexibility (Color Trail Test – CTT; D'Elia et al., 1996), inhibition (Go-Nogo; Dubois et al., 2000) and temporality (experimental task consisting of placing temporal adverbs on a time arrow). Several generalized linear mixed models were conducted, with participants' responses to the three verb inflection tasks as the dependent variable and participants' scores on the neuropsychological tests as the independent variable. Interactions between the neuropsychological test scores and the tense (past, present, future) were also assessed to determine whether the involvement of cognitive functions differed according to the tense. Random effects for items and participants and random slopes for tense were included where appropriate. Likelihood ratio tests were used to determine the significance of the main effects and interactions.

Results: The results of the likelihood ratio tests are given in Table 1. They revealed a significant or marginally significant positive effect of verbal working memory on performance in the three time-reference tasks, a significant positive effect of nonverbal working memory in the verb inflection selection and adverb selection tasks (T2 and T3), and a significant or marginally significant positive effect of the temporality score in the three tasks. Regarding the interactions between the cognitive scores and the tense, likelihood ratio tests showed a significant interaction between the tense and nonverbal working memory in the adverb selection task (T3), with a significant positive effect of nonverbal working memory in the past (β = 2.351, SE = 0.716, z = 3.283, p = .001) and future (β = 4.689, SE = 1.642, z = 2.856, p = .004) tenses, but not in the present tense (β = 1.119, SE = 0.717, z = 1.561, p = .119). There were no other significant effects or interactions.

Table 1. Likelihood ratio test (LRT) results for each cognitive predictor and their interactions with the tense in the three tasks assessing time reference.

	T1 – Inflection production		T2 – Inflection selection		T3 – Adverb selection	
Model tense + predictor	**LRT**	**p-value**	**LRT**	**p-value**	**LRT**	**p-value**
Verbal working memory	$\chi^2(1) = 3.837$	***.050***	$\chi^2(1) = 3.587$	***.058***	$\chi^2(1) = 4.603$	**.032**
Nonverbal working memory	$\chi^2(1) = 1.448$	.229	$\chi^2(1) = 9.240$	**.002**	$\chi^2(1) = 7.463$	**.006**
Mental flexibility	$\chi^2(1) = 1.481$	.223	$\chi^2(1) = 0.015$	.904	$\chi^2(1) = 3.193$	.074
Inhibition	$\chi^2(1) = 0.188$	.664	$\chi^2(1) = 0.002$	.961	$\chi^2(1) = 2.394$	.122
Temporality	$\chi^2(1) = 5.281$	**.022**	$\chi^2(1) = 3.366$	***.067***	$\chi^2(1) = 7.538$	**.006**
Model tense * predictor						
Verbal working memory * tense	$\chi^2(2) = 2.383$	.304	$\chi^2(2) = 1.360$	.507	$\chi^2(2) = 3.464$	.177
Nonverbal working memory * tense	$\chi^2(2) = 1.277$	.528	$\chi^2(2) = 0.613$	.736	$\chi^2(2) = 8.096$	**.017**
Mental flexibility * tense	$\chi^2(2) = 1.061$	.588	$\chi^2(2) = 0.137$	.934	$\chi^2(2) = 2.186$	.335
Inhibition * tense	$\chi^2(2) = 0.796$	.672	$\chi^2(2) = 0.804$	.669	$\chi^2(2) = 0.322$	.851
Temporality * tense	$\chi^2(2) = 1.035$	.596	$\chi^2(2) = 0.108$	.948	$\chi^2(2) = 3.149$	.207

Note. Bold = significant; italics = marginally significant

Discussion: The results of our study, with an effect of verbal working memory on all three tasks, confirm the cognitive cost of time reference demonstrated in elderly people, people with Alzheimer's disease, and PWA (Fyndanis et al., 2018b, 2018c, 2022; Schaffner et al., submitted). On the other hand, our results suggest that the past tense and its discourse linking (PADILIH; Bastiaanse et al., 2011) would not require more working memory resources than the present and future. Regarding the other cognitive factors, an effect of nonverbal working memory was found only in the verb inflection selection and adverb selection tasks (T2 and T3). This effect could reflect the conflict between the random placement of the forced-choice answers in T2 and T3, and our ""mental timeline"" which places the past on the left and the future on the right (Bonato et al., 2012). This conflict might be more pronounced in the past and future, as evidenced by the interaction between nonverbal working memory and tense in the adverb selection task. Our results also support the impact of the conceptual-semantic notion of temporality on time reference, and thus question a ""higher-level"" origin of time reference deficits in aphasia. Finally, no effect of mental flexibility and inhibition was found in our study. Further studies using finer-grained cognitive measures and a wider range of stimuli and participants are needed to confirm our findings and shed more light on the impact of cognitive functions on the ability of PWA to mentally and linguistically travel through time.

P3-02: Extension of the Dutch Linguistic Intraoperative Protocol (DuLIP-Extended): new standardized items and tasks for intraoperative language monitoring for mild, moderate and severe aphasia, Marike Donders-Kamphuis et al.

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Introduction: Awake surgery is the standard treatment for low-grade glioma patients, typically suffering from mild to moderate aphasia, (De Witt Hamer et al., 2012) and also seems to result in better surgical outcomes in glioblastoma patients (Gerritsenet al., 2022). The Dutch Linguistic Intraoperative Protocol (DuLIP) (De Witte et al., 2015) is a validated tool for intraoperative language monitoring and available in several languages. Tasks can be selected according to patient characteristics and cortico-subcortical tumor location (see also updated DuLIP model (Collée et al., 2023)). However, in clinical practice, addition of tasks and items appeared to be necessary due to 3 reasons: 1. some tasks need more items to avoid repetition of the same items intraoperatively; 2. some linguistic processes were not included yet; 3. for glioblastoma patients with preoperative (severe) aphasia undergoing awake surgery, less complex intraoperative language tasks are needed for detection of critical language areas in aphasic patients (Donders-Kamphuis et al., 2022). Therefore, we aim to develop an extended version of DuLIP (DuLIP-Extended) with extra items and tasks for mild aphasia (reasons 1 and 2 extension) and moderate to severe aphasia (reason 3).

Methods: We developed extra items and tasks (see Table 1 for an overview): extra items for phonology (word repetition) and semantics (semantic association, semantic sentence completion, semantic odd-picture-out); tasks for additional linguistic processes on phonology (reading aloud sentences, judgment of onset phonemes, rhyming judgment, rhyming), semantics (word pairs) and syntax (syntactically induced sentence completion, converting sentences from the present tense to the past tense); for patients with moderate to severe aphasia, tasks were developed for phonology (rhyming with cue), semantics (matching pictures to categories, matching pictures to written words, matching written words to pictures), and object naming of high-frequent words; besides this, additional less complex items were added for phonology (word repetition, judgment of onset phonemes) and semantics (word pairs). All new items were controlled for the linguistic variables word frequency, age of acquisition, prevalence and phonological complexity taken from linguistic databases (Brysbaert et al., 2019; Ghyselinck et al., 2003; Keuleers et al., 2010). Nine tasks were developed for administration during direct electrical stimulation (within 4 seconds) and 21 were developed for administration during resection (without 4 seconds). DuLIP-Extended was administered in healthy adult volunteers from The Netherlands and Belgium. Inclusion criteria consisted of Dutch as a mother tongue, no (history of) cardiovascular, neurological, psychiatric, or developmental language and/or speech disorders, no toxic substance abuse (no drug or alcohol abuse), normal vision, normal hearing, no use of sleep medication, psychopharmaca or neuroleptic drugs, and for participants above 70 years a score above 26/30 on the Montreal Cognitive Assessment. Accuracy rate was calculated per item and per task. Items and tasks needed to have an accuracy rate of ≥80% and ≥90% respectively. Differences on task performance between groups of sex (male, female), age and education were investigated with Mann Whitney U Test.

Table 1. Overview DuLIP-Extended

Domain	DuLIP 2015	DuLIP Extended			
		Mild aphasia		Moderate – severe aphasia	
		Extra items	New tasks	Extra items	New tasks
Phonology	Repetition of words (2-3 syllables with/without clusters)	Repetition of words (compound words with/without clusters)	Reading sentences aloud	Repetition of words (1-2 syllables with/without clusters)	
	Reading with odd word out		Rhyming		Rhyming with a cue
	Sentence judgment		Rhyme judgment		
			Onset phonemes judgment		Onset phonemes judgment
Semantics	Naming with odd picture out	Naming with odd picture out	Word pairs (category, synonyms, antonyms)		Word pairs (category)
	Semantic association	Semantic association			Matching pictures to categories
	Sentence completion	Sentence completion			Matching pictures to written words
	Reading with odd word out				Matching written words to pictures
	Sentence judgment				
Syntax	Action naming		Sentence completion (active and passive sentence with infinitive or past particle)		
	Verb generation		Converting sentences: present to past tense		
	Sentence judgment				
Naming	Object naming			Object naming of high-frequent words	
Verbal diadochokinesis	Verbal diadochokinesis				

Results: The cohort of healthy participants consisted of 151 healthy participants of which 53% were Flemish, 60% were women, 57% were younger than 55 years, and 69.5% had more than 12 years of education. In total seven items were removed because of an accuracy rate <80%. All tasks had an accuracy rate of ≥90%. The tasks that elicited most errors were the semantic association task (accuracy rate of 92%) and the rhyming judgment task (accuracy rate of 94%). No differences of sex were found in test performance. Younger participants (18-54 years) performed significantly better than older participants (≥ 55 years) on repetition of one syllabic words ($p<.001$), rhyming judgment ($p=.001$) and rhyming with a cue ($p<.001$). Participants with more than 12 years of education performed significantly better than participants with lower years of education (≤ 12 years) on word repetition of two syllabic singular words ($p<.001$) and converting sentences from the present tense to the past tense ($p<.001$).

Discussion: DuLIP-Extended is a standardized test battery for pre-, intra- and postoperative language monitoring which enables the linguist to select from a larger variety of items and tasks at different linguistic levels and at all complexity levels. This allows a more inclusive neuro-oncological care where patients with severe aphasia normally excluded from awake surgery can also be treated. Like the original DuLIP, the new items and tasks have a good accuracy rate and some effects of age and education were found. Validation in glioma patients with mild to severe aphasia needs to be executed before patient-tailored clinical implementation can take place. Further research about the application of DuLIP-Extended in accordance to cortico-subcortical areas needs to be done. Finally, adaptation to other languages will be done in the future.

P3-03: The Aphasia Friendly Business Campaign: Program Expansion and Evaluation, Julia Borsatto et al.

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Introduction: The Aphasia Friendly Business Campaign (AFBC) is an educational training program that was created to address the lack of public knowledge of aphasia. Previous work demonstrated that the in-person delivery of the AFBC was efficacious in achieving training outcomes (i.e., improve trainee's knowledge of aphasia and perceived ability to communicate with people with aphasia; Borsatto et al., 2021). The aims of the current project were to: (1) expand the AFBC training program to a virtual platform, (2) assess its efficacy, and (3) investigate how the virtual delivery compared to its in-person counterpart. Program expansion was complemented by program evaluation to assess training design, retention (e.g., do participants remember and use communication skills on the job and/or in daily life?), and transfer (e.g., have participants retained, shared, or trained others about aphasia and/or supportive communication post-training?)

Methods: The ABFC training was accessible to participants through the project website (aphasiafriendlycanada.ca). Recruitment occurred through word of mouth, promotion through media and social media platforms, and community outreach. Post-training questionnaires assessed aphasia knowledge (AK) and trainee's perceived self-efficacy (SE) to use communicative techniques. These evaluations also allowed trainees to assess the training content, its pertinence, and relevance to their personal and professional lives on a scale of 1 to 5 (1- strongly disagree, 5-strongly agree). On the same scale, they could also rate trainer characteristics (e.g., was knowledgeable, spoke clearly, enthusiastic). At a minimum of six-months post training, all trainees were invited to participate in a semi-structured interview (SSI) to assess virtual training retention and transfer. Data were analyzed using an inductive reflexive thematic analysis.

Results: At the time of analysis, 258 individuals participated in the virtual AFBC training; however, only 192 met inclusion criteria. Sample characteristics showed majority of participants identified as female and worked in healthcare. Most participants were located in Ontario, Canada but geographical reach extended across other provinces in Canada, the USA, and internationally. Results of this multi-method study showed that the virtual AFBC training significantly improved AK and SE in trainee's ability to use supportive communication skills. Comparing modalities, the virtual trainees outperformed in-person group on the post-training AK outcome measure. Investigation of SE showed that the in-person trainees felt significantly more comfortable and confident using communicative skills than the virtual group. Virtual trainees were satisfied overall with the AFBC training. A total of 11 individuals participated in SSIs. Four themes were generated from the data: (1) knowledge and skill acquisition, (2) knowledge translation, (3) accessibility awareness, and (4) considerations for future. AFBC training content was perceived as relevant and comprehensive, and trainees reported that they remembered and translated communication skills into their daily lives.

Discussion: The AFBC virtual training program is a cost-effective (free), time-efficient (20-30 minutes), and efficacious training program that translates to real-world change. Knowing that common barriers to participation in workplace training efforts are a lack of time and workload constraints (Daly et al., 2019), it will be important to engage stakeholders at the organizational level (e.g., Human Resources) moving forward with our program expansion. Further, given the scarcity of publicly available, multilingual aphasia related information and services, future AFBC program expansion includes the translation of our virtual training to other languages. It will also be important for more objective measures of program evaluation to be implemented in the future. Having people with aphasia and other communication difficulties go into businesses and organizations with trained service providers would provide this data. Assessment of the communicative techniques (e.g., used closed ended questions, used visual aids, spoke with clear and slow speech) and materials used by the trainees would provide longitudinal information about training retention and generalization. The AFBC program expansion and evaluation is an ongoing story that we hope inspires others to enact meaningful changes to improve community accessibility for people with aphasia.

P3-04: Verbal errors and verbosity in semi-spontaneous narratives in healthy very old speakers, Sonja Elisabet Alantie et al.

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Introduction: Population worldwide is ageing and so is the speech-language pathologists' clientele. However, there is little language and culture specific knowledge on how very old age affects language. It would be important to understand the changes related to healthy ageing in order to differentiate them from signs of neuropathology. Narrative tasks are frequently used in clinical settings to assess linguistic skilss. Narrative skills are also one aspect of language use that have been found to alter during ageing. Elderly speakers experience for example more word retrieval difficulties and manifest vaster verbosity than younger speakers (Cahana-Amittay & Albert, 2014; Pekkala, 2011). The aim of this study is to investigate what kind of verbal errors very old speakers make while producing a semi-spontaneous narrative and whether they have a tendency towards verbosity.

Methods: To assess verbal errors and verbosity in semi-spontaneous speech, we asked 50 neurologically healthy very old (80-100y, M=84.8y) Finnish speakers to generate a story from a wordless cartoon strip. The narrations were audio recorded and annotated. Then verbal errors and insidences of verbosity were identified, categorised and counted.

Results: We identified five main categories of verbal alterations 1) verbosity or talking past the topic, 2) naming error of noun or verb, 3) repetition of a word, syllable or phoneme, 4) false start or self-correction and 5) neologism. We will present the distribution of these categories and give examples of them. We will also state whether there are differences between 80–85-year-old speakers and 86–100-year-old speakers.

Discussion: The results of this study offer a suggestive normative profile on verbal errors and verbosity in healthy very old speakers' semi-spontaneous narratives. The results are clinically applicable and may help in making differential diagnosis as well as in evaluating rehabilitation outcomes. This study also aims at giving more insight into processes underlying ageing related alterations in language use and communication.

P3-05: Digital language testing in low-grade gliomas, Michelle van Steijn et al.

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Introduction: Patients with primary brain tumors (gliomas) frequently show subtle language disturbances, which may also have a serious impact on quality of life. They are often underdiagnosed because of a lack of suitable and sensitive tests. The Diagnostic Instrument for Mild Aphasia (DIMA) was developed and standardized as a Dutch test battery to detect mild aphasia in glioma patients (Satoer et al., 2022). The DIMA examines the most important linguistic levels: phonology, semantics and (morpho-)syntax, at both language production and comprehension. DIMA consists of 4 subtasks for production: 1) repetition ((non-)words, sentences), 2) semantic odd-picture-out, 3) sentence completion and at perception: 4) sentence judgment at all linguistic levels. The pen-and-paper version of DIMA is standardized in healthy participants (n=211) and validated in glioma patients (n=82; Vogrincic et al., in prep). In a rather busy clinical practice, pen-and-paper tests need a lot of time to be administered and scored. Therefore, a digital version of DIMA was developed, DIMA-app. With a digital test, scores can be (semi-) automatically calculated and reaction times can be measured more accurately. As people with mild aphasia frequently report mild word-finding difficulties, a speeded object and action naming test is also developed, a Dutch adaptation of MULTIMAP (Gisbert-Munoz et al., 2021). Aims: 1. To test the feasibility of DIMA-app in healthy participants; 2. To examine whether the scores on DIMA-app differ from the original pen-and-paper DIMA; a. To investigate effects of age and education on DIMA-app; 3. To make a first step to develop a digital speeded object and action naming test, MULTIMAP-NL.

Methods: DIMA: In a pilot study, 70 healthy participants from the Netherlands and Belgium were tested with DIMA-app (mean age 47, sd 20.4). The following subtests were examined: 1) repetition ((non-)words, sentences), 2) semantic odd-picture-out (nouns) and 3) sentence completion. First, accuracy scores in percentages were calculated for all subtests and the total scores on DIMA-app. Then, raw scores on these subtests and total raw scores were compared with the raw scores from 70 healthy participants on the pen-and-paper version (mean age 46,5, sd 19.9) matched for sex, age and education, using an independent samples t-test. Participants who were tested with the app were divided into two age groups: <55 years and ≥55 years old and two groups of years of education: ≤12 years or >12 years. MULTIMAP: We made a selection out of 218 colored images taken from Gisbert and colleagues (Gisbert-Munoz et al., 2021), based on relevant cultural and linguistic variables for the Dutch language. The Dutch databases CELEX (Kerkman et al., 1993), SUBTLEX-NL (Brysbaert et al., 2014; Keuleers et al., 2010) and Positiewoordenboek (Weijters et al., 1983) were used to check linguistic variables such as word frequency, word form, age of acquisition, prevalence and concreteness. Consequently, an online survey was created in Google Forms. In total, 219 people (87 male; 132 female; age: 84% between 18 and 54) participated in this survey. Naming agreement (≥80%) was calculated at item level.

Results: DIMA: The mean accuracy of the total score on DIMA-app was 94%. For the different subtests, see Table 1.

Table 1: *Accuracy (%) for all subtests on the DIMA-app and pen-and-paper version and p-values*

Subtest	Accuracy app	Accuracy pen-and-paper	*p-value*
Phonology			
Repetition 3-syllabic words	98%	99%	.200
Repetition compound words	99%	98%	.132

Repetition non-words	91%	92%	.537
Sentence repetition	92%	90%	.223
Total	95%	95%	.876
Semantics			
Odd-picture out	90%	91%	.561
(Morpho-)syntax			
Sentence completion	92%	96%	.037*
Total DIMA-app	94%	94%	.786

**p<0.05*

Between the app and pen-and-paper version, a significant difference was found on the subtask sentence completion (t (106.26) = 2,11, p = .037). The mean score on the pen-and-paper version on this subtask was significantly higher (M = 9.59, sd = .65) compared to the score on the DIMA-app (M = 9.24, sd = 1.2). Within the DIMA-app significant differences were found for groups of age and education. Participants <55 years old scored significantly higher on average on the total score on phonology (M = 38.76, sd = 1.3; t (48.2) = 3,54, p<.001), phonology: compounds words (M = 9.95, sd = .27; t (41.9) = 3.58, p <.001) and on the total score on the DIMA-app (M = 52.84, sd = 1.93; t (46.36) = 3.52, p <.001) than participants ≥55 years old (total phonology: M = 37.19, sd = 2.22; phonology compound words: M = 9,84, sd = .37; total score on the DIMA-app: M = 50.41, sd = 3.5). Participants >12 years of education scored significantly lower (M = 9.86, sd = 0.35) on phonology: compound words (t (68) = 2.83, p = .007) than participants ≤12 years of education (M = 10, sd = 0). MULTIMAP: 110 objects and 108 verbs were initially selected. A final subset of 69 objects and 46 verbs corresponded to naming agreement of ≥80%.

Discussion: DIMA-app appeared to be feasible, given the high scores in accuracy and appeared to be comparable to the pen-and-paper version apart from sentence completion. An error analysis and inter-rater reliability should be conducted to further investigate (minimal) differences between the DIMA-app and pen-and-paper version. Younger participants performed better on DIMA-app than older participants, particularly on phonological tasks which corresponds to the original DIMA pen-and-paper study (Satoer et al., 2022). The finding that lower educated participants scored higher than higher educated participants is unexpected and opposite to results from other norm studies (De Witte et al., 2015; Satoer et al., 2022). This might be explained by the skewness of the data, as the distribution across these categories is not equal (n=21 for ≤12 years of education and n=49 for >12 years of education). More data collection is ongoing to better control for skewness and to examine the possible influences of sex, age and education. For MULTIMAP we made an initial attempt for a Dutch adaptation taking into account cultural and linguistic variables. Standardization in healthy participants will follow. For both tests, data in patient groups is necessary in order to investigate sensitivity and validity before implementation in clinical practice can take place. We expect that both tests have high potential to examine mild aphasia, including subtle word finding difficulties in low-grade glioma patients. In addition, these tests might also be useful for other patient groups suffering from mild aphasia with a different pathology (e.g. stroke, trauma, early neurodegenerative disease). International adaptation of DIMA-app is also ongoing. Finally, the DIMA-app is also expected to be useful in the preparation of low-grade glioma patients undergoing an awake craniotomy with intraoperative language testing, as it was developed as an addition to the Dutch Linguistic Intraoperative Protocol (DuLIP; De Witte et al., 2015).

P3-06: Tense Impairment in Aphasia: A Usage-based Analysis, Ludovica Onofri et al.

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Introduction: Grammatical tense is challenging for many people with aphasia (PwA). Explanations for tense impairment range from the inaccessibility of tense nodes (Friedmann & Grodzinsky, 1997) or the underspecification of tense features (Wenzlaff & Clahsen, 2004) to morphological and morphosemantic accounts (Faroqi-Shah & Thompson, 2007; Ullman et al., 2005). However, PwA's behaviour is inconsistent with any single approach. This project addresses a number of gaps in research on tense impairment. Starting with the theoretical gap, we employ usage-based construction theories which propose usage-frequency effects at the single- and multiword level and introduce the notion of bias – the systematic preference of a lexical item for one frame or word combination – which to date has only been investigated in aphasia in passives (Gahl et al., 2003), plurals (Hatchard & Lieven, 2019), and formulaic language (Zimmerer et al., 2018), but not in tense. We investigate multiple frequentist variables along with morphological, phonological, and semantic complexity of verbs. Furthermore, studies on PwA's speech production rarely observe spontaneous language (Nerantzini et al., 2020), focusing on more constrained tasks (e.g., sentence-picture matching, sentence completion). The current project investigates grammatical tense in samples of spontaneous language production in PwA and controls.

Methods: A secondary analysis was carried out on data from Montclair State University available in AphasiaBank (Boyle; MacWhinney et al., 2011). Data from a total of 16 participants were analysed (8 PwA, mean age = 65.7, SD = 20.5, WAB mean = 76.7, SD = 13.3, years of education mean = 14.7, SD = 2.5; 8 controls, mean age = 57.1, SD = 7.2, years of education mean = 16.1, SD = 1.6). Participants were American English native speakers. Data were in the form of transcribed semi-structured interviews of which we selected one question - namely, whether participants recalled their stroke or any illness/injury (depending on group). Additionally, normative frequencies were measured using the Corpus of Contemporary American English (COCA) - the largest online database of American English encompassing around one billion words collected from 1990 to 2019 (Davies, 2008-). Due to the large number of lexemes, recognition of tense and time reference was semi-automatised using R scripts generated for this study (the error rate for classification is approximately 15%, on par with other methods of automated annotation). Each verb occurrence in the sample (e.g., I drove) was classified according to its reference lexeme (e.g., drive), tense (e.g., past simple), time reference (e.g., past), morphological (e.g. irregular verb, one morpheme) and phonological complexity (e.g., five phonemes), and semantic weight (e.g., heavy). Frequency of the lexeme (e.g., 194,360) and estimated frequency of the form (e.g., 35,374) were also reported. Finally, from a subsample of 500 sentences per lexeme, a tense and time bias (e.g., 0.182; 0.252) were calculated as proportions of the lexeme respectively in a specific tense or generic time reference.

Results: Our analysis on time bias found that the majority of verbs appear more frequently in the present, possibly reflecting a general bias towards the present in language use. However, some verbs showed a clear past bias (e.g., say, start, find, send, observe). Linear models showed that PwA produced a significantly lower proportion of regular verbs than controls, $t(14) = 4.231$, $p < .001$. The difference in proportions of light verbs did not reach statistical significance, $t(14) = -2.039$, $p = .06$. The difference in proportions of verbs in the past tense did also not reach statistical significance, $t(14) = 1.407$, $p = .18$. To test group differences in number of morphemes, number of phonemes, lexeme frequency, tense bias and time bias, we ran linear mixed effects models with the linguistic variable under consideration as outcome, Group as a fixed effect and Speaker ID as a random effect. These simpler models revealed only one significant difference: verb forms produced by PwA had on average .72 phonemes fewer than verb forms by controls, $\beta = .72$, $p = .03$. However, frequentist variables (lexeme frequency, form frequency, tense bias and time bias) were strongly correlated with the number of phonemes, reflecting that phonologically simpler forms are more frequent. Therefore, we entered an interaction between Group and Number of phonemes into our models. These models showed a significant effect of Group for tense bias, $\beta = .15$, p < .001 with PwA producing more forms in their biased tense, time bias, β = .14, p = .008 with PwA producing more forms in their most frequent time reference, and lexeme frequency, β = -9,544,000, p = .003 with PwA producing less frequent forms. There were significant interactions between Group and Number of phonemes for tense bias, β = -.03, p < .001 with an effect of phonemes on tense bias reduced for PwA, time bias, β = -.02, p = .002 with an effect of phonemes on time bias reduced for PwA, and lexeme frequency, β = 1,082,000, p = .01 with a greater effect of phonemes on lexeme frequency for PwA.

TABLE 1. Group means and standard deviations
(frequency variables are expressed in occurrences per million words).

	Aphasia	**Controls**
	mean (sd)	*mean (sd)*
proportion of regular verbs	17.18 (5.98)	29.17 (5.33)
proportion of light verbs	26.91 (12.3)	16.85 (6.58)
proportion of past verbs	52.17 (14.48)	64.19 (19.35)
lexeme frequency	11,678.5 (3,666.1)	13,485.6 (5,174.3)
form frequency	3,673 (1,638.5)	2,703.8 (1,015.3)
tense bias	0.28 (0.06)	0.24 (0.05)
time bias	0.43 (0.07)	0.38 (0.08)
number of phonemes	4.55 (0.45)	5.25 (0.6)
number of morphemes	1.57 (0.06)	1.57 (0.16)

Discussion: Current results identify a tendency of PwA to produce fewer regular verbs. This supports morphological complexity accounts which argue that regular verbs pose greater challenges for PwA due to the complex morphological operations they need to undergo to be inflected. Furthermore, PwA also tend to produce verb forms with fewer phonemes, providing support for the idea put forward by phonological complexity accounts that PwA prefer simpler phonological forms. However, these findings also highlight the influence of frequency variables introduced by usage-based approaches on verb production in PwA, particularly in relation to the fact that verbs tend to show a systematic preference towards a tense or time reference. Further investigations are warranted to gain deeper insight into these dynamics. These preliminary 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, our results contribute to our understanding of verb production in PwA, emphasising the importance of considering multiple linguistic factors, including usage-frequency and related variables.

P3-07: Documentary research for the construction of an evidence-based guide to support the caregiver of the patient with aphasia, Maria Camila Daza Garzon et al.

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Introduction: A documentary search is presented to find the main speech therapy intervention strategies used in patients with different types of aphasia, with the purpose of adapting them in the construction of an evidence-based speech therapy guide for the accompaniment of the caregiver of the patient with aphasia, therefore, the search was focused on articles, studies and systematic reviews in the databases PubMed, MedLine, LILACS and additionally, the database of the ASHA (American Speech-Language-Hearing Association) using the terms aphasia, caregivers, treatment, strategies and speech therapy, treatment, strategies and speech-language pathologists, in Spanish and English, between the years 2005 to 2023 in which a solid scientific basis for the application of techniques, defined as procedures to achieve a result and strategies, defined as tools that allow the design of an action plan to achieve an objective in a given time, which were then adapted and exemplified in the final product of this research to the Colombian population, in order to be applied by caregivers of patients with aphasia in their daily life at home.

Methods: A documentary search was carried out in the databases PubMed, MedLine and LILACS; and in publications of the American Speech-Language-Hearing Association (ASHA), using the terms aphasia, caregivers, treatment, strategies and speech therapists, in Spanish and English, from 2005 to 2023. A total of 417 research articles were obtained by filtering in the databases with the use of the selected terms, being Medline and LILACS the databases where a greater number of articles were found, obtaining 118 and 149, respectively, within the ASHA database 88 were found, and in PubMed 62 articles, subsequently, 48 articles were selected by their title, analyzing the relevance with the reading of their abstract. Exclusion and inclusion criteria: 34 articles were chosen taking into account the following exclusion and inclusion criteria: The focus of the research must be related to communication and not to psychological aspects; the research should consider evidence-based intervention strategies for the treatment of aphasia or caregivers, their perspective and participation in the therapeutic process; the articles must have been published within the last 18 years; the language of the research must be Spanish or English, other languages will be discarded; subsequently, the remaining 34 articles (5 in Spanish, 29 in English) were read in order to extract the specific strategies and techniques for adaptation to the final guide.

Results: The information obtained was filtered, looking for strategies and intervention techniques that could be adapted for caregivers to use on a daily basis with their family members. At the end of the review, 9 therapeutic strategies and 2 techniques were obtained. (Table 1).

Therapeutic techniques				
Name	Speech- therapy objective	Language area worked on	Incentives	Author
Constraint-Induced Aphasia Therapy. CILT	Recovery of expressive language.	Semantics	Expression	Raymer, A. M., & Roitsch, J. (2023).
Reduced Syntax Therapy (REST)	Restoration of syntactic processing	Syntax, semantics.	Expression	Hinckley, J. J., Hasselkus, A., & Ganzfried, E. (2013).
Mapping Therapy	Increase sentence comprehension	Syntax, semantics.	Expression and comprehension	
Helm elicited language program for syntax stimulation	Improving the use of syntax in patients with agrammatism	Syntax	Expression and comprehension	
Semantic feature analysis therapy	Improve lexical recall by strengthening or restoring activation within the semantic system.	Semantics	Expression	Efstratiadou, E. A., Papathanasiou, I., Holland, R., Archonti, A., & Hilari, K. (2018).
Melodic Intonation Therapy (MET)	Improve the fluency of verbal production with the use of melodic intonation regulated by the right hemisphere.	Fluency	Expression	Siponkoski, S. T., Pitkäniemi, A., Laitinen, S., Särkämö, E. R., Pentikäinen, E., Eloranta, H. & Särkämö, T. (2023)
Verb Network Strengthening Treatment	Strengthening of the verbal network and access to the vocabulary	Semantics	Expression	Karidas, S., Hinckley, J. J., & Brekher, I. (2023).
Gestural Facilitation of Naming	Recovery of expressive language and access to the vocabulary	Semantics	Expression	
Response Elaboration Training	Increase the number of content words used by the patient during spontaneous speech.	Fluency	Expression	
Strategies				
Physical objects better than images	Improving lexical recall through real multisensory inputs	Semántica	Expression	Fonseca, J., Miranda, F. D., Leal, G., & Martins, I. P. (2021).
Use conserved communicative elements	Recovery of expressive language with use of preserved communicative elements.	Semantics and fluency	Expression	Volkmer, A., Spector, A., Meitanis, V., Warren, J. D., & Beeke, S. (2020).

Table 1: Evidence-based techniques and strategies, authors' own elaboration.

Once the specific strategies and techniques were identified, a practical adaptation of objectives vs. activities was made, taking into account their principles of application and their purpose in such a way that, adapted to a Colombian social context and to a habitual practice within daily routines, they contribute to an effective and dynamic communication at home. To meet the objective, and taking into account that Volkner (2020) reports that the participation of caregivers in the practice of communicative activities with a caregiver or partner influences language recovery, however the number of sessions or optimal activities to generate a better result is not defined, 3 to 5 exercises are proposed in the guide for each strategy and technique to be implemented by caregivers.

Discussion: As a result of the documentary search carried out, it can be deduced: There is little information related to caregivers of aphasia patients globally and very little information related to the topic in Spanish; Within LILACS, Latin American database, research related to aphasia, treatments and intervention strategies and caregivers are mostly from Brazil, showing the research gap in the rest of Latin America. No record was found of research in Colombia on the subject, so it is essential to conduct more academic research and publications in the area focused on our country; within the documentary search, multiple strategies for oral expression, fluency and lexical access were found, however, very few of them include the components of pragmatics and language comprehension and, additionally, the strategies found do not have as main objective to work on these areas.

P3-08: Why aphasia researchers should use the PAOLI (People with Aphasia and Other Layperson Involvement) framework, Marina Charalambous et al.

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Introduction: Patient and Public Involvement (PPI) in aphasia research requires researchers to include people with aphasia (PWA) as research partners from the beginning of the study. Yet the quality of reporting on the level and type of involvement is poorly documented in the absence of a framework to guide PPI in aphasia research. Aim: To extract the items and statements relevant for the development of the People with Aphasia and Other Layperson Involvement (PAOLI) framework for designing and implementing PPI in aphasia research, in collaboration with people with aphasia. The goal is for researchers to use the PAOLI framework when designing their research study.

Method: To develop the PAOLI, the method recommended by the EQUATOR network for developing a framework was followed. This involved: (1) evidence from a scoping review, (2) a thematic analysis of the in-depth interviews, of people with stroke and aphasia, on the topics to be included in the pilot draft, (3) a two-round Delphi survey for item/statement selection and (4) an experts' consensus meeting. The research team involved two PPI partners with chronic stroke-induced aphasia. The research process involved co-design and was informed by the Dialogue model.

Results: The PAOLI framework includes 17 items (with 66 descriptive statements): establish collaborations, recruit patients, gain informed consent, organize induction meetings, train patient partners, create communication links, engage communication partners, conceptualize topics, establish research priorities, reach consensus, work with co-design methods, develop proposals, assist with dissemination of results, promote the implementation of the outcomes, support patient partners and promote self-evaluation, monitor progress and assess the impact of the patient involvement.

Discussion: The PAOLI is the first international consensus framework for guiding patient involvement in aphasia research. Researchers are encouraged to adopt the framework to improve the quality of their research by promoting the meaningful involvement of people with aphasia within the research team from the start.

P3-09: Exploring Cerebral Activity in Speech Processing Under General Anesthesia: An Intraoperative Neurophysiological Investigation, Pauline Pellet Cheneval et al.

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Introduction: Understanding the mechanisms of speech processing under general anesthesia is crucial for evaluating cognitive function during neurosurgical procedures. Intraoperative neuromonitoring remains today the most accurate method for localizing eloquent areas for motor or somatosensory functions. The objective of the study was to investigate the extent of cerebral activity related to speech processing under general anesthesia. Building upon previous research that focused on a phonological task, the study expanded to include lexical and semantic tasks. By employing three distinct auditory tasks—phonological tasks involving standard and deviant sounds, as well as semantic tasks encompassing congruent and non-congruent sentences—the study explored the phenomenon of mismatch negativity (MMN), a reliable marker of cerebral detection of auditory mismatches. Through the analysis of evoked potentials and spectral data derived from intraoperative electroencephalograms (EEGs) recorded from left temporal scalp or cortical electrodes, this research aimed to elucidate the extent of cerebral activity associated with speech processing during general anesthesia.

Methods: Anesthesia induction was accomplished using a combination of Propofol and Remifentanil, with continuous monitoring of frontal EEG activity utilizing the Bispectral Index (BIS). Additionally, a comprehensive battery of neuropsychological tests was administered both pre- and post-operatively to assess various aspects of cognitive function, including naming, repetition, writing, verbal fluency, as well as oral and written comprehension tasks. The proposed intraoperative tasks were as follows: an oddball task, involving the presentation of repeated sequences of syllables, with occasional deviant stimuli, aimed at assessing the integrity of phonemic processing. The MMN response was expected to occur between 150 to 200 ms after the onset of the deviant syllable. A lexicality task where a random mix of real words and pseudo-words was proposed to evaluate lexical processing. The N400 component, indicative of lexical processing, was anticipated to emerge approximately 300 to 400 ms after the onset of each word. Lastly, a semantic congruence task where participants were presented with sentences containing either correct or semantically incongruent phrases to investigate semantic processing. ERP components related to semantic processing were expected to occur approximately 400 ms after the presentation of a semantically deviant word within the sentence. Ethical approval was obtained, and data collection was conducted on a cohort of five patients undergoing surgery on the left hemisphere for DNET or gliomas. Four of these patients were exposed to the phonological task, while one patient undergoes the semantic task.

Results: Preliminary analysis of the phonological task revealed significant MMN responses in all four patients, accompanied by notable increases in amplitude spectral density within specific frequency bands. In the semantic task, a MMN-like response was observed for non-congruent sentences for the patient undergoing the semantic task. Spectral analysis also showed an increase in amplitude spectral density in a specific frequency band.

Discussion: The replication of MMN responses during general anesthesia underscores the robustness of this phenomenon as an indicator of cerebral activity. Furthermore, the detection of semantic errors even under light anesthesia suggests the presence of residual cognitive function, raising intriguing questions regarding patients' auditory perception and cognitive processing during surgery. These findings hold potential implications for the development of neuromonitoring techniques aimed at assessing cognitive function in real-time during surgical procedures under general anesthesia. In conclusion, this study contributed to our understanding of cerebral activity related to speech processing during general anesthesia. By incorporating a variety of auditory tasks and employing advanced neurophysiological techniques, the findings shed light on the complex interplay between anesthesia, cognitive function, and auditory perception. Moving forward, further research in this area could potentially pave the way for the development of innovative neuromonitoring approaches aimed at ensuring optimal cognitive outcomes for patients undergoing surgical procedures under general anesthesia.

Day 4: Underrepresented Languages in aphasia research: how can they add to our understanding of aphasia and what are the problems with anglo-centric research on aphasia?

Oral presentations 3

O3-01: Examining the Richness of Verb Use in Morphologically-Rich Languages: Evidence from Tagalog Agrammatism, Jonathan Gerona et al.

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Introduction: Morphologically-rich languages (e.g., Turkish, Finnish, Korean) are classified by their capacity to convey multiple tiers of grammatical information even at the word level (Tsarfaty et al., 2013). Because of this, it is commonly observed that the verbal morphology of these languages remains relatively preserved and exhibits resistance to verb deficits associated with agrammatism (Menn & Obler, 1990). This resilience is attributed to the significant reliance of these languages on bound morphology (Druks, 2016), rendering verbal affixes indispensable since the use of bare stems is not permissible (Grodzinsky, 1990). By utilizing Tagalog, a morphologically-rich and agglutinative language predominantly spoken in the Philippines, we aim to challenge the prevailing notion that agrammatic verb morphological impairment does not exist in morphologically-rich languages. Moreover, being typologically and genetically distinct from previous languages examined, Tagalog verbs are particularly special as they transcend both ends of the inflectional continuum, ranging from highly-agglutinated and nested verbal paradigms (Cena, 2020) to the acceptable use of bare verb forms (Garcia & Kidd, 2022; Schachter & Otanes, 1972). Leveraging on these particular features, we examine different dimensions of verb usage in spontaneous narrative speech, highlighting the morphological richness of the language, which has been given minimal attention in previous studies on agrammatism in morphologically-rich languages (Arslan et al., 2016; Halliwell, 2000; Nedergaard et al., 2020; Sang, 2015; Slobin, 1991).

Methods: Ten Tagalog-speaking individuals with agrammatism (IWA) from Greater Metro Manila, Philippines participated in this study. All IWA presented with non-fluent Broca's aphasia based on the clinical evaluation and speech output according to the WAB-R matrix for spontaneous speech (Kertesz, 2006). Additionally, 12 non-brain damaged (NBD) participants comprised the control group who were matched according to age, gender, and education. Semi-spontaneous narrative speech samples were elicited from each participant (personal interview, picture description, and story re-telling). After all samples were audio-recorded, they were transcribed orthographically, annotated, and analyzed by native speakers of Tagalog. Inter-rater reliability was also established to ensure integrity of the analyses. Multiple dimensions of verb use were examined such as comparison of (a) overall proportion of verbs and verb types, (b) lexical diversity, (c) finiteness, (d) inflectional accuracy and error patterns, and (e) morphological richness, using non-parametric Mann-Whitney U tests.

Results: A total of 1,015 verbs out of 5,185 words from both IWA and NBD groups were included in the analysis. In terms of overall proportions relative to the entire samples, IWA exhibited a tendency to overuse verbs and their various types compared with NBD speakers. However, this overuse did not occur without accompanying trade-offs. While the noun-verb ratio remained comparable, a discernable decrease in the diversity of lexical verbs was observed. Focusing solely on the proportions relative to lexical verb counts, it was found that IWA produced significantly more non-finite verbs than finite ones, a pattern contrasting with the NBD group. This increase in non-finite proportions, specifically aggravated by a heightened amount of bare verb use by the IWA, resulted in a decline in both the finiteness index and the percentage of correctly inflected verbs. Although the inflectional errors among IWA were relatively minor in quantity, they remained statistically significant when juxtaposed with the performance of NBD speakers. These erroneous productions were characterized by a combination of omission and substitution errors. Regarding measures of morphological richness, IWA displayed a lower usage of affixes per verb compared to the NBD group, leading to a reduction in the number of morphological templates produced, particularly the complex types. This limitation consequently restricted the average number of distinct forms per template, ultimately resulting in diminished morphological richness (please refer to Table A for summary of results).

Table A

Summary of Verb Measures of IWA & NBD Participants

Parameters	IWA		NBD		Mann-Whitney U	
	Mean	*SD*	*Mean*	*SD*	*Statistics*	*p-value*
MLU in Words	2.95	0.82	9.16	1.46	0.00	<.001*
Total Verb % word	24.88%	6.28	17.92%	1.86	16.00	.004*
Modal Verbs %	5.57%	3.72	2.39%	0.44	17.00	.005*
Lexical Verbs %	19.33%	5.41	15.47%	1.69	22.00	.012*
Verb TTR	0.710	0.08	0.813	0.03	13.00	.002*
Noun-Verb Ratio	1.331	0.91	1.143	0.13	58.00	.921
Finiteness Index	0.402	0.195	0.977	0.03	0.00	<.001*
Non-Finite Verbs %	54.34%	20.65	18.13%	6.33	0.00	<.001*
Finite Verbs %	45.66%	20.65	81.87%	6.33	0.00	<.001*
Bare Verbs %	45.99	20.97	2.69%	3.87	0.00	<.001*
Correctly Inflected %	42.93%	19.82	96.97%	4.39	0.00	<.001*
Inflection Error %	11.08%	5.08	0.34%	0.80	0.00	<.001*
Omission Error %	5.82%	3.08	0.19%	0.66	1.00	<.001*
Substitution Error %	3.99%	3.85	0.15%	0.53	19.50	.002*
Ave # Affixes per Verb	0.669	0.39	1.502	0.15	0.00	<.001*
# Morpho Templates	6.60	2.41	11.33	1.97	5.00	<.001*
Mean Size of MT	1.403	0.23	1.906	0.26	10.00	.001*

Discussion: The findings of this investigation offer fresh insights into the impact of agrammatism in the verbal morphology of morphologically-rich languages like Tagalog. The prevalence of verb overuse in the narrative speech of IWA was not unexpected, given that their spoken output primarily comprises lexical words, with a scarcity of function words (Menn & Obler, 1990), as compared to NBD speakers who demonstrated proficient usage across all word classes. While all verbs produced by the IWA are theoretically plausible forms, including bare forms, the accuracy of inflection was significantly compromised, resulting in diminished overall grammaticality. A closer examination of errors revealed both omission and substitution errors. This observation is intriguing as typically only one error type dominates depending on the typology of the language (Grodzinsky, 1990). Not only the lexical diversity of verbs is reduced in IWA, but their morphology is poorer and less intricate. The average number of affixes per verb is reduced. This limits the utilization of complex morphological templates, as these rely on the combination of at least 2 overt affixes in Tagalog. This underscores the minimal-markedness of agrammatic verb production, recognized to be the core feature of inflectional deficits in agrammatism (Lapointe, 1985). Such constraints may reflect a rational avoidance strategy used by IWA, wherein they evade opportunities to produce morphologically complex forms in a bid to avoid potential grammatical complexities (Fedorenko et al., 2023; Paradis, 2001; Penke, 2008), supporting the notion that verb-related mechanisms potentially underlie the impoverished characteristics of agrammatic speech (Faroqi-Shah, 2023). In summary, our findings demonstrate the presence of morphological deficits in verbs within morphologically-rich languages such as Tagalog. Not only do our findings highlight the verbal deficits evident across different dimensions of verb richness, but also emphasize the need for the development of morphologically robust measures tailored for morphologically-rich languages.

O3-02: Aphasia and polysynthesis: Evidence from West Greenlandic, Johanne S. K. Nedergaard et al.

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Introduction: Polysynthetic languages are characterised by a highly complex morphology. Words often consists of multiple affixes, and sentences often consist of one complex word only:

West Greenlandic (Nedergaard et al., 2020)
(1) An-neru-ler-sin-neqar-sinnaa-sori-nngik-kaluar-pakka.
be.big-more-begin-cause-passive-can-think.that-not-however-IND.1.SG/3.PL
'I don't think they can be made any bigger however.'

This highly complex morphology makes polysynthetic languages interesting from the point of view of agrammatic aphasia studies where morphology is traditionally found to be strongly affected (e.g., De Villiers, 1974; Saffran et al., 1989). In the first study of agrammatic aphasia in a polysynthetic language – West Greenlandic (WG) – Nedergaard et al. (2020) found a surprising pattern of results. While individuals with aphasia (IWAs) displayed problems with syntax (transitivity, subordinate clauses, and valence-changed verbs), they produced inflectional and derivational morphology that was as complex as that of control participants. Importantly, they did not produce significantly more grammatical errors. The study was limited to only five IWAs and five matched control participants, however. The purpose of the present study is two-fold: 1) to provide a more complete picture of the characteristics of aphasia in WG; 2) to present a focused analysis of grammatical aberrations in WG aphasia. For these purposes, we collected speech and comprehension data as well as working memory measures from a larger group of IWAs. Specifically for the former purpose, we conducted a hierarchical cluster analysis based on a range of measures (see below). For the latter purpose, we are performing a detailed analysis of the grammatical aberrations as well as the morphosyntactic complexity found in the data.

Methods: We recruited thirty participants who were preliminarily identified as having aphasia, all native speakers of WG (18 female and 12 male; median age = 63.5; age range = 37-90 years). Initial identification of IWAs was provided by non-expert healthcare staff and subsequently qualified using a novel screening battery designed by the authors (including a speech-and-language pathologist and an expert on WG). IWAs' performance on the screening battery was compared to that of a control group (8 female and 4 male; median age = 67.5; age range = 52-89 years). The novel screening battery consisted of tests of three groups of language abilities: repetition, comprehension, and production. Repetition tests included simple speech motor movements, nonsense syllables at three speed levels, and increasingly complex linguistic strings. Comprehension tests included the Token Test (Bastiaanse et al., 2016) and single noun and verb identification from simple picture stimuli (partially adapted from the CAT; Swinburn et al., 2012). Production tests included single noun and verb naming from simple picture stimuli and three semispontaneous speech sections. Semispontaneous speech was elicited using an updated, colourised version of the Cookie Theft Picture (Berube et al., 2019), the Broken Window (Menn et al., 1998), and the question 'What was it like for you during the COVID-19 pandemic?' All speech samples and test results were collected in Greenland and Denmark in 2023 in collaboration with test assistants who were native speakers of WG. Test results, transcriptions, and translations were recorded and crosschecked by two of the authors independently.

Results: An overview of aphasia in West Greenlandic: We conducted the hierarchical cluster analysis using Euclidean distances between participants' vectors of measures (Kolde, 2019; R version 4.3.1.; R Core Team, 2023). The measures included both results of the screening battery and production measures from the semispontaneous speech samples (e.g., median length of utterance in characters and in words, proportion of unfinished words, pauses, and repetitions). All measures were normalised with 1 being the maximum possible score (within the sample) and 0 being the minimum possible score (within the sample) (see Figure 1).

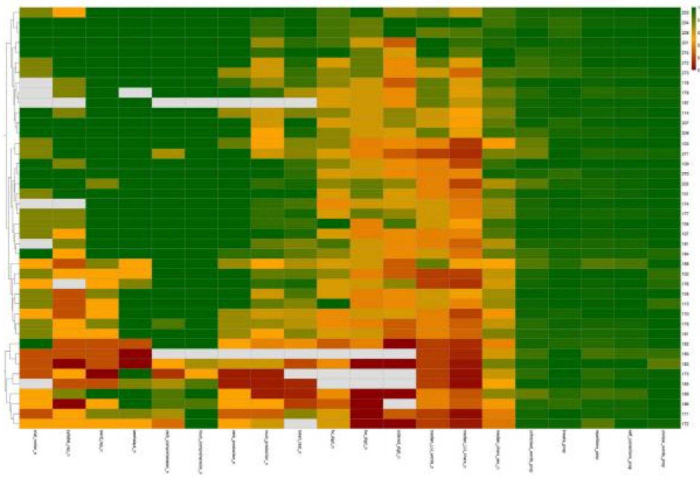

Figure 1. Participants clustered according to similarity on our measures. The x axis displays normalised measures, the right y axis displays participant IDs, and the left y axis displays the result of the hierarchical clustering. IDs starting with '1' were preliminarily screened as having aphasia while IDs starting with '2' were originally included as control participants. Grey cells indicate that it was not possible to record the measure, for example if the participant was blind.

The cluster analysis indicated that 13 participants had no detectable aphasia (including nine of the control participants), 20 participants had light to moderate aphasia (including three of the control participants), and nine participants had severe aphasia. These clusters corresponded to a qualitative assessment made by our speech and language pathologist. Participants in both groups with aphasia produced significantly shorter utterances both in terms of words per utterance and characters per utterance. They also spoke significantly slower measured in characters per second and produced significantly shorter words in terms of characters per word. Grammatical aberrations: We expect to find aberrations especially in individuals with relatively non-fluent aphasia. But based on Nedergaard et al. (2020), we also expect that aberrations will be relatively sparse. A preliminary inspection of the data revealed that the sentence production of participants with aphasia is both morphologically and syntactically less complex than that of the controls. For instance, when asked to describe a picture of a boy kicking a ball into a window, an IWA simply said arsarpoq 'he is playing football', while a control participant produced the following string: nukappiaraq arsarluni arsaq isimmikkamiuk igalaaq aserorlugu eqqorpaa 'as the boy is playing football, kicking the ball he hits the window breaking it'.

Discussion: Our cluster analysis of aphasia-related data challenges a more traditional understanding of aphasia types as being neatly distinguishable. Our analysis shows that not only is it hard to draw a strict dividing line between patient groups, it is not even always straightforward to distinguish control participants from patients. In fact, some of the persons initially identified as patients come out as controls in the detailed analysis, and highly surprisingly, some initially identified as controls actually pattern with the patients. If confirmed, our expected findings regarding grammatical aberrations raise the question why such aberrations are relatively sparse in WG. A possible explanation is that utterances often consist of single (though complex) words. This makes WG seemingly immune to syntactic impairment.

O3-03: Lexical vs. grammatical aspect markers in Chinese aphasia, Silvia Martínez Ferreiro et al.

Silvia Martínez Ferreiro[1], Linlin Sun[2], Kasper Boye[3]

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Introduction: Usage-based approaches to the study of language are currently casting new light on aphasic speech and the underlying causes of aphasia. One such approach is the ProGram theory of the grammatical-lexical distinction originally outlined in (Boye & Harder, 2012). According to this theory, the grammatical-lexical distinction is a conventionalized means for prioritizing parts of complex linguistic messages in terms of attentional prominence potential. Lexical items have the potential to be discourse primary (i.e. attentionally foregrounded). Consequently, they can be focalized, addressed in the subsequent discourse, and modified. In contrast, grammatical items are by convention discourse secondary (i.e. attentionally backgrounded) and cannot be focalized, addressed, or modified outside corrective contexts. (Boye & Harder, 2012; Boye et al., 2023; Martínez-Ferreiro et al., 2020). Elements classified as grammatical according to these tests, are expected to be more severely affected in cases of non-fluent aphasias (including agrammatism), whereas lexical elements are expected to be relatively spared. A growing number of cross-linguistic empirical studies on verbs, adverbs, prepositions and pronouns mostly in Indo-European languages support the ProGram theory. The aim of this presentation is to check the applicability of the theory in a typologically different language and a new set of linguistic elements, the Chinese aspect markers. In dealing with aspect markers, the study interferes with and provides new light on recent research on aspect in aphasia (Dragoy & Bastiaanse, 2013). Four aspect markers in Chinese were selected: the resultative marker wán, the progressive marker zài, the durative marker zhe, and the perfective marker le. These four markers were classified as grammatical or lexical based on native speakers' assessment of the results of applying the focus and addressability tests to them (Sun & Boye, 2019). Perfective le and durative zhe were classified as grammatical, as they cannot be focused or addressed independently. In contrast, progressive zài passed the focus test, and was therefore classified as lexical, and resultative wán passed all of the tests except for addressability through anaphoric reference, and was also classified as lexical. In the present study, we tested whether these classifications are significant for the description of agrammatic aphasic Mandarin Chinese speech. Specifically, we hypothesized that the two grammatical particles (perfective le and durative zhe) are underproduced in agrammatic speech, while the frequency of the lexical particles (progressive zài and resultative wán) does not differ from that found in non-brain-damaged speech.

Methods: Six native speakers of Mandarin Chinese (5 male; mean age: 51.17 y. o.; SD: 9.04) with chronic agrammatic aphasia, henceforth PWAs, participated in the study. Clinical diagnostics were established based on the results of the Boston Diagnostic Aphasia Examination (BDAE; Goodglass & Kaplan, 1983) and confirmed by speech and language therapists. Patients' performance was compared to that of a control group (NBDs), consisting of 5 right handed non-brain damaged speakers (4 female; mean age: 28; SD: 2). Participants were asked to describe three pictures adapted to Chinese speakers (Pak-Hin & Law, 2004). The stimuli included an adapted version of the Cookie Theft picture of the BDAE (Goodglass & Kaplan, 1983), the picnic scene in the Western Aphasia Battery (WAB; Kertesz, 1982), and the living room scene of the Cantonese version of the WAB (Yiu, 1992). Data analysis: All instances of the following (ambiguous and unambiguous) aspectual markers were included in the analysis: a) resultative wán, b) progressive zài, c) durative zhe, and d) perfective le. Self-corrections, hesitations, fillers (including interjections), and repetitions were excluded from the final analysis. Since the length of the speech samples varied across participants and groups (PWAs vs. NBDs), the aspect marker production of the two groups was compared in terms of proportions (number of markers relative to total number of words). Fisher's exact test was used for statistical analysis of proportion differences.

Results: The PWAs produced 1873 words, and the control group 2978 in total. Perfective le and durative zhe: The PWAs produced 6 unambiguous instances of perfective le and 3 unambiguous instances of durative zhe. In the control group, there were 35 unambiguous instances of perfective le and 79 unambiguous instances of durative zhe. The PWAs produced proportions (relative to words in total) of unambiguously durative zhe and unambiguously perfective le that were lower than the proportions produced by the control group. Statistical analysis showed that in both cases, the proportions were significantly lower ($p = .0011$, and $p < .00001$, respectively). Progressive zài and resultative wán: The PWAs produced a total of 23 unambiguous cases of the progressive zài, and only one instance of resultative wán. The NBDs produced a total of 26 unambiguous cases of progressive zài, and (just like the PWAs) only one instance of resultative wán. The low number of occurrences of wán may be due to the fact that wán is an optional form, whereas the other aspect markers included in the study form a paradigm that is obligatory in the context of verbs. The proportions of zài and wán produced by the PWAs did not differ significantly from those produced by the NBDs ($p = .2411$, and $p = 1$, respectively).

Discussion: The results confirm our hypotheses and show that a classification of Chinese aspectual markers based on the ProGram theory is significant for the description of agrammatic speech. The Chinese speakers with agrammatic aphasia included in this study underproduce the two markers classified as grammatical: perfective le and durative zhe. In contrast, their production of the markers classified as lexical, viz. progressive zài and resultative wán does not differ from the NBDs' production.

Poster session 4

P4-01: Cognitive Assessment Tools Used in the Evaluation of Primary Progressive Aphasia in Türkiye: A Scoping Review, Esra Başol et al.

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Introduction: Primary progressive aphasia (PPA) is a neurodegenerative condition caused by focal dementia that affects the language network leading to prominent aphasia symptoms (Mesulam, 2001). Although language is affected primarily, cognitive functions often gradually decline in PPA (see Coemans et al., 2022; Eikelboom et al., 2018). Recent studies have shown that cognitive functions including memory, executive functions, attention, learning, abstract thinking and visuospatial processing, can occur in PPA, even during the early stages of the disease (Macoir et al., 2017; Bettcher & Sturm, 2014). This cognitive decline is progressive but may vary depending on the PPA variant (de la Sablonniere et al., 2021; Eikelboom et al., 2018; Foxe et al., 2021). A detailed cognitive assessment might therefore render an important clinical marker for differential PPA diagnosis possible, separating it from other neurocognitive conditions (see Henry & Grasso, 2018). However, the availability of such cognitive assessment tools is not warranted in many other languages besides English, hindering assessment and diagnosis of PPA speaking those other languages. In the current review, we take the available cognitive assessment tools in Türkiye, where the proportion of the elderly population has increased compared to previous years and is predicted to do so in the years to come (Keskin & Koç, 2023). Our aims are (i) to review available cognitive assessment tools in Turkish and (ii) to evaluate the suitability of those tools for assessment of PPA across different cognitive domains.

Methods: We scanned relevant publications, including published theses, using Web of Science and Google Scholar databases. Searches were conducted in Turkish and English using the terms [''primer progresif afazi''] (primary progressive aphasia) and [''bilişsel değerlendirme''] (cognitive assessment) and additionally the terms [[''primary progressive aphasia''], [''cognitive asssessment''], [''cognitive evaluation''] [''Turkish'']] were used. The initial search yielded 2334 publications: 740 in Turkish and 1594 in English. We included studies that (1) were conducted in Türkiye, (2) included participants with a PPA diagnosis and (3) reported at least one cognitcoemanseikelbobettcheive assessment outcome measure. Having applied the above inclusion criteria, a total of 13 studies were included in the current systematic review.

Results: Out of 13 included studies, 7 were case reports, 3 were master's theses and 3 were research articles. These reviewed studies reported outcome measures from a total of 38 cognitive assessment tools (i.e., Executive Functions n=10, Language n=7, Visual Perceptual Skills n=7, Global Cognitive Assessment n=6, and Memory tasks n=8) see Table 1. The most commonly used tools included the Mini Mental State Examination (Güngen et al., 2002), Benton Face Recognition Test (Keskinkılıç, 2008) and Benton Line Orientation Test (Karakaş, 2006). 25 of those tools normed in the Turkish elderly population and adapted into Turkish, 1 was only normed in the Turkish children population and adapted into Turkish, 9 were simply translated without cultural/linguistic adaptation, and 3 were used in their original form.

Table 1. *Summary of the reviewed assessment tools (n = number of studies using the particular tool).*

Executive Functions	**Language**	**Visual Perception Skills**	**Global Cognitive Assessment**	**Memory**
Clock Drawing Tests (Brodaty, 1997; Goodglass et al., 1983; Shulman et al., 1986) (Cangöz et al., 2006) (Emek-Savaş et al., 2018) (n=5)	Boston Naming Test (Kaplan et al., 1983) (Soylu & Cangöz, 2018) (n=6)	Benton Face Recognition Test (Benton, 1980) (Keskinkılıç, 2008) (n=9)	Mini Mental Test Examination (Folstein, 1975) (Güngen et al., 2002) (n=8)	Wechsler Memory Scale-R Visual Reproduction Subtest (Weschler, 1987) (Karakaş et al., 1996) (n=3)
Verbal Fluency Tests (Tumaç, 1997) (Tunçer, 2011) (n=4)	Language Assessment Test for Aphasia (Toğram & Maviş, 2012) (n=4)	Benton Line Orientation Test (Benton et al., 1978) (Karakaş, 2006) (n=7)	Clinic Dementia Rating (Hughes et al., 1982) (n=2)	Wechsler Memory Scale-R Digit Span Subtest (Wechsler, 1987) (Karakaş et al., 1996) (n=3)
Trail Making Test (Reitan, 1955; 1993), (Cangöz et al., 2007) (n=4)	Gulhane Aphasia Test (Tanrıdağ, 1993) (n=3)	Verbal and Nonverbal Cancellation Test (Weintraub & Mesulam, 1985) (Karakaş & Başar, 1993) (n=4)	Wechsler Adult Intelligence Scales-3 Symbol Digit Modalities Test (Wechsler, 1997) (n=2)	Auditory Verbal Learning Test (Rey, 1964) (Öktem, 2011) (n=2)
Wechsler Adult Intelligence Scales-R Comprehension Subtest (Wechsler, 1981) (n=2)	Boston Diagnostic Aphasia Examination Cookie Theft Picture (Goodglass & Kaplan, 1983) (n=1)	Poppelreuter-Ghent's Overlapping Figures Test (Poppelreuter, 1917) (n=2)	Alzheimer's Disease Assessment Scale-Cognitive Subscale (Rosen et al., 1984) (Mavioğlu et al., 2006) (n=1)	Three words three shapes test (Weintraub et al., 2000) (Kudiaki & Aslan, 2007) (n=3)
Stroop Test (Stroop., 1935; Regard, 1981) (Karakaş et al., 1999) (n=3)	Boston Diagnostic Aphasia Examination (Goodglass & Kaplan, 1983) (n=1)	Letter Cancellation Test (n=2)	Global Deterioration Scale (Reisberg, 1982) (n=1)	Pyramids and Palm Trees Test (Howard and Patterson, 1992) (Bozdemir & Gürvit, 2022) (n=1)
Wechsler Adult Intelligence Scales-R Similarities Subtest (Wechsler, 1981) (n=2)	Western Aphasia Battery (Kertesz, 1982) (n=1)	Bender- Gestalt Test (Bender, 1938) (Yalın, 1980), Somer (1988) (n=3)	Montreal Cognitive Assessment (Nasreddine, 1996) (Selekler et al., 2010) (n=1)	Wechsler Memory Scale-R (Weschler, 1987) (Karakaş et al., 1996) (n=2)
Raven's Progressive Matrices (Raven, 1938) (Karakaş et al., 1996) (n=1)	Token Test (De Renzi & Faglioni, 1978) (Ergen, 2019) (n=1)	Navon Task (Navon, 1977) (n=2)		Recognition Memory Test (Warrington, 1984) (n=1)
The Proverb Scale (Aydın et al., 2022) (n=1)				Wechsler Memory Scale-R Logical Memory Subtest (Wechsler, 1987) (Karakaş et al., 1996) (n=2)
Porteus Maze Test (Porteus, 1959) (Toğrol, 1974) (n=1)				
Wisconsin Card Sorting Test (Heaton, 1981) (Karakaş et al., 1999) (n=1)				

Discussion: The aims of this review were to recapitulate on available cognitive assessment tools in Turkish and to evaluate the suitability of those tools for assessment of PPA across different cognitive domains. First, we should note that studies investigated cognitive assessment in PPA in Türkiye are scarce. Furthermore, not all cognitive domains were assessed in each study. Furthermore, since primary progressive aphasia is associated with various cognitive effects, it could be beneficial to conduct assessments encompassing all cognitive domains. Critically, several instruments were employed without being adapted into Turkish, i.e. only translated into Turkish or the original versions were used, casting doubt on the validity of the measured results. Also, 13 tests for which norm values were not determined, which may cause mild cognitive impairments to be overlooked. Therefore, a critical output from this review would be to stress importance of cultural/linguistic adaptation of assessment tools with psychometric norms. Especially, the language assessment tools used in studies are inadequate as they are not standardised for neurodegenerative conditions specifically. Standardized language evaluation instruments used to examine people with post-stroke aphasia may not indicate the existence of cognitive communication problems. Additionally, they are insufficient to differentiate individuals with PPA according to PPA types. Presently, very commonly used PPA tests including Sydney Language Battery Test (Janssen et al., 2022), Progressive Aphasia Language Scale (PALS; Leyton et al., 2011), Progressive Aphasia Severity Scale (PASS; Sapolsky et al., 2014) lack Turkish adaptations. This systematic review revealed that there is no specific approach to cognitive assessment tools to be used in the evaluation of PPA in Türkiye. Due to the wide range of cognitive involvement in PPA, a standardized assessment protocol that includes detailed assessment of all cognitive domains should be established.

P4-02: Building a Corpus of Gulf Arabic Aphasia, Samawiyah Ulde et al.

Samawiyah Ulde[1], Ahmed Bensaid[1], Eiman Mustafawi[1], Yusuf Albustanji[2], Saleh Shaalan[3], Emad Mohamed[4], Tariq Khwaileh[1]

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Introduction: The Arabic language is the largest living Semitic language, spoken in more than 22 countries. Although studies on the Arabic language have increased over the past few decades, there is still a dearth of research in some specialised fields. Speech and language impairments are among the Arabic language's least researched topics (Khwaileh & Hamouda, 2022). In particular, Arabic-speaking Persons with Aphasia (PwA) remain largely underserved. Databases like AphasiaBank (MacWhinney et al., 2011), and more recently DELAD (Lee et al, 2023), have been highly useful in the study of aphasia. These databases have also been invaluable in assisting speech and language therapists in training, assessment, and intervention design. While these databases are multilingual in nature, we hypothesized that a dedicated, language-specific database can capture detailed and nuanced insights and enable analysis specific to the morphosyntactic structure of the language. Currently, no such repository of Arabic exists. As such, the goal of the present study is to build a database or corpus of Arabic aphasia in the Gulf Arabic dialect.

Methods: Participants are Arabic-speaking persons with aphasia recruited with the aid of speech and language pathologists in Saudi Arabia and UAE. After obtaining consent, the following batteries and tasks are administered to the participants: The Gulf Arabic Comprehensive Aphasia Test (Khwaileh et al., 2016), Arabic Mini-Mental State (El-Hayeck et al., 2019), Montreal Cognitive Assessment Arabic (Rahman and Gaafary, 2009), narrative speech sample and picture description task, hearing screening. All tasks are audio recorded. Performance from test batteries and demographic information are additionally entered into excel sheets. The audio recordings are pre-processed to reduce background noise and increase speech clarity by using filtering and denoising algorithms. To maintain uniformity throughout the dataset, the audio levels are normalized using the software Audacity. The recordings are then manually transcribed with fidelity. Transcriptions are done in the Arabic script, International Phonetic Alphabet and in roman letters. Both target and intended utterances are included. Roman letter transcription conventions follow the CHAT format and are conducted using the CLAN program (MacWhinney, 2000). The CHAT transcription format includes adaptations specific to the Arabic script. The transcriptions undergo further manual annotation based on the CHAT format conventions (MacWhinney, 2000) to include the following: prosodic annotation (tone direction, stress, lengthening), error codes (phonological, semantic, neologisms, morphological, disfluencies, missing words), post codes (utterance level errors), gestures, fillers, and speech act codes. Finally, morphosyntactic annotations are automatically generated in CLAN. The final transcribed script is then checked by a second researcher to ensure accuracy.

Results: This project will result in the creation of a rich, detailed and large-scale corpus of speech and language data from Gulf Arabic that includes audio recordings, transcriptions, and associated metadata. Detailed manuals with the transcription and annotation guidelines are being prepared and will be made publicly available. This corpus itself will be publicly available and hosted on a dedicated website. It will also be open for data contributions from other researchers. It is expected to complement existing databases like AphasiaBank and DELAD. While data from this project may be hosted on these databases too, the purpose of the dedicated website is to add features that enable analysis in Arabic and the development of Artificial Intelligence models specific to its morphosyntactic features. A unique user interface will be created to enable ease of interaction with the corpus data and to facilitate further analysis.

Discussion: The corpus is expected to facilitate high-quality research worldwide in an understudied language and underserved population. It can significantly improve analysis of a heterogeneous population (Arabic-speaking PwA) and consequently our understanding of Arabic aphasia. And finally, it can aid in the development of more efficient Artificial Intelligence models for the purpose of assessment, diagnosis, syndrome classification and therapy.

P4-03: Dyslexia assessment battery targeting Slovenian-speaking children and adolescents, Christina Manouilidou et al.

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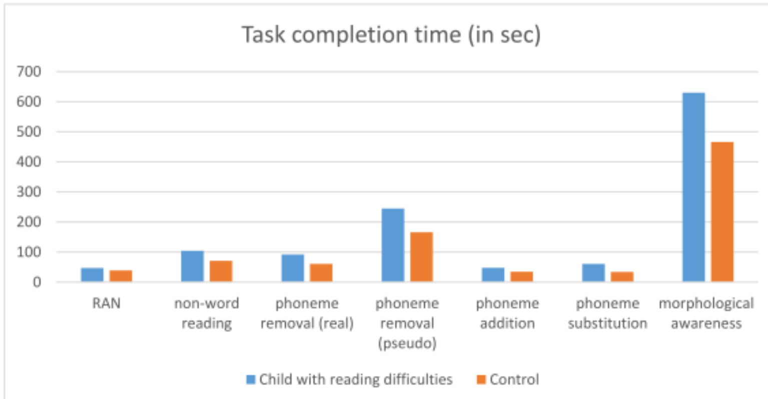
Introduction: The current study is part of the bigger project NEDIS, which stands for Neuromodulation and Behavioral approaches for the improvement of dyslexia symptoms in Slovenian-speaking children and adolescents. Developmental dyslexia (DD) is one of the most common learning disabilities characterized by a variety of symptoms typically affecting reading and spelling. Throughout the years, various theories have been proposed trying to explain the symptoms and understand the underlying deficit. The most prevailing among them is that dyslexia results from a phonological coding deficit (Ramus et al., 2006). This means that individuals with dyslexia have difficulties with decoding and identifying phonological properties of speech input, as well as accessing phonological representations in the brain (Shaywitz & Shaywitz, 2005). When assessing dyslexia three types of variables are considered reading-, writing- and cognitive-related variables. The first two groups include word, pseudoword and text reading, spelling, phonological awareness, orthographic knowledge, phonological memory, rapid automatized naming, and vocabulary. The cognitive variables include verbal and non-verbal IQ, working memory, abstraction and speed of processing (Reis et. al., 2020). People with dyslexia of different ages and native languages have been found impaired in all domains except for IQ tests. Moreover, other linguistic competences tackling various aspects of language such as morphological, syntactic, lexical and pragmatic competence (Landerl et al, 2013) have also been assessed. Studies highlight delayed morphosyntactic skills and vocabulary in pre-school children at genetic risk of dyslexia (Koster et al., 2005). Most studies agree that children with DD experience a delay in vocabulary learning as well (Cappelli, 2022) and have poor vocabulary skills compared to their peers. Moreover, they have been shown to display difficulties in segmenting morphologically complex words (e.g., breaking a word like sing-er into sing + er) and in detecting the stem of multimorphemic words, which consequently leads to difficulties in understanding compositional meaning (Casalis et al., 2004). The abstract focuses on the identification of specific linguistic problems in Slovenian-speaking children and adolescents, observing the potential effect of varying orthographic depth in reading and spelling. Slovenian has a shallow orthography. Every sound is written with a single letter (there are no two or three letter clusters to represent a single sound) and most phonemes have a fixed letter equivalent. However, there are some phonemes that are written with the same letter, so there is not a complete grapheme-phoneme correspondence. For example, the sound /u/ can be written either as 'u' or as 'v' or as 'l'. The study aims to identify whether this kind of variation will present problems for populations with dyslexia.

Methods: We performed the following tasks: 1. Reading assessment: timed text reading (reading speed, accuracy); 2. Phonological awareness: nonword reading; phoneme removal in words (e.g. dlan 'palm' without /l/ -> dan 'day' and in pseudowords (e.g. *glekev without /l/-> *gekev); phoneme addition (osa 'wasp' add /k/ -> kosa 'skythe'; phoneme substitution (naga 'naked' – žoga 'ball' exchange /n/ and /ž/ -> žaga 'saw', noga 'foot'; 3. Morphological awareness: formation of diminutives, pluralization, formation of agentive and process nouns; 4. Lexical Retrieval (Rapid Automatized Naming - RAN): picture naming; 5. Spelling (words and non-words); 6. Working memory; 7. Semantic fluency. Up to now, we have recruited 2 participants (boy and girl, age 12) one with reading difficulties (RD) but with no confirmed diagnosis (girl) and one without. By the time of the conference, we will have assessed at least 10 more participants in each group (dyslexia vs. controls).

Results: Considerable differences between the two participants were observed in all tasks assessed, with the greatest between them being in timed tasks. Reading assessment: in the time frame of 30 seconds, the child with RD read 54 words while the control child read 88 words. More striking are the differences in time completion of lexical retrieval tasks (RAN) as well as all components of phonological and morphological awareness tasks (see graph 1). Specifically, for RAN the child with RD needed 47sec while the control child needed 39sec. For phonological awareness tasks, the child with RD needed 550sec as opposed to the control child who needed 367sec to complete the whole battery of phonological awareness assessment. Finally, for morphological awareness tasks, the child with RD needed a total of 630sec to complete the tasks as opposed to the control child who needed a total of 466sec. When it comes to numbers of errors, the greatest difficulty between the two children is in pseudoword reading, as the child with RD made 10 errors when reading 52 pseudowords, while the control child made no errors. Similarly, the child with RD made 6 errors in pseudoword phoneme removal (out of 20 cases) while the control child made only one error.



Discussion: Preliminary results indicate that there is indeed a difference between the child with RD and the one without RD, something which probably holds for the general population. Two domains appear considerably impaired, ie. phonological awareness as well as morphological awareness. While the number of errors is suggestive of the impairment, the biggest difference between the two participants lies in the processing time in performing these two groups of tasks, suggesting a processing delay and a difficulty engaging in the process of decomposing words, either at phonological or morphological level. This is also boosted by the fact that most errors the child with RD made concerned pseudowords, which are not listed in the mental lexicon and their processing requires some sort of segmentation. Finally, the difference between the two participants in RAN, even though not very robust, also points to this direction. The current preliminary results are in line with the phonological theory part of which is also the double deficit hypothesis (Wolf & Bowers, 1999) which postulates that phonological awareness together with RAN represent the two main and most reliable cognitive markers of DD regardless of age which when combined with some other cognitive aspects such as working memory and verbal skills, they best predict reading speed, even in highly transparent orthographies (Kelić, 2017).

P4-04: Practices for assessment of cognition and language of neurodegenerative language impairments in the Nordic countries, Ingeborg Sophie Ribu et al.

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Introduction: Assessment of neurodegenerative language impairments require a multidisciplinary approach, taking biomedical, neuropsychological, and linguistic aspects into account. Recent studies show that persons with neurodegenerative language impairments are not always referred to speech and language therapists (SLT), despite the fact that there is a growing evidence that speech and language therapy can be beneficial for this population (Volkmer et al., 2020; Wauters et al., 2023). The aim of this study is to explore the assessment practices of neurodegenerative language impairments between different groups of health care professionals in the Nordic countries (Iceland, Norway, Sweden, Finland, and Denmark).

Methods: Two online surveys were distributed among SLTs, psychologists, medical doctors, and other health care professionals in the Nordic countries. The first survey was distributed in Norway, and the second survey, with similar, but culturally adapted questions, was sent out to professionals in Iceland, Sweden, Finland and Denmark. The questions were related to experience with patients with neurodegenerative language impairments, cognitive and linguistic assessment, and referral to other health care providers. The results from the two surveys were combined for analysis. We present the data from the surveys using descriptive statistics. Quantitative data is analyzed through frequency distributions and percentages. A network analysis was performed to investigate referral patterns between professions.

Results: Responses from 180 respondents were analyzed (Norway n=95, Finland, n=39, Denmark n=20, Sweden n=19, Iceland n=7). Most of the respondents worked in hospitals and reported working with several different patient populations with neurodegenerative language impairments. The results show that there are many similarities in both assessment and referral practices between the countries, but also some differences. In all countries, SLTs use a range of different language assessment batteries compared to the other professions, but rarely perform any cognitive assessment of their patients. (Neuro)psychologists and medical doctors, on the other hand, use a wider range of cognitive screening and assessment tools. In Norway, the mostly used tools for cognitive assessment are the Mini Mental State Examination (MMSE) and the Montreal Cognitive Assessment (MoCa), whereas in the other countries the Wechsler Adult Intelligence Scale (WAIS), the Wechsler Abbreviated Scale of Intelligence (WASI) and the Wechsler Memory Scale (WMS) are more frequently used. Respondents from Norway, Finland and Denmark indicate that there are national cognitive screening tools available, but these are rarely used in Denmark (n=1) and Finland (n=2) compared to Norway (n=39). None of the respondents from Sweden or Iceland indicate that they use any screening tools that are recommended nationally. Approximately half of the medical doctors and neuropsychologists refer their patients to SLTs, and most SLTs report that they refer their patients to other SLTs or back to medical doctors and (neuro)psychologists.

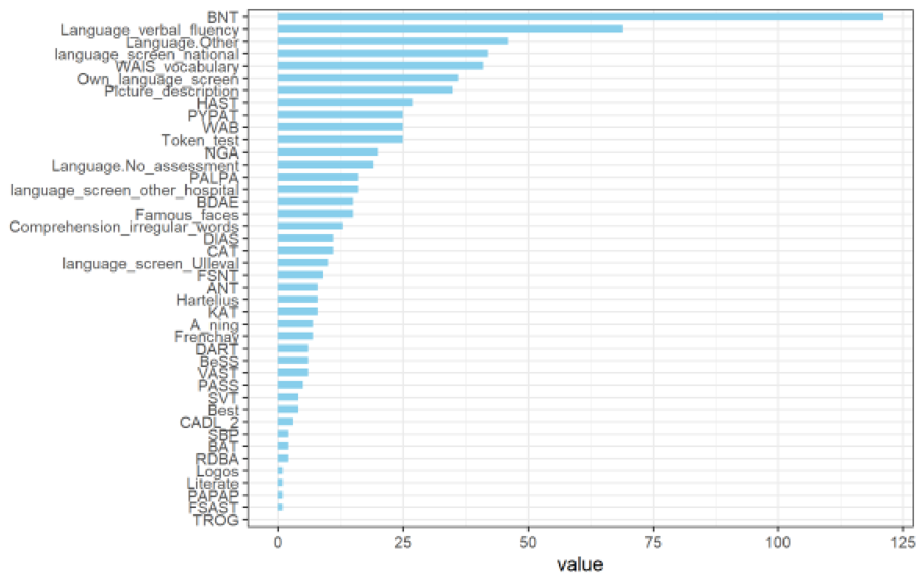

Figure 1: Overview of the language assessment batteries reported by the respondents

Discussion: The results from the two surveys show that there are both similarities and differences in assessment practices of cognitive and linguistic screening of neurodegenerative language impairments among professionals and between countries in the Nordics. The high rate of referrals to SLTs may explain the more extensive language screening in the SLT group compared to the other professions; patients are referred to SLTs after a neuropsychological assessment by a medical doctor or neuropsychologist may receive a more thorough language assessment by the SLTs. Our results indicate that there are nationally recommended assessment batteries for neurodegenerative diseases in three out of five countries, however, these are not often used in the assessment of patients with language impairments in Denmark and Finland. These national guidelines may not be specific enough for detecting language impairments. This paper highlights the importance of multidisciplinary assessment and treatment approach for patients with neurodegenerative language impairments. The results from the current survey also support a continued need for health care professionals to refer patients to other professionals for a comprehensive assessment and treatment of neurodegenerative language impairments.

P4-05: Assessing Verb Retrieval in Urdu-Speaking People with Aphasia: A Spontaneous Speech Analysis, Ayesha Areej et al.

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Introduction: Spontaneous speech production in people with aphasia (PWA) is often characterized by reduced diversity of verbs, omissions of inflections and function words, resulting in agrammatism (Bastiaanse & Thompson, 2003; Bastiaanse & Jonkers, 1998). The characteristics of agrammatic spontaneous speech, however, are largely biased toward "Western" languages (Menn et al., 1990). Opposing patterns including normal verb production and excessive inflections in Standard Indonesian and relatively intact verb inflection in Turkish have been reported (Arslan et al., 2016; Anjarningsih et al., 2012). Verb retrieval impairments remain undiscovered in languages that present different psycholinguistic characteristics of verbs, for example, in South Asian languages including Urdu (Ahmed, 2010; Butt, 2010). In this study, we focus on verb retrieval, emphasizing on light verbs, in spontaneous speech elicited from Urdu-speaking PWA and healthy controls. Light verbs in Urdu have complex semantic-syntactic structures and share a tight connection to the main verb in the verb complex (V-V, main verb-light verb, complex). Owing to these characteristics, light verbs are proposed as a distinct and important class of verbs that share the same lexical entry to the main verbs in Urdu. Thus, challenging the conventional and unspecified notion of light verbs being semantically depleted verbs or a class of auxiliaries (Butt & Lahiri, 2013; Ahmed, 2010). Unlike previous studies where light verbs have been analyzed for their semantic simplicity in comparison to heavy verbs (Barde et al., 2006; Gordon et al., 2003; Park et al., 2023), we analyze them in the V-V complex considering their impact and relation to the main verbs. We intend to explore: What are the impairment patterns of verbs in Urdu-speaking PWA in terms of number, diversity, and correctness of verbs in general and light verbs, specifically? How do specific morphosyntactic and semantic characteristics of verbs in general and in the V-V complex predicate manifest?

Methods: Spontaneous speech data collection from ten Urdu-speaking PWA and their healthy controls is currently in process. The data of 8 healthy controls (4 males, 4 females) has been recorded with a mean age of 51.37 years (SD = 9.00). PWA were contacted through the neurology departments of private hospitals in Lahore, Pakistan. Detailed demographic information on PWA and the control group will be provided upon completion of data collection. The elicitation method includes a semi-spontaneous interview, a picture description task, and a visually aided storytelling task. For the semi-spontaneous interview, the participants are asked the following questions: Can you tell me about your family? Can you tell me about your daily routine or job? Can you tell me a past event of your life (for controls)? Can you tell me how your speech problem started (for PWA)? For the picture description, participants are asked to describe the picture from the Comprehensive Aphasia Test (CAT; Swinburn et al., 2004). Lastly, for the visually aided storytelling task, participants are asked to tell "The Thirsty Crow" story, a well-known local tale from Pakistan (Figure 1).

Figure 1.

Images digitally drawn by an artist from Lahore

Language usage and history of bilingualism of the participants are assessed using the Bilingual Aphasia Test (BAT; Paradis, 1987). We audio-record the spontaneous speech data for transcription and extract 300 words for further analyses. The speech data will be analyzed for the number of V-V complexes, the number and diversity of verbs, the type-token ratio for nouns and verbs (lexical), and tense and gender agreement in general and in V-V complex.

Results: In the data from the so-far recorded participants, we observe a quite frequent usage of light verbs and the V-V complex. For example, in the analysis of one participant (Female, Age = 57 years), we found 22 V-V complexes and 6 different light verbs. We also observe polysemous usage of the same verbs based on complex semantic needs. For example, the verb jana (to go) was used as the lexical verb for its literal meaning, and as a light verb to give a sense of suddenness and completion to the main verb, see (2). For some examples of the V-V constructions used by the control participants, see (1) and (2).

1. *A* *rahi*
   come.$_{INF}$ live.$_{PRES\_PROG.FEM}$ (light verb)
   "(she is) coming"
2. *Ho* *jata*
   Happen.$_{INF}$ go.$_{PRES\_MAS}$ (light verb)
   "(It) happens"

The results will be formalized and updated after obtaining the data from the PWA. We expect reduced diversity of verbs and V-V complexes in PWA as compared to healthy controls. If the proposed account of the tight connection and the shared lexical entry of the main verbs and light verbs (Butt, 2010) is correct, the number of light verbs in comparison to main verbs should not be lower in PWA as compared to healthy controls. Moreover, we expect omitted inflections of verbs. However, we expect the inflections to be intact if they occur in a V-V complex given the structural strictness of the predicate.

Discussion: The control data suggests that light verbs are highly frequent in Urdu spontaneous speech. This study provides a deeper insight into the linguistic patterns of light verbs in post-stroke aphasia. Based on the richness of morphosyntactic and semantic information that is carried within the V-V structure, we expect to have reduced usage by the PWA as compared to healthy controls. If this is the case, we would assume that the amount of information carried by a verb determines its retrieval, unless we find some unexpected characteristics like the omission of light verbs or inflected main verb in the V-V complex. This research can be the first step toward fundamental future research on the status of light verbs, their impairment patterns in the N-V (noun-verb) complex along with the V-V complex, and the neural mechanisms behind this complex predicate production. Urdu is widely spoken bilingually in Pakistan, mostly as a second language. We may also find different characteristics of multilingual aphasia in verb impairments in Urdu-speaking PWA.

P4-06: Slovenian adaptation of Diagnostic Instrument for Mild Aphasia (DIMA-SI): a pilot study in a digital and pen-and-paper version, Barbara Vogrincic et al.

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Introduction: Mild aphasia can profoundly impact patients' quality of life, resulting in reduced social engagement, challenges in daily activities, including limitations in participating or returning to the work environment. Consequently, the recognition, evaluation, and effective treatment of mild aphasia pose significant challenges to the medical care (Brownsett et al., 2019; Cavanaugh et al., 2020). The Diagnostic Instrument for Mild Aphasia (DIMA) (Satoer et al., 2022) is the first standardized and validated tool designed for evaluating neurological patients with mild aphasia, with adaptations available in various languages (Clément et al., 2022). It consists of tasks at the levels of phonology (repetition), semantics (odd-picture-out) and morpho-syntax (sentence completion) (Satoer et al., 2022). Notably, in Slovenia up to now, a standardized diagnostic tool specifically tailored for mild aphasia has yet to be established. In the light of this gap, the present study pursued two objectives: firstly, to translate, adapt, and conduct a pilot study of the DIMA-SI in both digital and pen-and-paper versions; and secondly, to compare the performance scores of participants between both versions.

Methods: In the development of DIMA-Sl, item selection was conducted with careful consideration of psycholinguistic variables, such as word frequency, word and sentence length, and cultural differences. Subtest from the pen-and-paper version were presented orally (phonology (total score = 70) and morpho-syntax (total score = 14) and via PowerPoint (semantics (total score = 15)). The digital version was programmed in Pen Controller for IBEX (all subtests) (Zehr et al., 2018). 60 healthy Slovenian native speakers (MMSE>25), balanced in age (22-86 years (m = 53.40, SD = 19.51)), sex (F=29), and education (≤ high school = 30; > high school = 30) were recruited. Half of the participants (F = 16; age range = 22-86, m = 53.40, SD = 21.43) were tested with the pen-and-paper version and other half (F=13) with the digital version (N = 30; age range = 25 - 81, m = 49.50, SD = 17.52). The Wilcoxon rank sum test was used to compare the groups with non-normally distributed data.

Results: Repetition: The mean of the total score of all phonological tasks in the pen-and-paper version was 64.0 (91.43 %) (SD = 4.21) and in the digital version the mean was 63.1 (90.14 %) (SD = 5.10). There was no significant difference between the versions (p = 0.567, r = 0.0748). Odd-picture-out: The mean of the semantic task in the pen-and-paper version was 11.8 (78.67 %) (SD = 2.15) and in the digital version the mean was 13.3 (88.67 %) (SD = 1.91). There was a significant difference between the versions (p = 0.005, r = 0.365). Post hoc analysis showed that the participants with higher education scored significantly better on the digital version than the pen-and-paper version (p= 0.0127, r = 0.451). Sentence completion: The mean of the morpho-syntactic task in the pen-and-paper version was 11.6 (82.86 %) (SD = 1.63) and in the digital version the mean was 12.4 (88.57 %) (SD = 1.59). There was a significant difference between the versions (p = 0.0245, r = 0.291). Post hoc analysis showed that the participants with higher education scored significantly better on the digital version than the pen-and-paper version (p= 0.0011, r = 0.427). Total score: The mean DIMA-SI total score in the pen-and-paper version was 87.4 (88.28 %) (SD = 6.26) and the mean in the digital version was 88.8 (89.70 %) (SD = 7.75). There was no significant difference between the versions (p = 0.146, r = 0.188).

Discussion: We successfully developed a pen-and-paper and digital version of DIMA-Sl taking into account cultural characteristics and linguistic variables from the Slovenian language. Pilot results showed that both versions were comparable with high accuracy scores. However, highly educated participants performed better than lower educated participants in the odd-picture-out and the sentence completion tasks, which is in line with the original study (Satoer et al., 2022). The next step involves enlarging our data set in healthy participants and validating it in a cohort of neurological patients. We expect that both versions have a high potential for clinical implementation, however, clinicians should carefully choose the appropriate version based on the clinical setting.

P4-07: Direct Object Clitic Production in Agrammatic Aphasia: Insights from Cypriot Greek, Stella Tsigka et al.

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Introduction: There is cross-linguistic evidence that persons with agrammatic aphasia (PWAAs) are impaired in the production of direct object clitics (e.g., for Spanish: Sanchez-Alonso et al., 2011; Martínez-Ferreiro, 2010; for Italian: Rossi, 2007, 2015; for French: Nespoulous et al., 1988; for Greek: Stavrakaki & Kouvava, 2003). This deficit has been attributed to the fact that clitic pronouns involve discourse linking, which taxes the processing system of PWAAs (e.g., Sanchez-Alonso et al., 2011; Martínez-Ferreiro et al., 2017) Another source of difficulty for clitic production appears to be overt syntactic movement (Rossi, 2015), which has been argued to be challenging for PWAAs (Bastiaanse & van Zonneveld, 2005). The present study investigates the clitic production abilities of PWAAs whose first and dominant language (L1) is Cypriot Greek (CG), an understudied language variety, and second language (L2) is Standard Greek (SG). Specifically, we focus on the production of direct object clitics. According to Terzi (1999), the postverbal clitic position in CG is a consequence of the overt movement of the verb to the head position of the Mood Phrase, which occurs only in syntactic environments devoid of functional heads like subjunctive mood markers and negative markers. Syntactic environments in which clitics appear preverbally in CG involve no overt syntactic movement (Terzi, 1999).

Methods: We administered a sentence completion task tapping production of direct object clitics to seven CG-speaking PWAAs whose L2 was SG, as well as to seven neurotypical controls matched for age, years of formal education and language background. The task, conducted in CG, included structures requiring preverbal clitic placement (preverbal condition) and structures necessitating postverbal clitic placement (postverbal condition). In both conditions, participants were presented with incomplete two-clause sentences cross-modally and were instructed to complete them by producing the missing verb phrase. Quantitative analyses included between- and within-group comparisons (using Mann-Whitney U test and Wilcoxon test, respectively), as well as within-participant comparisons (using Fisher's exact test). Qualitative analysis involved error analysis.

Results: The group of PWAAs fared worse than the control group, which performed at ceiling. All seven PWAAs exhibited impairment in clitic production, with overall accuracy ranging from 7% to 73%. Moreover, the PWAAs had better performance in the preverbal condition (50% correct) than in the postverbal condition (32% correct). At the individual level, PWAA1 and PWAA3 performed better in the preverbal than in the postverbal condition, while PWAA7 exhibited the opposite pattern. The other PWAAs did not exhibit dissociations between the two conditions. The most prevalent error types were clitic omissions in both conditions, along with clitic misplacement errors in the postverbal condition (i.e., clitics were placed preverbally rather than postverbally).

Discussion: The finding that CG-speaking PWAAs performed worse than neurotypical control participants on direct object clitic production is consistent with previous cross-linguistic studies on clitic production in agrammatic aphasia (e.g., Martínez-Ferreiro, 2010; Nespoulous et al., 1988; Rossi, 2007, 2015; Sanchez-Alonso et al., 2011; Stavrakaki & Kouvava, 2003). This impairment could be partly attributed to the fact that object clitic production involves discourse linking, which is demanding in terms of processing resources (Martínez-Ferreiro et al., 2017 ; Sanchez-Alonso et al., 2011). The dissociation between the preverbal and postverbal conditions at the group level, with the former eliciting better performance than the latter, aligns with the Derived Order Problem Hypothesis (Bastiaanse & Van Zonneveld, 2005), which posits that PWAAs have difficulty producing "derived orders", which involve overt syntactic movement. The frequent occurrence of clitic omission errors is consistent with many studies showing that frequent omission and/or substitution of functional elements – including clitics – is common in agrammatic speech (e.g., Miceli & Mazzucchi, 1990; Miceli, Silveri, Romani & Caramazza, 1989; Stavrakaki & Kouvava, 2003). The frequent instances of clitic misplacement errors, predominantly observed in the postverbal condition, suggests that CG-speaking PWAAs often switched to SG and relied on its grammar to circumvent their difficulty in producing “derived orders”. This inference arises from the fact that this error type violates clitic positioning restrictions in CG but not in SG (Terzi, 1999). In bidialectal speakers, the grammars of the two proximal varieties are always activated and switching between them is common (Fotiou & Grohmann, 2022; Tsiplakou, 2014). Therefore, the strategy of CG-speaking PWAAs to resort to the SG grammar results in sentences that are acceptable in the language community of Cypriot Greeks. Furthermore, this strategy results in instances of language switching/mixing that is not pathological, as it does not lead to communication breakdown (Fyndanis & Lehtonen, 2022). Therefore, the CG-speaking PWAAs’ performance was largely grammar constrained. Additional evidence for this is provided by the fact that they rarely made erroneous postverbal clitic placement as this would violate both the CG grammar and the SG grammar.

P4-08: Time Reference and Aspect in Greek: Evidence from stroke-induced aphasia and healthy aging, Marielena Soilemezidi et al.

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Introduction: In several languages, persons with aphasia (PWA) have been found to be more impaired in past reference than in non-past reference (e.g., Bastiaanse, 2013; Cordonier et al., 2024). Bastiaanse et al. (2011) accounted for this dissociation by proposing that only past reference involves discourse-linking, which taxes PWA's processing system. However, time reference may interact with aspect. In a study on Russian aphasia, Dragoy and Bastiaanse (2013) proposed that there are prototypical associations between past reference and perfective aspect, and between non-past reference and imperfective aspect. Nevertheless, the evidence for the above dissociations and associations is inconclusive. For example, Fyndanis et al. (2018), Nerantzini et al. (2020) and Koukoulioti and Bastiaanse (2020) reported that, in production, there was no significant difference between past and future reference in three groups of Greek-speaking PWA. Moreover, Fyndanis and Themistocleous (2019) analyzed the production data of 8 Greek-speaking PWA and 103 Greek-speaking neurotypical adults aged between 22 and 86 years and found no evidence for Dragoy and Bastiaanse's (2013) proposal that there are associations between past reference and perfective aspect, and between non-past reference and imperfective aspect. The present study follows up on the above-mentioned studies on Greek aphasia and healthy aging and addresses (a) whether past and future reference dissociate in PWA and neurotypical adults (as would be expected by Bastiaanse et al., 2011, and Bastiaanse, 2013), and (b) whether associations emerge between past reference and perfective aspect, and between future reference and imperfective aspect (as would be expected by Dragoy and Bastiaanse, 2013).

Methods: We administered a sentence completion task testing production of time reference and aspect to (i) 10 Greek-speaking PWA, (ii) an age- and education-matched group of healthy control participants (N=10), and (iii) a large cohort of neurotypical Greek-speaking adults (N=200), aged 19–80 years. We crossed time reference (past, future) and aspect (perfective, imperfective), which resulted in four time reference subconditions (past reference within a perfective aspect context [past perfective], past reference within an imperfective aspect context [past imperfective], future reference within a perfective aspect context [future perfective], and future reference within an imperfective aspect context [future imperfective]) and four aspect subconditions (perfective aspect within a past reference context [perfective past], imperfective aspect within a past reference context [imperfective past], perfective aspect within a future reference context [perfective future], and imperfective aspect within a future reference context [imperfective future]). We analyzed the data by fitting generalized linear mixed-effects models.

Results: The group of PWA fared worse than the control group on both time reference and aspect. There were no significant differences between past and future reference in the group of PWA and in the large group of neurotypical adult participants. Moreover, in either group, there were no dissociations between (1) past perfective and past imperfective, (2) future perfective and future imperfective, and (3) perfective future and imperfective future. Lastly, while the neurotypical participants performed worse on perfective past than on imperfective past, the PWA exhibited no dissociation between the two.

Discussion: Results contradict previous findings that PWA are more impaired in past reference than in non-past reference (e.g., Bastiaanse, 2013; Bastiaanse et al., 2011; Cordonier et al., 2024). That past reference is not harder than future reference can also be seen from the results of 200 Greek-speaking neurotypical adults. Furthermore, consistent with Fyndanis and Themistocleous (2019), the present results call into question the cross-linguistic validity of Dragoy and Bastiaanse's (2013) proposal that there are prototypical associations between past reference and perfective aspect, and between non-past reference and imperfective aspect.