

Effectiveness of a teletherapy-based phonological short-term memory training in the lvPPA

Guillaume Duboisdindien^{1,2}, Monica Lavoie^{1,3}, Robert Jr Laforce^{1,3,4}, Joël Macoir^{4,5}

1 Chaire de recherche sur les Aphasies Primaires Progressives - Fondation de la Famille Lemaire, Université Laval, Québec (QC), Canada
2 Département de psychologie et de neuropsychologie de l'adulte, Université de Liège, Belgium
3 Clinique Interdisciplinaire de Mémoire, Département des Sciences Neurologiques du CHU de Québec, Québec (QC), Canada
4 Faculté de médecine, Université Laval, Québec (QC), Canada
5 Centre de recherche CERVO, Québec (QC), Canada



WHY DOES IT MATTER ?

The clinical problem

lvPPA
↓
pSTM impairment
↓
Poor repetition
↓
Communication difficulties

Research gap

- ✗ Lexico-semantic interventions
- ✗ General cognitive training
- ✗ Neuromodulation

✓ A first step toward teletherapy specifically targeting pSTM in lvPPA

STUDY DESIGN

T1 Baseline 1
T2 Baseline 2
Intervention 15 sessions – 5 weeks
3 sessions/week
T3 Post-treatment
T4 Follow-up 4 weeks
T5 Follow-up 3 months

n = 5, biomarker-confirmed lvPPA

T1 + T2 → Baseline level (≥80% accuracy) → Training up to +3 levels

Teletherapy delivery

Immediate & delayed repetition of words + pseudowords

Assessment Battery (tests & tools) : Global cognition: MoCA, Processing speed : WAIS IV (Coding), Digit span : WAIS IV (Forward & Backward), Visual memory : DMS-48 (immediate + delayed recognition), Language : BECLA Battery I Spontaneous speech (narrative and semantic association), Picture naming (TDQ-60 + BECLA), Rhyme judgement on pictures, Communication : ECVB (global score & subscales : expression, conversation, phrase, social relation, satisfaction)

Primary aim: Evaluate the feasibility and efficacy of a teletherapy intervention specifically targeting pSTM in lvPPA.

STIMULI (validated lexical material)

Lexical stimuli
Created from the Lexique 3.83 database (frequency 0.5–2.94 per million words)

	N items
Trained words (List A)	120
Untrained words (List B)	120
Trained pseudowords (List A)	70
Untrained pseudowords (List B)	70

TOTAL STIMULI DEVELOPED (2 to 8 syllables) **380**

Stimuli characteristics

- 80% simple syllables (CV, CVC)
- Pseudowords matched on structure
- Matched across syllabic level for phoneme frequency
- Balanced difficulty across sessions
- Scored for phonological errors (phoneme substitution, omission, addition, distortion)

Repetition training items used in the intervention

- 20 words (10 immediate + 10 delayed)
- 20 pseudowords (10 immediate + 10 delayed)

Total = 40 items

MAIN RESULTS

1 SPECIFIC EFFECTS ON TRAINED ITEMS

Predicted change in % correct repetition (mixed-effects models)
Relative to Baseline 1 (T1)

Trained words

Time Point	Immediate repetition	Delayed repetition
T1	0	0
T2	0	0
T3	+25.8***	+21.6**
T4	+24.8***	+24.4***
T5	+24.0***	+23.2**

Trained pseudowords

Time Point	Immediate repetition	Delayed repetition
T1	0	0
T2	-1.2	0
T3	+32.5***	+23.6***
T4	+27.7***	+19.6***
T5	+19.2**	+17.6**

*** $p < .001$ ** $p < .01$ * $p < .05$

2 GENERALIZATION TO UNTRAINED ITEMS

Predicted change in % correct repetition (mixed-effects models)
Relative to Baseline 1 (T1)

Immediate repetition (untrained items)

Time Point	Words	Pseudowords
T1	0	0
T2	+1.4	-1.7
T3	+27.3**	+21.6*
T4	+23.3*	+16.8
T5	+20.8	+12.4

Delayed repetition (untrained items)

Time Point	Words	Pseudowords
T1	0	0
T2	+0.8	-0.8
T3	+19.2*	+27.8**
T4	+20.4*	+22.9*
T5	+20.3*	+21.2*

*** $p < .001$ ** $p < .01$ * $p < .05$

3 TRANSFER TO FUNCTIONAL LANGUAGE TASKS

Picture naming (phonological errors)

Predicted change in mean number of phonological errors

Time Point	Mean number of errors
T1	0
T3	-3.4*
T4	-2.2
T5	+1.0

⌚ **Marginal reduction in phonological errors.**
Main effect of TIME: $F(3,12) = 3.31$, $p = .057$
Immediate improvement at post-treatment only.

Connected speech (phonological errors)

Predicted change in mean number of phonological errors

Time Point	Mean number of errors
T1	0
T3	-1.6
T4	-1.0
T5	0

✗ **No significant reduction in phonological errors.**
Main effect of TIME: $F(3,12) = 1.63$, $p = .234$

Interpretation: Transfer to functional language tasks remained limited despite robust gains in repetition. Connected speech relies on multiple processes beyond pSTM (lexical retrieval, semantics, executive functions, discourse planning, etc.).

4 INDIVIDUAL VARIABILITY IN RESPONSE

% correct repetition (trained items: words and pseudowords combined)

Heterogeneous response trajectories across participants, ranging from strong responders to more variable or limited responders.

Individual factors accounted for a substantial proportion of the variance across dependent variables (ICC range: .87–.94).

Early, personalized phonological training targeting pSTM via teletherapy is feasible and may provide meaningful benefits in lvPPA. Delayed repetition may promote internal rehearsal processes and facilitate generalization.

! Note. Values are predicted from linear mixed-effects models reported in the article.

CLINICAL IMPLICATIONS

- ✓ Mechanism-based teletherapy targeting pSTM is feasible in lvPPA.
- ✓ Early and personalized interventions may maximize benefits.
- ✓ Interindividual variability highlights the need for tailored approaches.

FUTURE DIRECTIONS

- ✓ Replicate findings in larger, controlled cohorts.
- ✓ Identify predictors of treatment response.
- ✓ Combine pSTM training with discourse-oriented interventions.
- ✓ Ongoing case-study on self-monitoring to support communication outcomes

Key references

Key references	Contribution
Meyer et al.(2016)	Telerehabilitation of Anomia in PPA
Kalinyak-Fliszar et al. (2011)	Improving activation and maintenance of linguistic representations in psTM (Aphasia)
Macoir et al.(2023)	Impact of phonological short-term memory impairment on verbal repetition in the lvPPA
Banco et al.(2025)	Mechanism-based interventions and generalization

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Interested in discussing this work or future collaborations? Feel free to contact me: guillaume.duboisdindien@uliege.be

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