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The multidimensional nature of aphasia: Using factors beyond language to predict treatment outcomes

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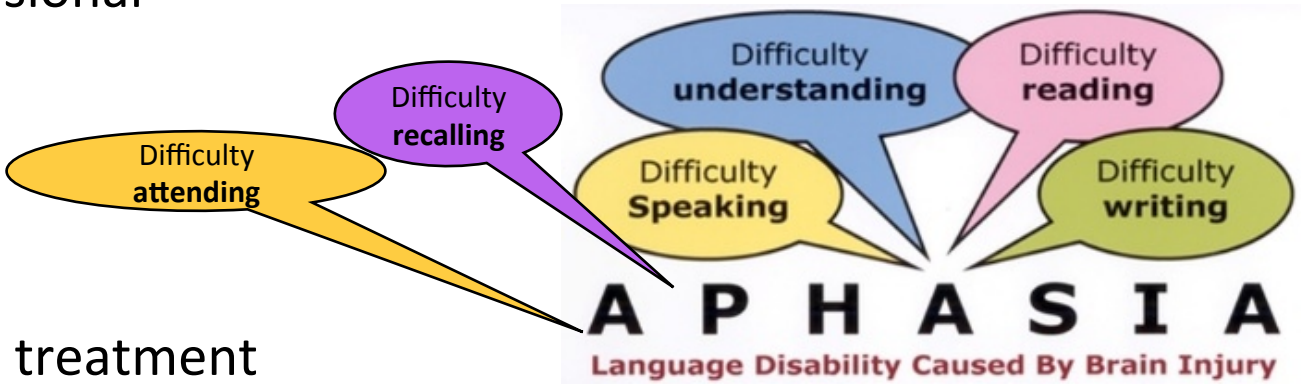
Background

- Variable recovery patterns in persons with aphasia (PWA)
- General predictors of recovery
  - Age, lesion size, initial severity of language impairment
- Traditional view of aphasia as a language disorder
- Research pointing to aphasia as a multidimensional disorder
- PWA demonstrate impairments in
  - Attention
  - Memory
  - Executive functions
- Cognitive factors have been shown to predict treatment outcomes
  - General cognition
  - Executive functions/self-monitoring
  - Visuospatial memory



e.g., Holland et al., 1989; Pedersen et al., 1995; Lambon Ralph et al. 2010; van de Sandt-Koenderman et al. 2008; Dignam et al. 2017; Murray et al., 2012; Villard & Kiran, 2015

Overarching Aims

1) to determine whether baseline language and cognitive abilities and/or demographic variables predicted patients' response to language treatment

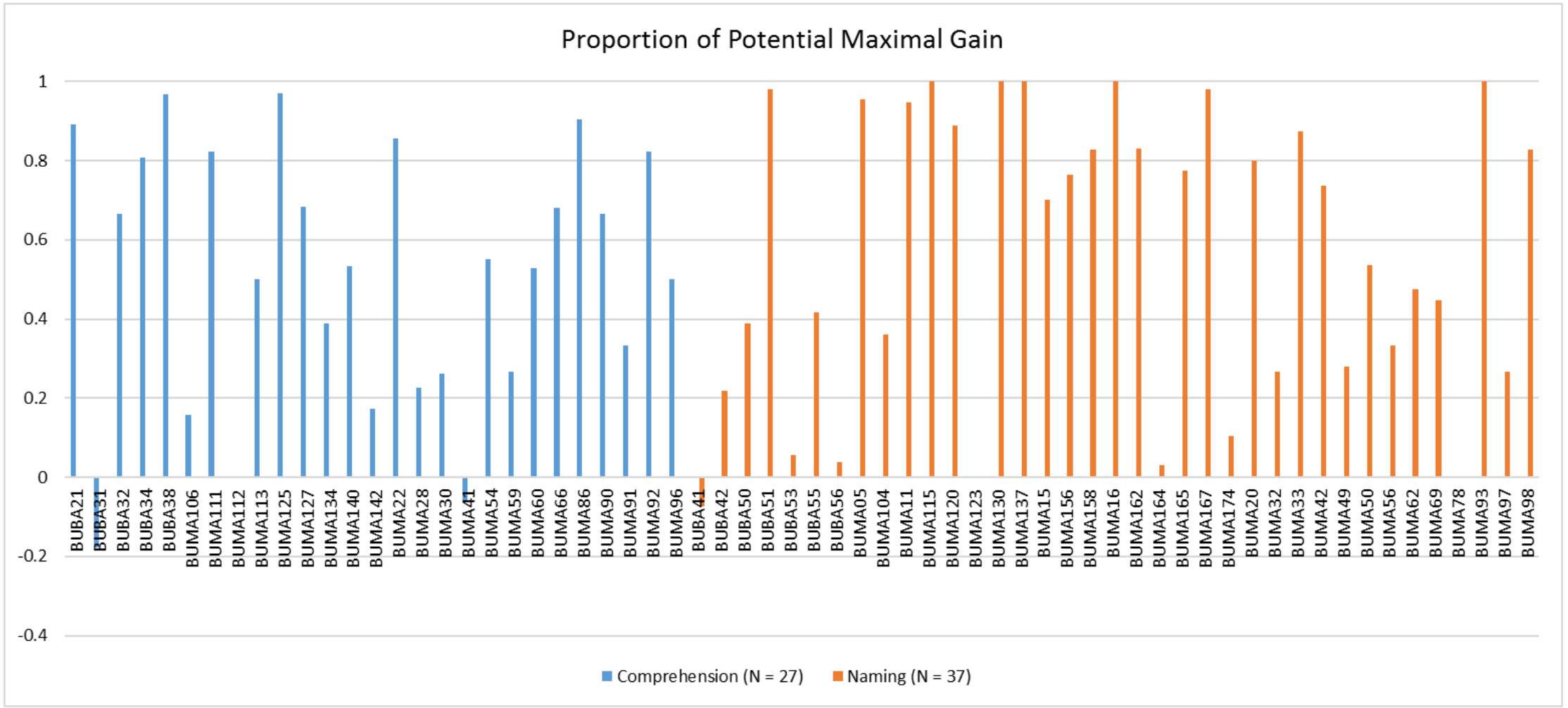
2) to ascertain which specific cognitive measures predicted a response to anomia treatment.

Retrospective Analysis 1

N = 64 PWA (41 M; mean age = 60.1; MPO = 49.3)

- Western Aphasia Battery (WAB) Aphasia Quotient (AQ): M= 66.63, SD = 25.82, range = 10.2-100
- Completed one of four language treatment studies (Des Roches et al., 2016; Gilmore et al., 2017, in prep.; Kiran et al. 2015; Sandberg & Kiran, 2014)
  - 1 sentence comprehension treatment (N = 27)
  - 3 word retrieval treatments (N = 37)
- Treatment intensity: 2-hour, 2x/week for 10-12 weeks

mean PMG = .5464
SD = .3482
range = -.1765-1.00



No difference in PMG by treatment groups (one-way ANOVA: $F_{(1,62)} = .35$, $P = .56$)

Language & Cognitive Measures

Boston Naming Test (BNT)

Pyramids and Palm Trees Test (PAPT)

Western Aphasia Battery (WAB)

- Spontaneous speech
- Auditory Verbal Comprehension
- Repetition
- Naming & Word Finding
- Reading
- Writing

Cognitive Linguistic Quick Test (CLQT)

- Attention
- Memory
- Language
- Executive Function
- Visuospatial Skills

Principal Components Analysis (PCA)

	Comp.1	Comp.2	Comp.3	Comp.4	Comp.5
Standard deviation	2.96000	1.51162	0.93126	0.67723	0.62115
Proportion of Variance	0.62583	0.16321	0.06195	0.03276	0.02756
Cumulative Proportion	0.62583	0.78904	0.85099	0.88375	0.91131

Factor Loadings

Measure	LANGUAGE	COGNITIVE
WAB Spontaneous Speech	.87	.22
WAB Auditory Verbal Comprehension	.81	.28
WAB Repetition	.89	.16
WAB Naming & Word Finding	.94	.21
WAB Reading	.81	.3
WAB Writing	.72	.49
WAB Constructional, Visuospatial, & Calculation	.37	.80
PAPT	.25	.42
BNT	.85	.26
CLQT Attention	.17	.87
CLQT Language	.94	.19
CLQT Memory	.93	.24
CLQT Visuospatial Skills0	.12	.97
CLQT Executive Function	.24	.89

Regression: ***PMG ~ Lang.Comp + Cog.Comp + Age + MPO***

	St. Coeff.	Std.Error	*t*	*p*
Intercept	0.54637	0.03341	16.355	<2e-16***
Lang.Comp	**0.5773**	**0.03367**	**5.969**	**.000000132*** **
Cog.Comp	**0.3103**	**0.03367**	**3.208**	**0.00213 ** **

Residual standard error: 0.2673 on 61 degrees of freedom
Multiple R-squared: 0.4295, Adjusted R-squared: 0.4108
F-statistic: 22.96 on 2 and 61 DF, p-value: .00000003677

For each 1 standard deviation increase in Language Component score, PMG increases by .20.
For each 1 standard deviation increase in Cognitive Component score, PMG increases .10.

Retrospective Analysis 2

- N = 24 PWA (16 M; mean age = 61; MPO = 55)
- WAB AQ: M = 58.72, SD = 26.39, range = 11.7 – 95.2
- Completed 12 week semantic feature analysis-based treatment
- Treatment intensity: 2-hour, 2x/week for 12 weeks
- Treatment response was positive overall

Standardized Cognitive Measures

- Cognitive Linguistic Quick Test
- Raven's Coloured Progressive Matrices
- Corsi block-tapping test
- Wechsler Scales Digit Span
- Doors and People Test Visual Recognition subtest
- Serial Response Time Test
- Geometric Control- Form Matching (mental rotation)
- Geometric Control- Inclusion (mental rotation)

Regression: ***PMG ~ CLQT Executive Functions + Corsi Memory Span + Digit Span Total + Doors & People Test + Serial Response Time Learning + Geometric Control Inclusion + Geometric Control Form Matching***

	Coeff.	Std.Error	*t*	*p*
Intercept	-1.29365	0.9222	-1.403	0.17981
Geometric Form Matching	**0.377647**	**.8528754**	**2.285**	**.03633**
CLQT EF	**0.518785**	**.5810616**	**2.413**	**.02818**
Digit Span	**0.493945**	**.4109923**	**3.113**	**.00669**

Residual standard error: 0.2612 on 16 degrees of freedom
Multiple R-squared: 0.6845, Adjusted R-squared: 0.5465
F-statistic: 4.959 on 7 and 16 DF, p-value: .003843

For each 1 standard deviation increase in Geometric Control Form Matching, PMG increases by .15.
For each 1 standard deviation increase in CLOT Executive Functions, PMG increases by .20.
For each 1 unit increase in Digit Span Total, PMG increases by .19.

Take home message

- Cognition matters
  - Brain damage in Left hemisphere impacts both language AND cognition
  - Specific cognitive skills are relevant to anomia treatment outcomes
    - Verbal short-term memory
    - Visuospatial processing
    - Executive functions

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