A systematic review of standardized outcome measures used in aphasia rehabilitation, including meta-analyses

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College of Health & Rehabilitation Sciences: Sargent College
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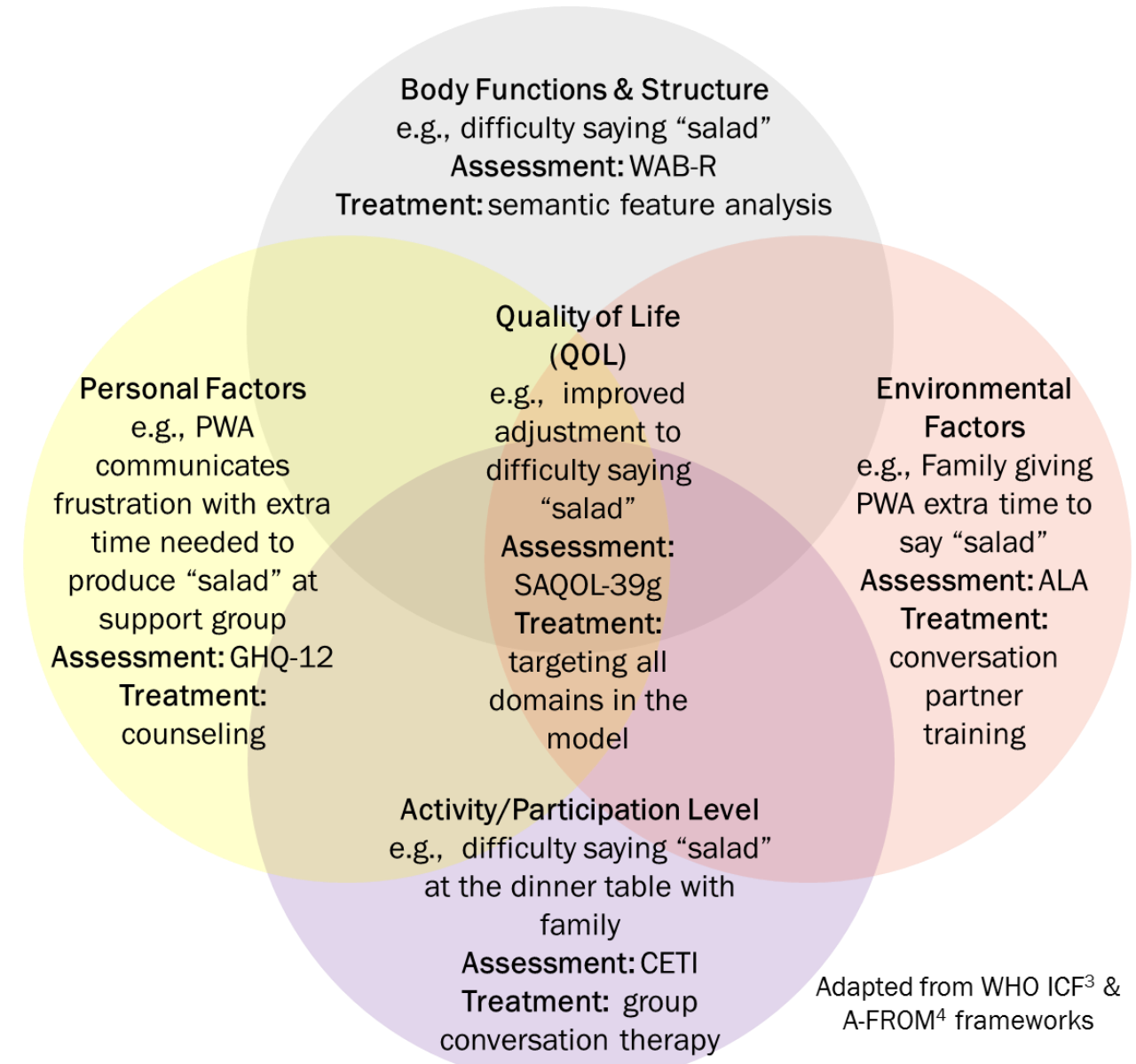Aphasia Research Laboratory
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INTRODUCTION

- 30-40% of stroke survivors experience aphasia[1] primarily impacting their speaking, listening, reading and writing skills, and in some cases, other cognitive skills (e.g., attention).[2]

Body Functions & Structure
e.g., difficulty saying "salad"
Assessment: WAB-R
Treatment: semantic feature analysis

Quality of Life (QOL)
e.g., improved adjustment to difficulty saying "salad"
Assessment: SAQOL-39g
Treatment: targeting all domains in the model

Personal Factors
e.g., PWA communicates frustration with extra time needed to produce "salad" at support group
Assessment: GHQ-12
Treatment: counseling

Environmental Factors
e.g., Family giving PWA extra time to say "salad"
Assessment: ALA
Treatment: conversation partner training

Activity/Participation Level
e.g., difficulty saying "salad" at the dinner table with family
Assessment: CETI
Treatment: group conversation therapy

Adapted from WHO ICF[3] & A-FROM[4] frameworks

- Measurement tool use in aphasia rehabilitation is inconsistent.
- Steps have been taken to improve measurement practice in aphasia rehabilitation (e.g., core outcome set).[5-6]
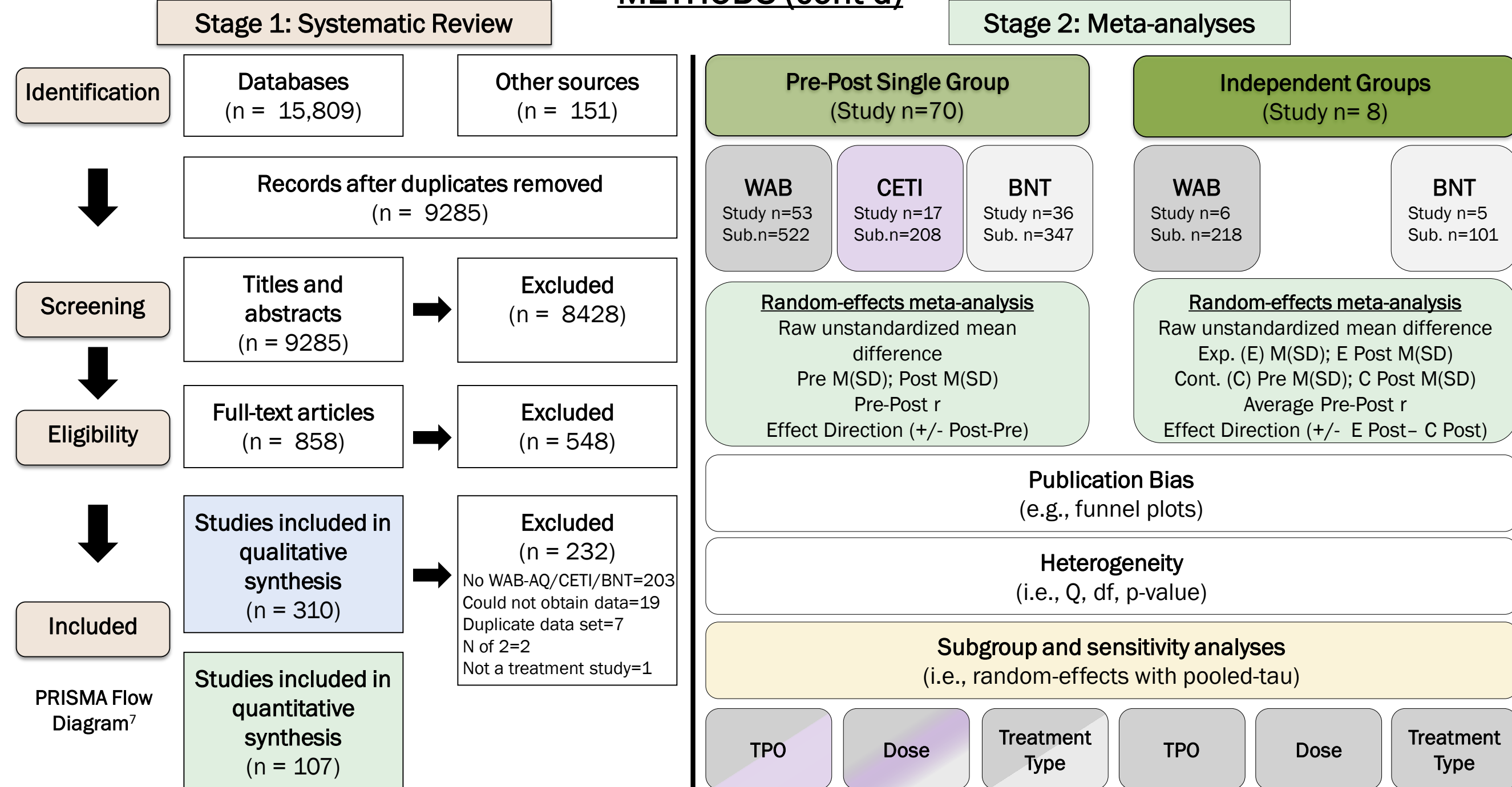- Average significant change on these outcome measures remains unknown.

RESEARCH AIMS

1. Classification of interventions and outcome measures according to their association with health and health-related domains (e.g., QOL) (not presented here)
2. Calculation of the mean significant change reported on the most frequently-used and most relevant outcome measures
3. Determine if the SES significantly differed across subgroups for the various outcome measures (i.e., time post onset, dosage, treatment type)

Eligibility criteria

METHODS

- Behavioral aphasia treatment studies (i.e., n ≥ 3)
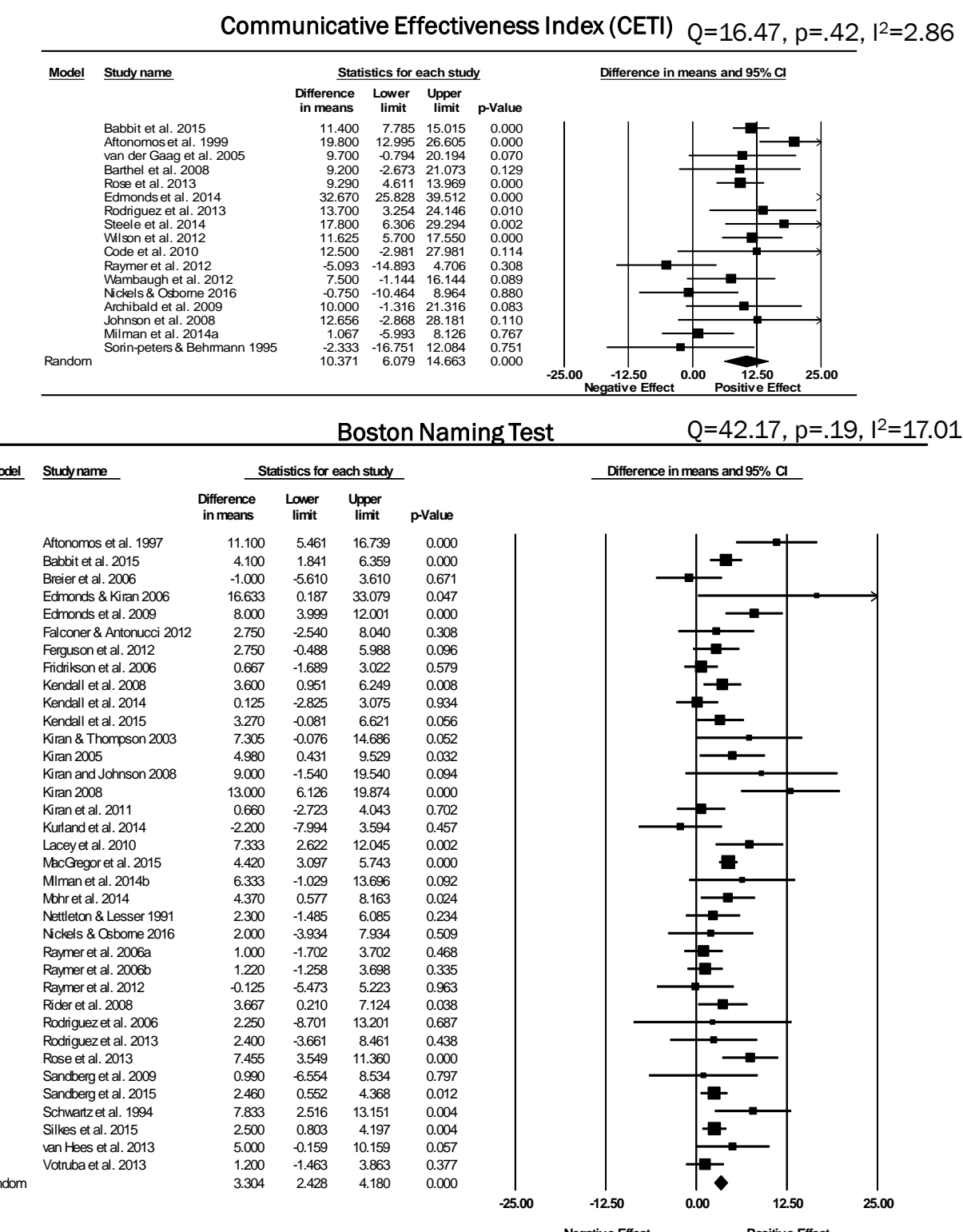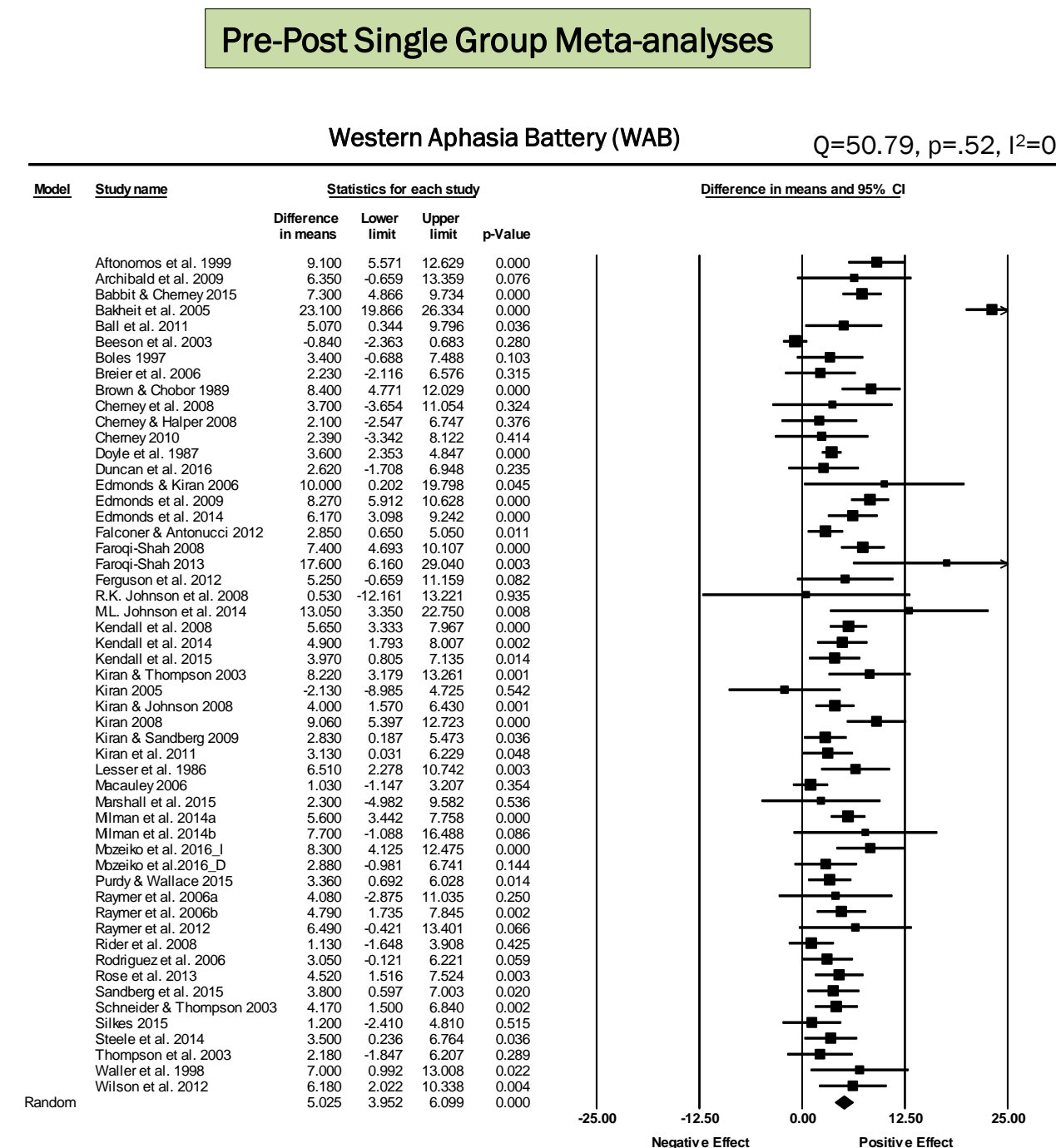- Used standardized outcome measure to measure change
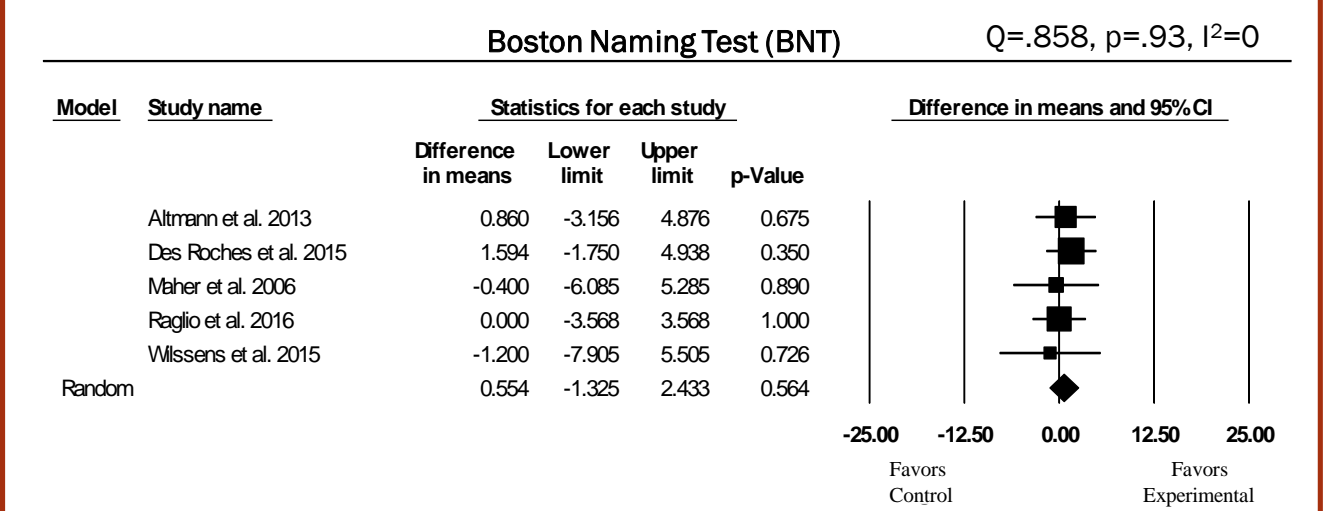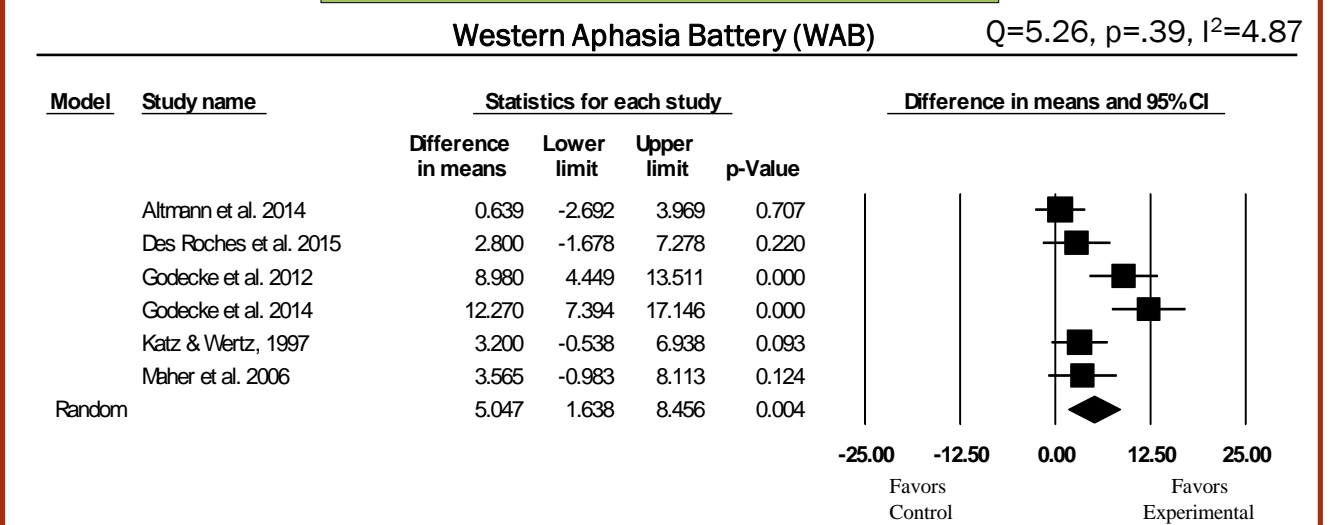
METHODS (cont'd)

Stage 1: Systematic Review

PRISMA Flow Diagram[7]

Identification → Databases (n = 15,809) | Other sources (n = 151)
→ Records after duplicates removed (n = 9285)
Screening → Titles and abstracts (n = 9285) → Excluded (n = 8428)
Eligibility → Full-text articles (n = 858) → Excluded (n = 548)
Included → Studies included in qualitative synthesis (n = 310) → Excluded (n = 232)
No WAB-AQ/CETI/BNT=203
Could not obtain data=19
Duplicate data set=7
N of 2=2
Not a treatment study=1
→ Studies included in quantitative synthesis (n = 107)

- Dual-screening of titles/abstracts and full-text
- Both reviewers extracted data (i.e., agreement = 97.48%)

Stage 2: Meta-analyses

Pre-Post Single Group (Study n=70)

| WAB | CETI | BNT |
| Study n=53 Sub.n=522 | Study n=17 Sub.n=208 | Study n=36 Sub. n=347 |

Random-effects meta-analysis
Raw unstandardized mean difference
Pre M(SD); Post M(SD)
Pre-Post r
Effect Direction (+/- Post-Pre)

Independent Groups (Study n= 8)

| WAB | BNT |
| Study n=6 Sub. n=218 | Study n=5 Sub. n=101 |

Random-effects meta-analysis
Raw unstandardized mean difference
Exp. (E) M(SD); E Post M(SD)
Cont. (C) Pre M(SD); C Post M(SD)
Average Pre-Post r
Effect Direction (+/- E Post– C Post)

Publication Bias (e.g., funnel plots)

Heterogeneity (i.e., Q, df, p-value)

Subgroup and sensitivity analyses (i.e., random-effects with pooled-tau)

TPO | Dose | Treatment Type | TPO | Dose | Treatment Type

- Meta-analyses were conducted using Comprehensive Meta-analysis Software(CMA).[7]

RESULTS

Pre-Post Single Group Meta-analyses

Western Aphasia Battery (WAB) Q=50.79, p=.52, I²=0

Communicative Effectiveness Index (CETI) Q=16.47, p=.42, I²=2.86

Boston Naming Test Q=42.17, p=.19, I²=17.01

Independent Group Meta-analyses

Western Aphasia Battery (WAB) Q=5.26, p=.39, I²=4.87

Model	Study name	Difference in means	Lower limit	Upper limit	p-Value
	Altmann et al. 2014	0.639	-2.692	3.969	0.707
	Das Roches et al. 2015	2.800	-1.678	7.278	0.220
	Godecke et al. 2012	8.980	4.449	13.511	0.000
	Godecke et al. 2014	12.270	7.394	17.146	0.000
	Katz & Wertz, 1997	3.200	-0.538	6.938	0.093
	Miher et al. 2006	3.565	-0.983	8.113	0.124
Random		5.047	1.638	8.456	0.004

Boston Naming Test (BNT) Q=.858, p=.93, I²=0

Model	Study name	Difference in means	Lower limit	Upper limit	p-Value
	Altmann et al. 2013	0.860	-3.156	4.876	0.675
	Das Roches et al. 2015	1.594	-1.750	4.938	0.350
	Miher et al. 2006	-0.400	-6.085	5.285	0.890
	Raglio et al. 2016	0.000	-3.568	3.568	1.000
	Wissens et al. 2015	-1.200	-7.905	5.505	0.726
Random		0.554	-1.325	2.433	0.564

Subgroup and Sensitivity Analyses

Summary effect, Confidence Interval (CI)

	WAB PP	WAB IG	CETI PP	CETI IG	BNT PP	BNT IG
Acute	n/a	N=2 10.51* 7.19-13.82	n/a	n/a	n/a	n/a
Chronic	N=52 4.52* 3.72-5.32	N=4 2.30* .34-4.26	N=16 10.94* 6.59-15.29	n/a	n/a	n/a
Intensive	N=18 5.34 3.98-6.70	N=5 5.49* 1.26-9.71	N=7 10.35 5.95-14.75	n/a	N=25 2.60 1.02-4.18	n/a
Distributed	N=33 4.11 3.17-5.06	n/a	N=10 10.65 4.82-16.47	n/a	N=36 3.80 2.70-4.90	n/a
Impairment	N=32 4.42 3.09-5.76	N=4 3.70* .35-7.06	n/a	n/a	N=23 3.33 2.19-4.47	n/a
A/P	N=6 5.10 1.73-8.47	n/a	n/a	n/a	N=5 3.89 1.62-6.15	n/a
Integrated	N=15 6.48 4.38-8.57	n/a	n/a	n/a	N=8 3.34 1.17-5.51	n/a

Note: Subgroup analyses are bolded. Sensitivity analyses are starred. N = number of studies included in the analysis, not participant N. None of the subgroup analyses were significant (p > .05), suggesting that the overall summary effect sizes did not vary based on these variables (i.e., TPO, dosage, treatment type).

CONCLUSIONS

- Benchmarks have been established to evaluate overall aphasia severity (WAB-AQ), functional communication (CETI) and naming ability (BNT).
- More work is needed to identify change metrics on additional assessments that span the ICF.

SELECTED REFERENCES

1. Dickey L, Kagan A, Lindsay MP, Fang J, Rowland A, Black S. Incidence and Profile of Inpatient Stroke-Induced Aphasia in Ontario, Canada. Arch Phys Med Rehabil. 2010;91(2):196-202. doi:10.1016/j.apmr.2009.09.020.
1. McNeil M, Odell K, Tseng CH. Toward the integration of resource allocation into a general theory of aphasia. Clin Aphasiology. 1991;20:21-39.
2. World Health Organization. Towards a common language for functioning, disability and health: ICF. 2005. http://www.who.int/classifications/icf/icfbeginnersguide.pdf?ua=1. Accessed September 23, 2017.
3. Simmons-Mackie N, Kagan A. Application of the ICF in aphasia. Semin Speech Lang. 2007;28(4):244-253. doi:10.1055/s-2007-986521.
4. Wallace SJ, Worrall L, Rose T, Le Dorze G. Measuring outcomes in aphasia research: A review of current practice and an agenda for standardisation. Aphasiology. 2014;28(11):1364-1384. doi:10.1080/02687038.2014.930262.
5. Wallace SJ, Worrall L, Rose T, Le Dorze G. Core Outcomes in Aphasia Treatment Research: An e-Delphi Consensus Study of International Aphasia Researchers. Am J Speech Lang Pathol. 2016;25(4S):S729. doi:10.1044/2016_AJSLP-15-0150.
6. Moher D, Shamseer L, Clarke M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P). Syst Rev. 2015;4(1):1-9.
7. Borenstein M, Hedges L, Higgins J, Rothstein H. Comprehensive Meta-Analysis. Englewood, NJ: Biostat; 2014.

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