

A critical appraisal of the evidence for constraint induced and multi-modal aphasia therapies for people with aphasia: Why we need the COMPARE randomised controlled trial

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Before I begin...thank you



Mieke van de Sandt and Sandra Wielart for the invitation to speak

Where do I come from?



Melbourne



Melbourne
AUSTRALIA

Parks and Gardens



Australian Rules Football



Coffee!!!!





Collaborators



Dr Abby Foster



Dr Marcella Carragher



Dr Lucie Lanyon



Michelle Attard



Maya Menahemi-Falkov



John Pierce



Dr Zaneta Mok



Prof Leanne Togher



Dr Kazuki Sekine



Dr Carola de Beer



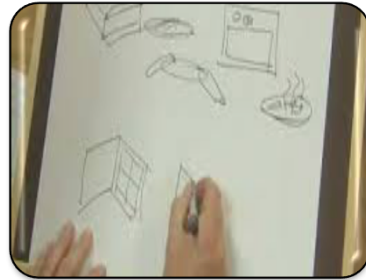
Dr Karin van Nispin



Dr Robyn O'Halloran

Background

- Human communication is essentially multimodal
 - speech, gesture, draw, write/read, facial and body postures



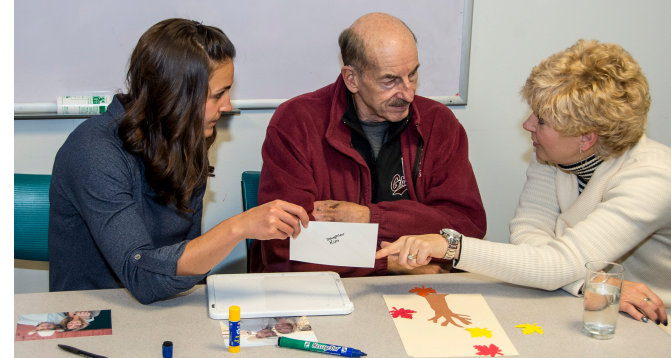


Background

- Aphasia therapies have emphasised speech, reading and writing tasks
 - Strategies have focused on semantic, phonologic, orthographic, and repetition cueing (Nickels, 2002)
- Therapists maintain strong ideas about difference between restitution and compensation approaches
 - Luria's Intersystemic Reorganisation
 - Cross modal facilitation of speech



Background



- Principles of neuroplasticity include
 - *Use it or lose it + Use it and improve it*
 - Aim to overcome learned nonuse after impairment
- Development of constraint aphasia therapy
 - use of preferred modality (speech) and no/limited use of compensatory modalities (gesture, drawing, reading/writing)
- BUT are these constraint ideas relevant in a highly interconnected multimodal communication system?
 - Do gesture, drawing, writing negatively or positively impact speech restoration?
 - COMPARE trial: An RCT comparing CIAT Plus and Multimodal aphasia therapy



Overview of the talk

- **Overview of rationale and features of constraint and multimodal aphasia therapy**
- **Comparative evidence**
 - Constraint aphasia therapies
 - Multimodal aphasia therapies
 - Systematic reviews
 - Single subject designs (Pierce et al., 2017)
 - RCTs (Zhang et al, 2017)
- The **COMPARE trial** and what it hopes to achieve

Principles of Neuroplasticity

- **Plasticity** is the **adaptive capacity of the CNS**
- Neurons alter their structure and function in response to the biological and external environment, including behavioral training → ***experience-dependent plasticity***
- **Rehabilitation involves reorganising** the brain to *restore* and *compensate* for functions that have been compromised
- **Learning** is achieved through the **continuous rewiring of the neural circuitry**
 - Genes, synapses, neurons, neural networks

10 Main Principles of Neuroplasticity



Kleim and Jones (2008) *JSLHR*, 51, S225-239

Table 1. Principles of experience-dependent plasticity.

Principle	Description
1. Use It or Lose It	Failure to drive specific brain functions can lead to functional degradation.
2. Use It and Improve It	Training that drives a specific brain function can lead to an enhancement of that function.
3. Specificity	The nature of the training experience dictates the nature of the plasticity.
4. Repetition Matters	Induction of plasticity requires sufficient repetition.
5. Intensity Matters	Induction of plasticity requires sufficient training intensity.
6. Time Matters	Different forms of plasticity occur at different times during training.
7. Salience Matters	The training experience must be sufficiently salient to induce plasticity.
8. Age Matters	Training-induced plasticity occurs more readily in younger brains.
9. Transference	Plasticity in response to one training experience can enhance the acquisition of similar behaviors.
10. Interference	Plasticity in response to one experience can interfere with the acquisition of other behaviors.



Background to Constraint Induced Approaches

- Constraint induced (CI) approaches based on **experience-dependent learning principles derived from neuroscience trials**
 - Monkeys with surgically induced unilateral somatosensory lesions stopped using the affected limb and relied on compensatory use of unaffected limb (*non-use hypothesis*)
 - Monkeys with chronic impairments trained to use the affected limb by restraining the unaffected one and providing gradual motor retraining
 - This reversed the impairment and improved function

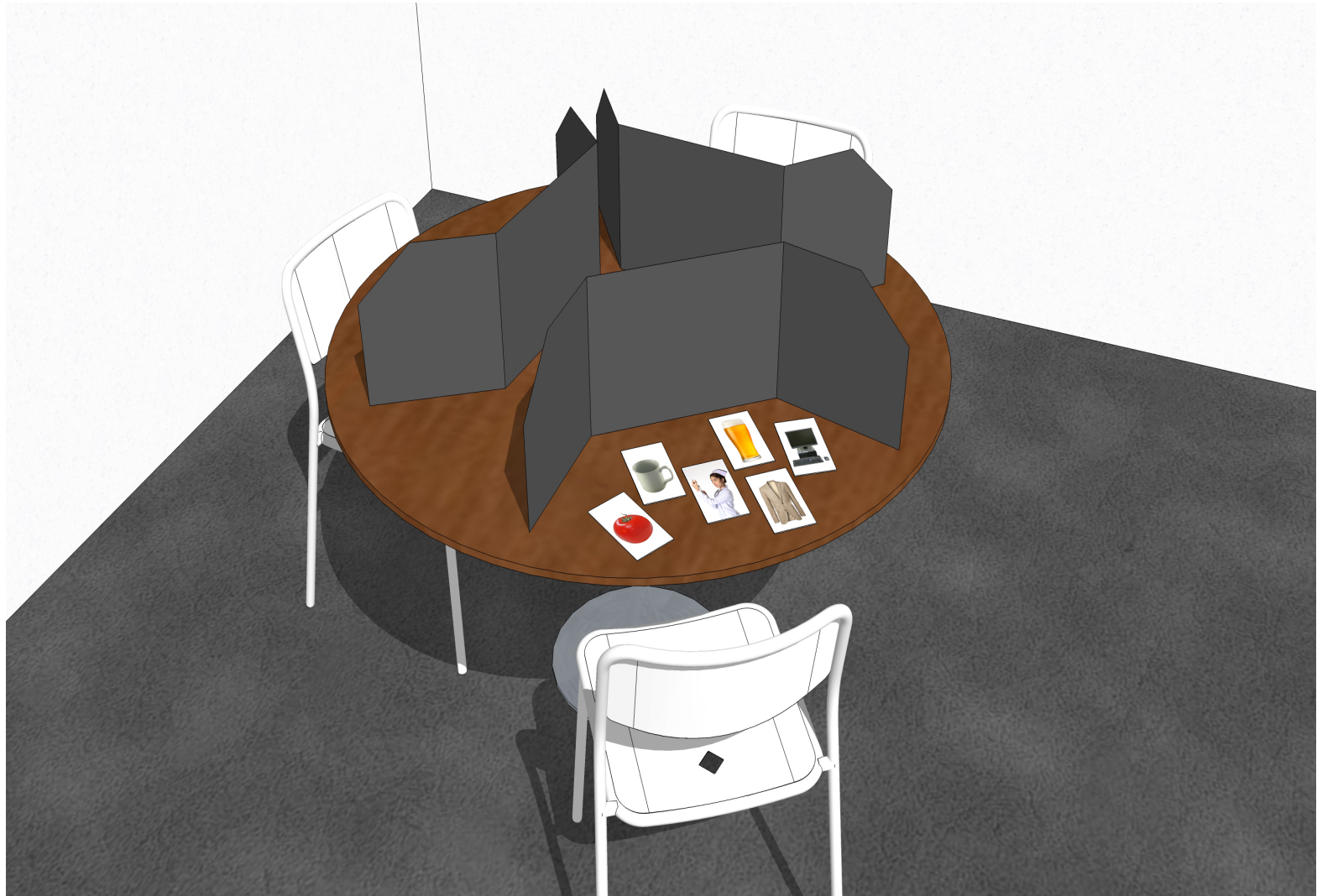
(Taub et al., 2002)

Background to Constraint Induced Approaches



- Led to the development of ***Constraint-induced movement therapy*** for chronic stroke motor impairments (Taub 2002; 2006; Peurala et al, 2012; Dong et al, 2013)
- **4 main principles:-**
 - Overcoming non-use by constraining non-affected limb with sling/splint
 - Massed practice- several hours per day x 2+ weeks
 - Shaping- difficulty of task is gradually increased
 - Behaviourally relevant treatment settings to enhance transfer of learning

Constraint induced movement therapy (CIMT) → Constraint induced aphasia therapy (CIAT)





Constraint Induced Aphasia Interventions emerged 2001

- Pulvermuller et al (2001) argued that withdrawal from communication, change of communication strategy, and use of compensation strategy are forms of learned non-use
- Designed therapy based on CIMT principles to address the non-use → ***Constraint Induced Aphasia Therapy***

CIAT

Constraint Induced Aphasia Therapy

1. Intensive training

30 hours in 2 weeks

2. Communicatively relevant tasks

Group therapy, communicative games

3. Constraint to speaking

Barriers limit modalities
Shaping

Constraint Induced Aphasia Interventions emerged 2001

Note: many terms to cover same /similar protocols

- **CIAT:** Constraint Induced Aphasia Therapy (Pulvermuller et al, 2001)
- **CILT:** Constraint Induced Language Therapy (Maher et al, 2006)
- **CIAT Plus:** Constraint Induced Aphasia Therapy Plus: an amended protocol adding a reading and home transfer task to protocol (Meinzer et al, 2005)
- **ILAT:** Intensive Language Action Therapy, latest term (Pulvermuller & Berthier, 2008; see DiFrancesco et al 2012 for description)
- **CIAT 11:** Enhanced protocol: variety of tasks; increasing the dose; transfer package (Johnson, Taub, et al 2014)

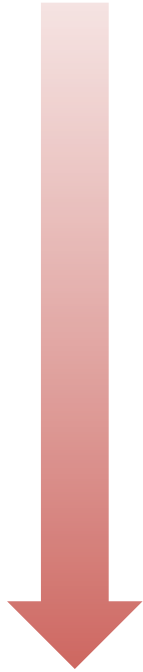
Constraint Induced Aphasia Therapy

- 4 main components CIAT

1. Intensive (massed) practice: 30 hours over 2 weeks-3 hours per day

2. Shaping of responses: gradual increase in task complexity and use of reinforcement

Typical hierarchy of difficulty: gradual increase during therapy



Clock?

Pass clock?

Could you pass the clock?

Could you pass the white clock?

Joe, could you please pass the
white clock?



Constraint Induced Aphasia Therapy

- 4 main components CIAT

Repetition, Intensity

1. Intensive (massed) practice: 30 hours over 2 weeks-3 hours per day

Shaping

2. Shaping of responses: gradual increase in task complexity and use of reinforcement

Saliency, Transfer

3. Social imperative to communicate: interactive game-based activities

↓ Learned non-use

4. Constraint to verbal modality: nonverbal communication discouraged, use of verbal models/cues

Typical CIAT set ups



Language Action Games
(Speech Acts)

- Request (nouns)
- Propose (verbs)
- Accept/Reject/Clarify

Barriers focus verbal communication



In groups of 2-3 people with aphasia + 1 therapist



Sets of paired picture cards form communication focus



Developments and Confusions in CIAT

- **Original Pulvermuller 2001** version of CIAT focused on **minimising learned non-use** by complete **focus on verbal channel** and **restricting non-verbal communication**

“aphasic patients often use the communication channel that is accessible to them with the least amount of effort: they gesticulate or make drawings instead of using spoken language. Such strategies need to be suppressed in Constraint Induced therapy in favor of verbal communication” (p. 1,621)

“all communication had to be performed by use of spoken words or sentences: pointing or gesturing was not permitted” (p. 1,622)

- **Maher’s (2006) CILT vs PACE study** continued the original protocol

“if participants resorted to any of these [non-verbal] strategies during the therapy sessions, they were reminded to use only speech and to ‘sit on their hands’ if necessary” (p. 846)

Developments and Confusions in CIAT

- **CIAT Plus developed and tested** in 2005 by Meinzer and colleagues
 - Added action pictures/scenarios
 - Added written cues for reading aloud
 - Included a home transfer task to practice skill learnt in session in everyday life
- CIAT v CIAT Plus in larger cohort of 27 participants
 - **CIAT Plus led to superior result**
 - Also included the nonverbal constraints
 - “screens between players prevented them from seeing each other’s cards and movements to enforce communication by spoken language and to ‘constrain’ communication by gestures” (p. 1,463)*

Developments and Confusions in CIAT

- **Early focus on restricting non-verbal communication** picked up by clinicians who
 - Believed that a major component of CIAT was restriction of nonverbal communication
 - Asked clients to contain/stop their hand gestures
 - Prevented clients from writing letters/words as self cues
 - Heavy focus on talking without nonverbal accompaniment
- BUT evidence suggests that **restricting gestures in healthy speakers → increases dysfluency and word retrieval difficulty**

(Morsella & Krauss, 2004; Rauscher, Krauss, & Chen, 1996; Frick & Guttentag, 1998; Pyers et al, 2010)

Developments and Confusions in CIAT

- **“Constraint”** retermed **“focus”** in the 2008 version of CIAT by Pulvermuller & Berthier to emphasise a **focus** on verbal communication through the social game-based activities
 - Still included barriers to prevent/discourage gesture, writing, drawing as communication options



Developments and Confusions in CIAT/ILAT

- **Intensive Language Action Therapy (ILAT)** is a recent development (Di Francesco, Pulvermuller & Mohr, 2012)
 - “Friendlier term” “Guiding patients” rather than the more negative term of “constraining” them

“Nonverbal communication replacing verbal activity should be avoided, but the concordant verbal communication and other body actions are in fact desirable—especially given the background of the well-known evidence for synergistic effects between action and language processes”. p.1318

Aim is to practice verbal abilities, speaking and writing, possibly accompanied and facilitated by gestures (e.g., saying “letter” plus gesture of writing), but not to replace words by isolated gestures p.1326

Developments and Confusions in CIAT

- **Intensive Language Action Therapy (ILAT) involves**
 - Behavioural techniques such as modeling, shaping and positive reinforcement
 - Providing a verbal model for copying
 - Gradually increasing difficulty of task
 - Praising good performance



Developments and Confusions in CIAT

- **Intensive Language Action Therapy (ILAT) DOES NOT specifically involve or provide instruction about mainstays of word retrieval therapy**





- Semantic or phonologic cueing (except for simple repetition and copying of oral targets)
- Graphemic or orthographic cueing

- **BUT many clinicians report incorporating additional treatment components** in their versions of ILAT/CIAT
 - Semantic Feature Analysis, Phonological Component Analysis, Phonetic Placement; semantic cueing, phonological cueing etc

→ Possible confusion in the clinical implementation of ILAT/CIAT versus current research protocols and their underpinning evidence



Constraint and multimodal approaches to therapy for chronic aphasia: A systematic review and meta-analysis

John E. Pierce ^{a,b}, Maya Menahemi-Falkov^a, Robyn O'Halloran ^a,
Leanne Togher ^c and Miranda L. Rose ^a

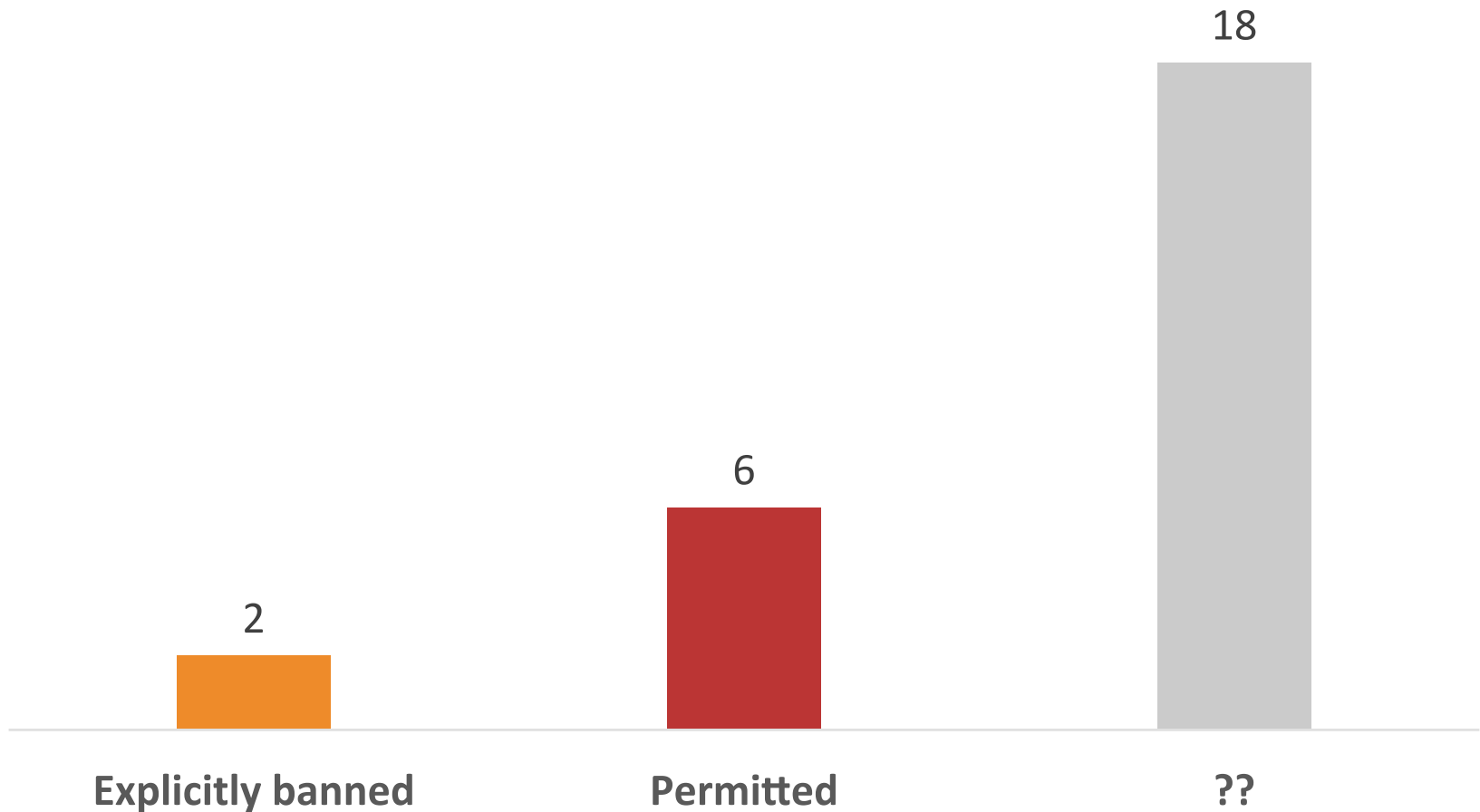
^aSchool of Allied Health, La Trobe University, Melbourne, Australia; ^bSpeech Pathology, Cabrini Health, Melbourne, Australia; ^cSpeech Pathology, Faculty of Health Sciences, University of Sydney, Lidcombe, Australia

ABSTRACT

Aphasia is a significant cause of disability and reduced quality of life. Two speech pathology treatment approaches appear efficacious: multimodal and constraint-induced aphasia therapies. In constraint-induced therapies, non-verbal actions (e.g., gesture, drawing) are believed to interfere with treatment and patients are therefore constrained to speech. In contrast, multimodal therapies employ non-verbal modalities to *cue* word retrieval. Given the clinical and theoretical implications, a comparison of these two divergent treatments was pursued. This systematic review investigated both approaches in chronic aphasia at the levels of impairment, participation and quality of life. After a systematic search, the level of evidence and methodological quality were rated. Meta-analysis was conducted on 14 single case experimental designs using Tau-U, while heterogeneity in the four group designs precluded meta-analysis. Results showed that high-quality research was limited; however, findings were broadly positive for both approaches with neither being judged as clearly superior. Most studies examined impairment-based outcomes without considering participation or quality of life. The application and definition of constraint varied significantly between studies. Both constraint and multimodal therapies are promising for chronic post-stroke aphasia, but there is a need for larger, more rigorously conducted studies. The interpretation of "constraint" also requires clearer reporting.

Constraint studies (26) (Pierce, O'Halloran, Togher, Rose, 2017)

Multimodal self-cueing allowed?



Constraint studies (26)

Cues provided by clinician?



What is being tested in these studies?
Dose?
LAGS?
Range of cues?

Releasing the Constraints on Aphasia Therapy: The Positive Impact of Gesture and Multimodality Treatments

Miranda L. Rose^a

Purpose: There is a 40-year history of interest in the use of arm and hand gestures in treatments that target the reduction of aphasic linguistic impairment and compensatory methods of communication (Rose, 2006). Arguments for constraining aphasia treatment to the verbal modality have arisen from proponents of constraint-induced aphasia therapy (Pulvermüller et al., 2001). Confusion exists concerning the role of nonverbal treatments in treating people with aphasia. The central argument of this paper is that given the state of the empirical evidence and the strong theoretical accounts of modality interactions in human communication, gesture-based and multimodality aphasia treatments are at least as legitimate as either a constraint-based aphasia treatment

individuals with aphasia that are harnessed in treatments are reviewed. The negative effects on word retrieval of restricting gesture production are also reviewed, and an overview of the neurological architecture subserving language processing is provided as rationale for multimodality treatments. The evidence for constrained and unconstrained treatments is critically reviewed.

Conclusion: Together, these data suggest that constraint treatments and multimodality treatments are equally efficacious, and there is limited support for constraining client responses to the spoken modality.

Questions about CIAT

- **What are the potent ingredients of CIAT/ILAT?**
 - Intensity of schedule
 - Social speech practice in language action games
 - Focus on speech as main communication strategy
 - Shaping behaviours
 - Transfer tasks
 - Cues
- **What do people actually mean when they say “we are using CIAT/ILAT” in the clinic?**
- **Therapeutic Drift ?**



An Enhanced Protocol for Constraint-Induced Aphasia Therapy II: A Case Series

Margaret L. Johnson,^a Edward Taub,^b Leslie H. Harper,^b Jamie T. Wade,^b Mary H. Bowman,^b Staci Bishop-McKay,^b Michelle M. Haddad,^b Victor W. Mark,^b and Gitendra Uswatte^b

- Aimed to
 - Make CIAT more potent
 - Involve caregivers as trained therapists
 - Use scripted interventions
 - Increase variety of tasks
 - Include transfer package
- Complete “How well” scale daily
- Speech repetition drills (20m)-phonemic/placement cueing
- Phrase repetition drills (25m)
- Language card game (30m)
- Picture description (30m)
- Role play phrases (30m)
- Home skills assignment (15m)
- Post Rx practice and follow up (30-45 min daily)



Constraint/ILAT???

Questions about CIAT

- When is a treatment CIAT/ILAT and when is it not?
- Therapeutic Drift?
- CIAT 11 seems to be a whole range of therapies



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- *“Use of gestures or nonverbal vocalisations for communication was strongly discouraged. The therapist did not respond to gestures or nonverbal vocalisations, and cautioned against their use, and they instructed the caregivers to do the same.”* p.63

Questions about CIAT

- **Is CIAT for all patients?**
 - Rates of nonresponse very poorly reported
 - Approx 15-30% of participants are not responsive
- Di Francesco et al (2012) suggest
 - People with global aphasia or severe mixed transcortical aphasia might be better treated in a group of 2 participants with 1 therapist each
 - Presence of major perceptual, motor and neuropsychological impairments may make it difficult to perform language action games
 - **Need to understand patient-related factors!**

What are Multi-Modality Aphasia Therapies



Principles underlying multi-modal treatment approaches



- **Human communication is multi-modal**
 - Speak, gesture, write, read, draw, in everyday life
 - **Motor functions:** 1 limb is usually dominant and the other is not involved in an act (e.g., brushing your teeth with right hand only)
 - **But for communication:** gesture, writing, reading are not “compensatory” in everyday life- **they are inherent to successful and natural communication**

Principles underlying multi-modal treatment approaches



- **Neural networks** underpinning **human communication** are **highly multi-modal**
- Neuroscience evidence suggests that the neural bases of language and action are **functionally interlinked** (e.g., Glenberg et al, 2008; Pulvermuller et al, 2005; Willems et al, 2011)

Strong conceptual and neural connections between language and action

- Processing verbs associated with **mouth, hand, leg** (**lick, pick, kick**) stimulates cortical activation in the **relevant motor areas**

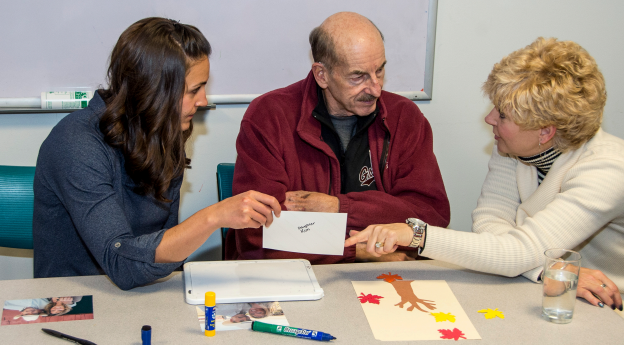
(Binkofski & Buccino, 2006; Boulenger et al., 2006; Fadiga et al., 2002; Hauk & Pulvermuller, 2004; Pulvermuller et al 2005; Rizzolatti et al, 2001)

- Transcranial Magnetic Stimulation applied to motor areas speeds lexical decision on related action terms
(Pulvermuller et al., 2005)
- Gesture stimuli influence comprehension and production of words when subjects are asked to observe the performed action *(Gentilluci et al, 2006; 2008; 2008)*

Principles underlying multi-modal treatment approaches



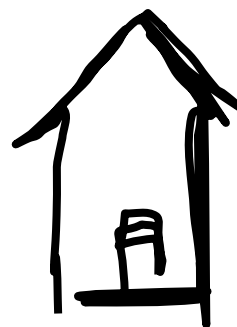
- Re-establishing language and speech with the aide of **previously used multimodal cues and unimpaired brain networks** after stroke *might be more effective* than concentrating solely on the more impaired verbal modality



Principles underlying multi-modal treatment approaches

- **Encoding specificity principles** (Tulving and Thomson, 1973)
 - Context in which linguistic material is initially presented can itself be used to gain access to the mental representation
 - The contextual conditions are part of the encoding environment and can act as effective retrieval cues
- **Depth of processing principle** (Craig and Tulving, 1975)
 - Formation and durability of mental representations are positive functions of the depth (and the degree of semantic involvement) in which the expressions are initially processed
 - A more descriptive context can help to elaborate information: pictures, demonstrations, gestures, pantomime, drawings

Multimodal treatments =
other modalities cue and aid
speech (re-) learning



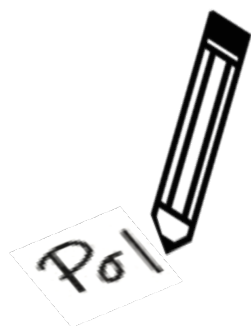
Drawing



Reading/orthographic



Gesture



Writing



Music

Principles underlying multi-modal treatment approaches



- When language is **compromised (in aphasia)** or unavailable (travelling to foreign country) more of the **communicative load** can be **transferred to the gesture modality**
- **People with aphasia can gesture**
 - **Significantly more people with aphasia gestured** during story retell and conversation tasks than control participants
 - Used a **high number of iconic and communicative gestures**

(Sekine & Rose, 2013; Sekine, Rose, Foster & Lanyon, 2013; Rose, Mok, Sekine, 2016)

Principles underlying multi-modal treatment approaches



- **People with aphasia can gesture**
 - Listeners comprehend messages of pwa more accurately in gesture + speech condition than speech alone or gesture alone conditions (de Beer et al., 2017; Rose et al., 2016; van Nispin et al., 2017)
 - Includes pantomimes, emblems and referential gestures
- **So perhaps these gestures are useful in aphasia intervention rather than harmful?**

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Miranda Rose, PhD
& Michelle Attard



M-MAT PROCEDURE MANUAL

2011

**Multi-modality
aphasia intervention
(M-MAT):
The details....**

Multi-Modality Aphasia Therapy (M-MAT)

- We developed **M-MAT** taking into consideration
 - Principles of **experience-dependent neuroplasticity**
 - **Multi-modal** nature of **human communication**
 - Evidence for **semantic, phonologic and orthographic cues** in aphasia therapy
 - **Encoding principles** of learning
- Aim to directly **compare CIAT/ILAT to M-MAT**
 - **Intensive dose, socially motivated communication tasks**

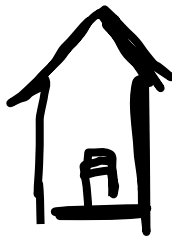
(Rose & Attard, 2011)

M-MAT

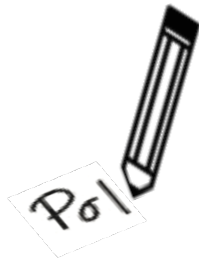
Multi-Modal
Aphasia
Therapy



Repeat word while
gesturing



Repeat word while
drawing item



Repeat word while
copying item

180 items
3 sets: easy,
medium, hard
48 nouns
32 verbs
(10 adjectives)

Repeat word x3 looking at
written word and card

CIAT

MMAT

Intensive
training



15 hours/week, 2 weeks



15 hours/week, 2 weeks

Communicatively
relevant



Communication Action
Games



Communication Action
Games

Shaping of
responses



Constrained to verbal
Repetition and
orthographic cueing



Multimodal cues -
gesture, drawing,
writing, reading

The Weight of Evidence



SPECIAL COMMUNICATION

First Decade of Research on Constrained-Induced Treatment Approaches for Aphasia Rehabilitation

Marcus Meinzer, PhD, Amy D. Rodriguez, PhD, Leslie J. Gonzalez Rothi, PhD

ABSTRACT. Meinzer M, Rodriguez AD, Gonzalez Rothi LJ. First decade of research on constrained-induced treatment approaches for aphasia rehabilitation. *Arch Phys Med Rehabil* 2012;93(1 Suppl 1):S35-45.

In 2001, the concept of applying CI-based principles to treat chronic language impairments was introduced, and CI-based approaches have generated considerable interest since that time. The original protocol was tailored to improve functional communication in chronic aphasia (ie, 6–12mo after stroke)

ES: How well does it work? How big was the difference ?

CIAT Effect Sizes

	Comparison	N	ES
Pulvermuller 2001	CIAT SLT Distributed	17	Large AAT
Meinzer 2005	CIAT CIAT Plus	27	Small AAT
Pulvermuller 2005	CIAT	9	Small AAT
Richter 2008	CIAT	16	Medium AAT
Sickert 2014	CIAT (3 wks) SLT	100	20% AAT

- **5 trials compared CI to other therapies**
 - Conventional 1:1 Tx (FUATAC; Pulvermuller, 2001; VERSE II)
 - Linguistic oriented group therapy (Sickert, 2014)
 - Semantic (BOX) SLT (Wilssens, 2015)

- **No evidence of difference**
 - Functional communication (n=126, 3 trials)
 - Aphasia severity (n=34, 2 trials)

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- Complete “How well” scale daily
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- 4 participants with chronic Broca's aphasia
- 3/4 good improvements on WAB-AQ (mean 13.1)
- 1 did not respond
- Significant changes on the Verbal Activity Log

Constraint-Induced Aphasia Therapy Versus Intensive Semantic Treatment in Fluent Aphasia

Ineke Wilssens,^{a,*} Dorien Vandenborre,^{b,c,*} Kim van Dun,^c
Jo Verhoeven,^{d,e} Evy Visch-Brink,^f and Peter Mariën^{a,c}

(2015); 24

- CIAT v Semantic Therapy (BOX) (Visch-Brink, 2001)
- 9 people with chronic moderate fluent aphasia
 - 4 BOX; 5 CIAT; 30 hrs 9-10 days
- Sig improvements from both treatments higher verbal communication scores from BOX
- Treatment specific effects
 - BOX → better language comprehension and semantics
 - CIAT → better language production and phonology

Constraint-induced aphasia therapy in post-stroke aphasia rehabilitation: A systematic review and meta-analysis of randomized controlled trials

Jiaqi Zhang, Jiadan Yu, Yong Bao, Qing Xie, Yang Xu, Junmei Zhang, Pu Wang

Published: August 28, 2017 • <https://doi.org/10.1371/journal.pone.0183349>

8 RCTs included; 3 main comparisons

1. CIAT vs unconstrained, lower intensity

- 3 trials
- Chronic: Pulvermuller 2001 (Sig AAT) ; Szaflarski 2015 (NS except BNT)
- Acute: Woldag 2016 (NS AAT)

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2. CIAT vs no constraint (same dose)

- 4 trials
- Chronic: Wilssens, 2015 (NS ANELT); Kurland, 2016 (NS BDAE)
- Acute: Ciccone, 2015 (NS WAB)
- Subacute: Sickert, 2013 (NS AAT)
- No significant differences in primary outcomes

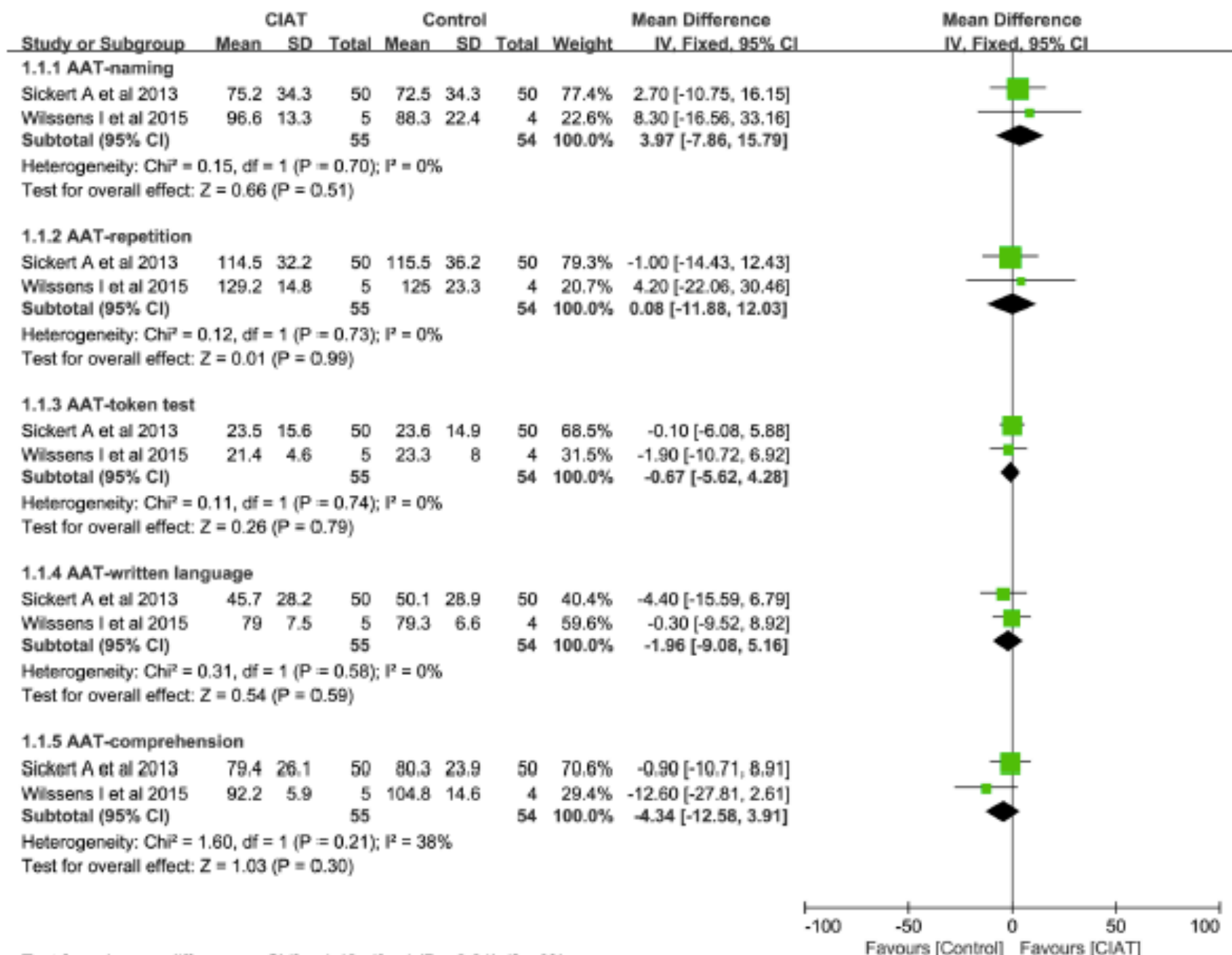
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3. ILAT v naming Rx : Stahl, 2016

Significantly better for ILAT (n=18)



Test for subgroup differences: Chi² = 1.42, df = 4 (P = 0.84), I² = 0%

Fig 2. Meta-analysis of AAT subscores.

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Summary findings

- CIAT is successful, particularly in the chronic phase
- Patients tolerate it, even in subacute phase
- No strong evidence to support CIAT being superior to other intensive therapies
 - Is constraint the vital ingredient or not?



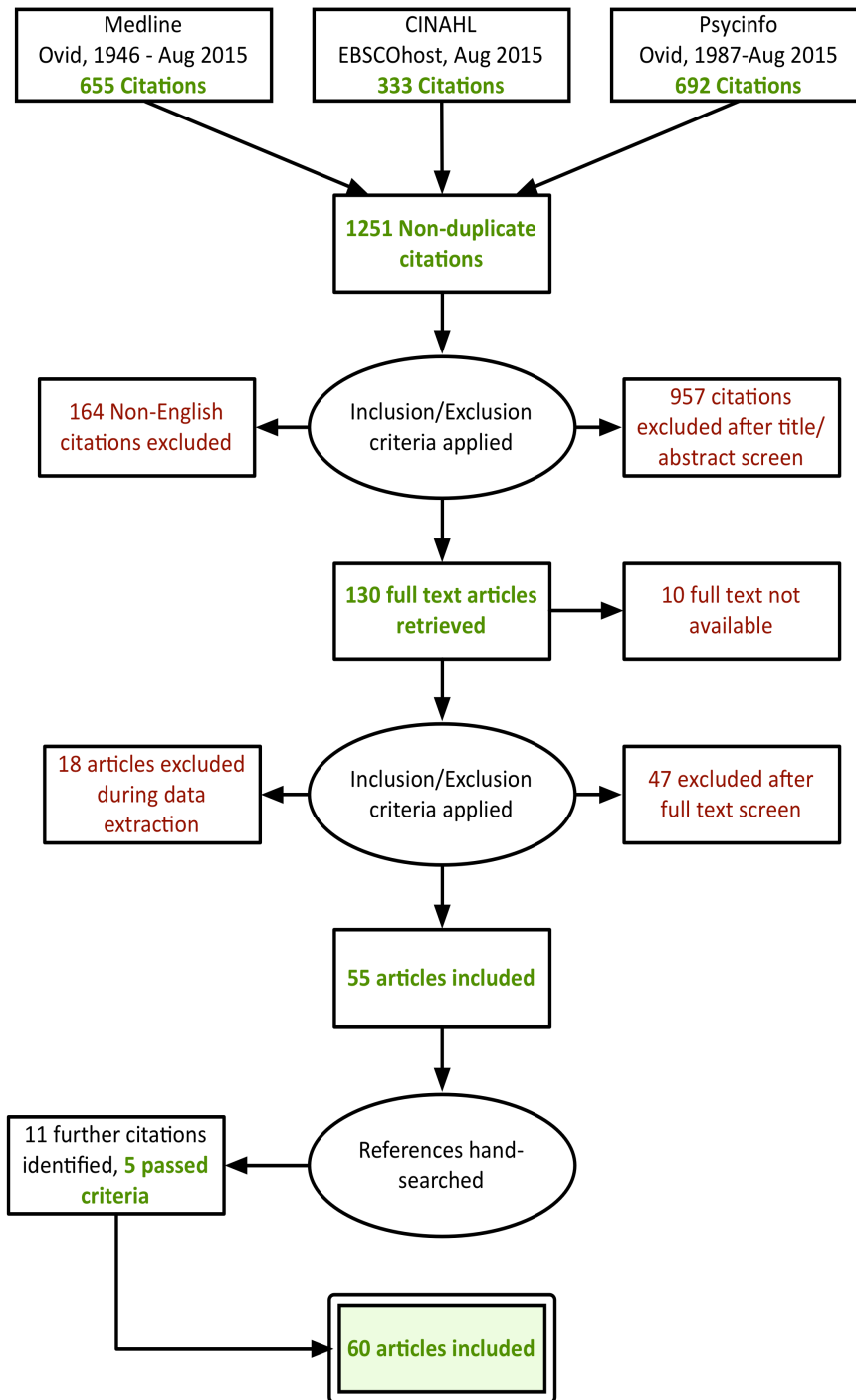
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John E. Pierce ^{a,b}, Maya Menahemi-Falkov^a, Robyn O'Halloran ^a,
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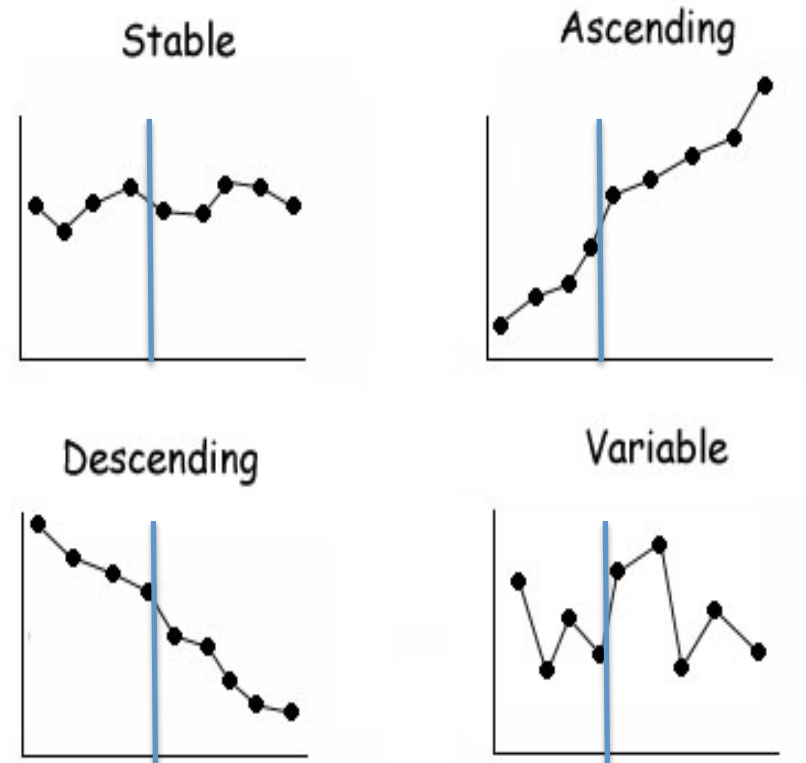
ABSTRACT

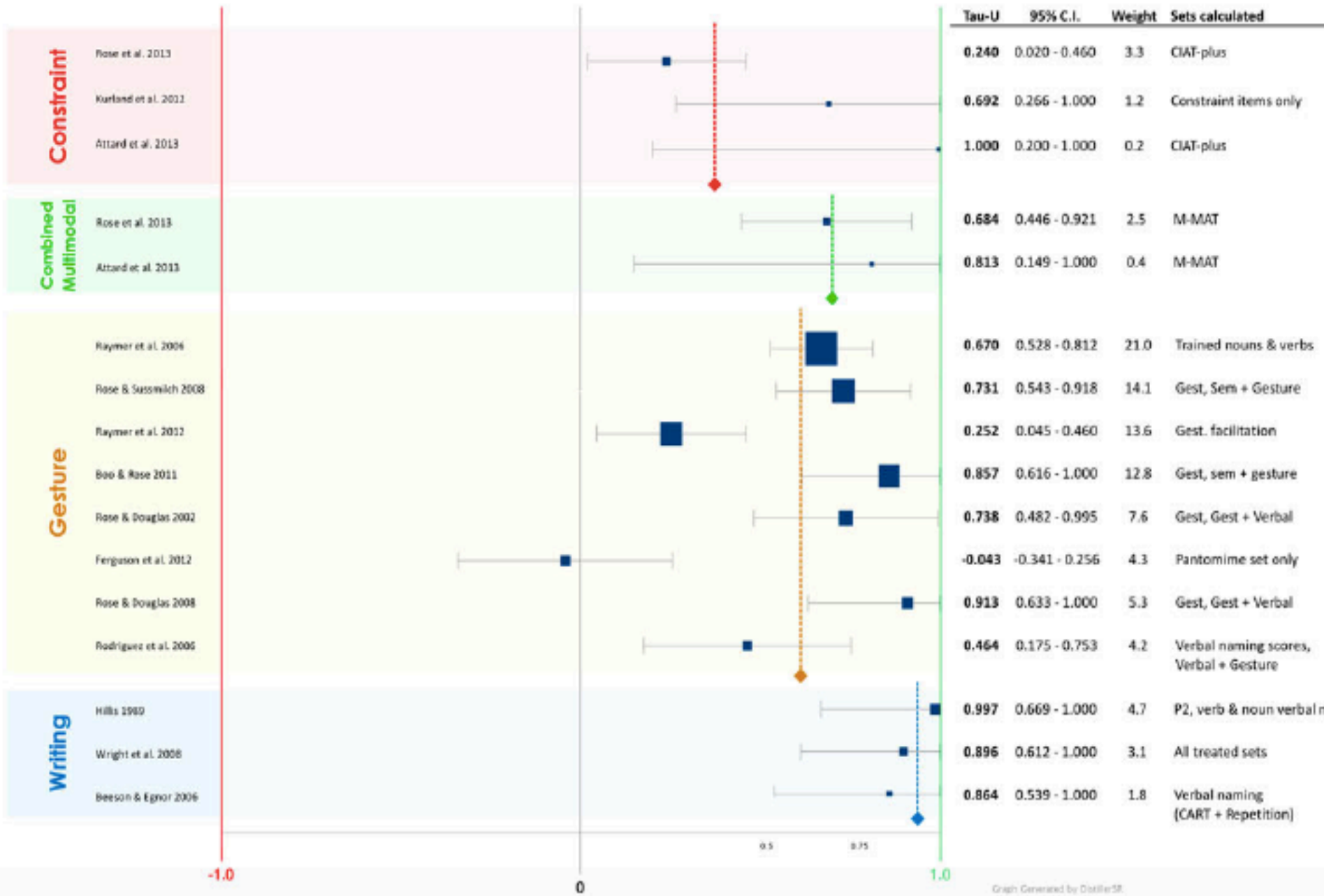
Aphasia is a significant cause of disability and reduced quality of life. Two speech pathology treatment approaches appear efficacious: multimodal and constraint-induced aphasia therapies. In constraint-induced therapies, non-verbal actions (e.g., gesture, drawing) are believed to interfere with treatment and patients are therefore constrained to speech. In contrast, multimodal therapies employ non-verbal modalities to *cue* word retrieval. Given the clinical and theoretical implications, a comparison of these two divergent treatments was pursued. This systematic review investigated both approaches in chronic aphasia at the levels of impairment, participation and quality of life. After a systematic search, the level of evidence and methodological quality were rated. Meta-analysis was conducted on 14 single case experimental designs using Tau-U, while heterogeneity in the four group designs precluded meta-analysis. Results showed that high-quality research was limited; however, findings were broadly positive for both approaches with neither being judged as clearly superior. Most studies examined impairment-based outcomes without considering participation or quality of life. The application and definition of constraint varied significantly between studies. Both constraint and multimodal therapies are promising for chronic post-stroke aphasia, but there is a need for larger, more rigorously conducted studies. The interpretation of "constraint" also requires clearer reporting.



Tau U Effect Size

- Tau-U scores show the percentage of data points in the treatment phase that has improved compared with baseline
- -1 to +1
- 1 = 100% of data points are better after therapy
- -1 = 100% of data points are worse after therapy
- Corrects for baseline trend





Systematic review conclusions:

- Encouraging but low-moderate quality evidence for efficacy:
 - Constraint – small RCTs and non-randomised controlled trials, few comparing to equivalent non-constraint controls
 - Multimodal – single case experimental designs and non-randomised trials
- Insufficient evidence to demonstrate clear superiority of constraint vs multimodal approaches or analyse per subgroup
- Minimal use of activity/participation and quality of life outcomes

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COMPARE



COnstraint Induced or **M**ulti-Modal
Personalised **A**phasia **R**Ehabilitation



COMPARE



3 hrs p/day x 2 weeks = 30 hours
3 people in small group
Stratified on aphasia severity: mild, mod, severe

Multi-Modal
Aphasia Therapy



Multi-Modal
Aphasia Therapy



(Low Intensity)

Controls
(Usual Care)

Single-
blinded RCT

3 treatment arms
n=216
2015-2018

Constraint
Induced Aphasia
Therapy



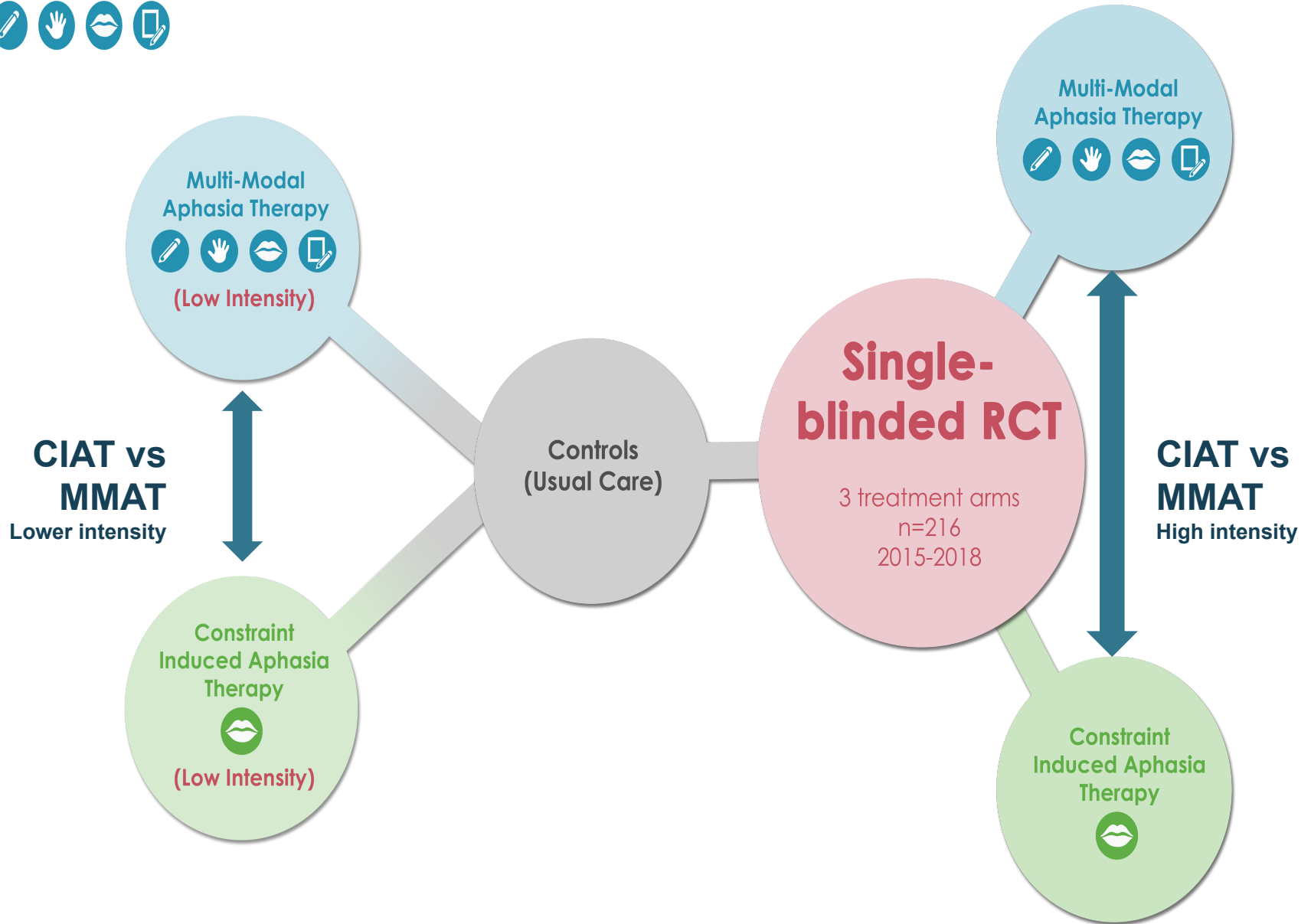
(Low Intensity)

Constraint
Induced Aphasia
Therapy

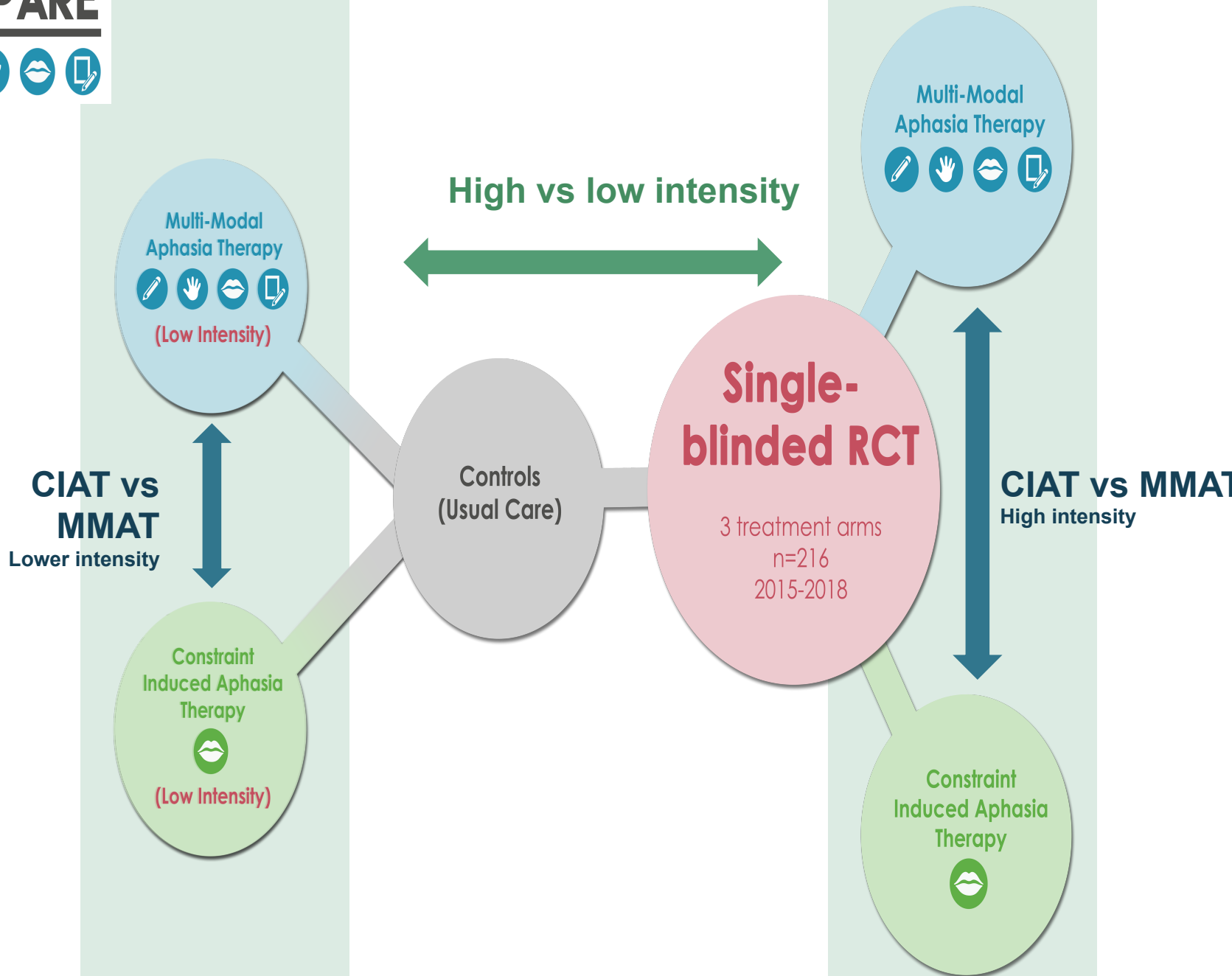


2 hrs p/day x 3 days pw x 5 weeks = 30 hours
3 people in small group
Stratified on aphasia severity: mild, mod, severe

COMPARE



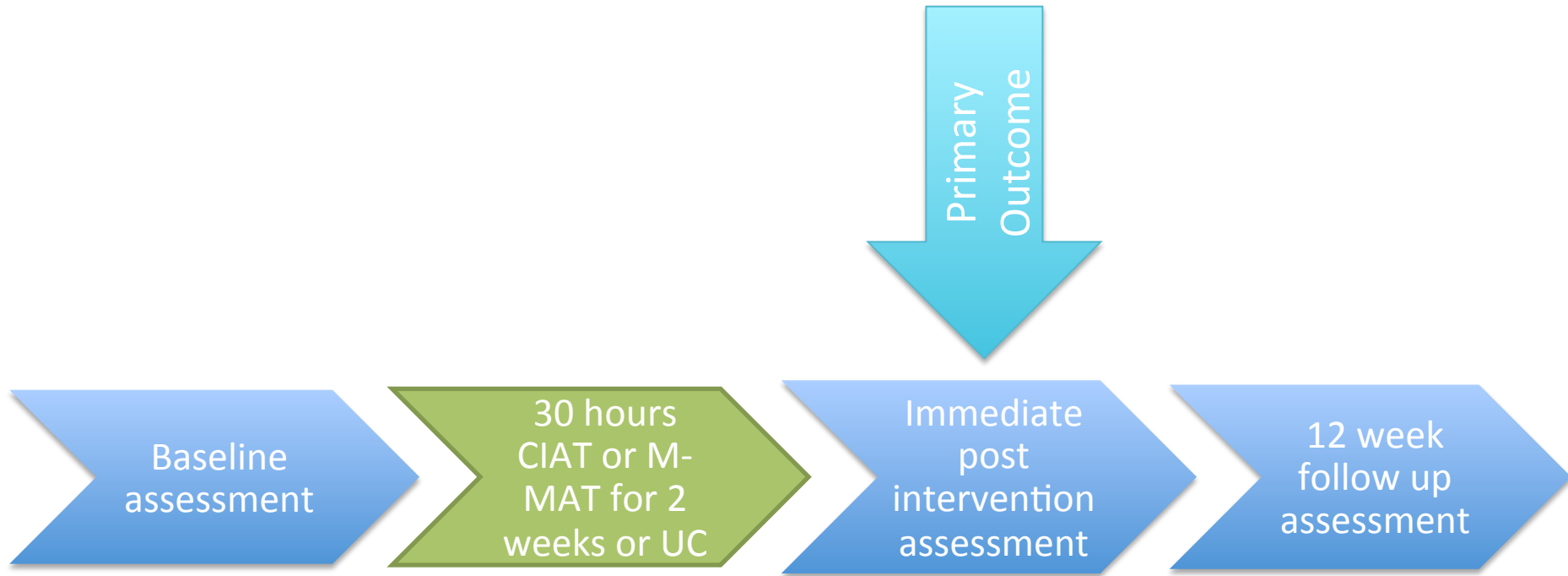
COMPARE



COMPARE

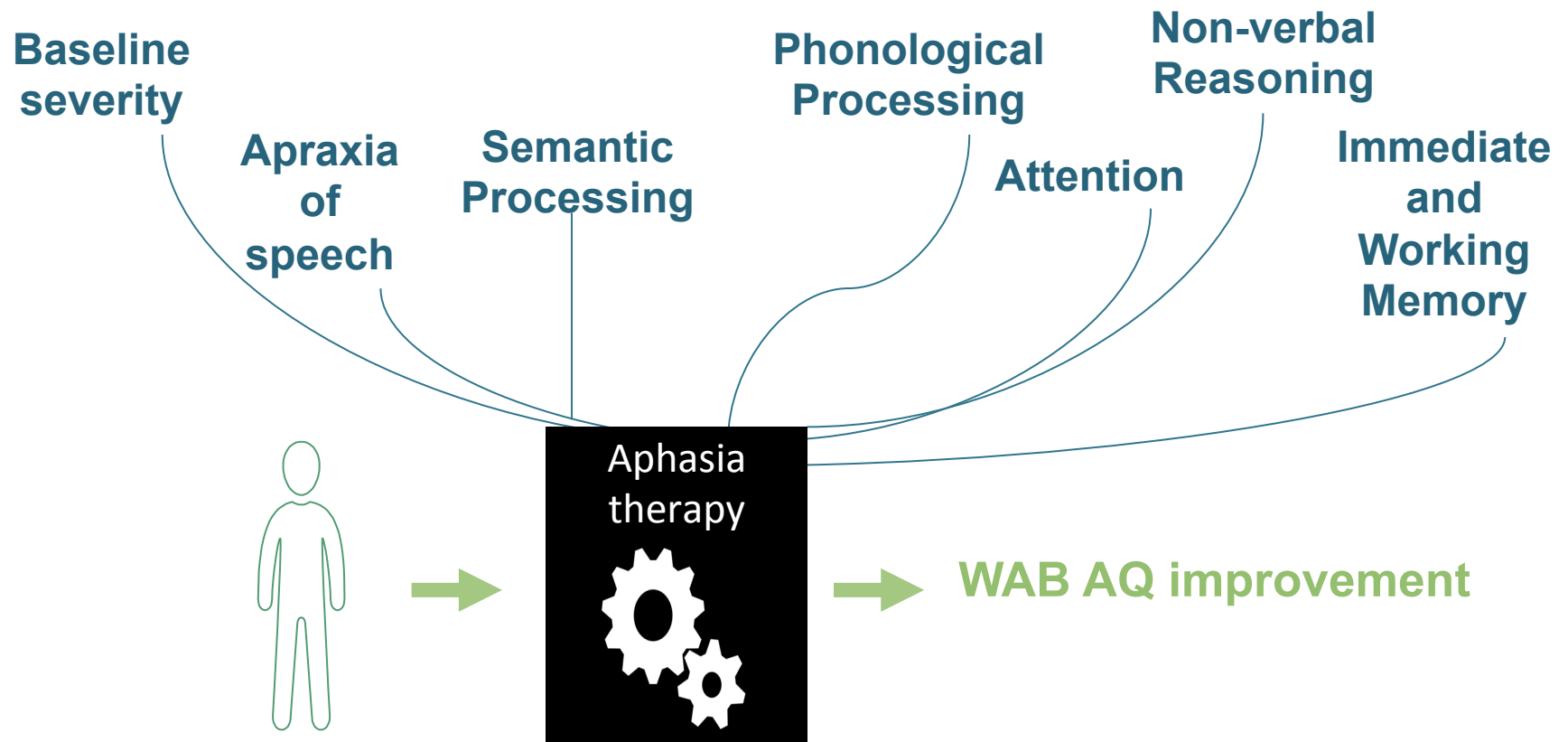


WAB AQ improvement



All assessments are blinded

Secondary Aim: Predictors of performance





Outcome Measures

Domain	Outcome Measures
Aphasia Type and Severity	WAB-Aphasia Quotient* <i>(Kertesz, 2007)</i> WAB-Language Quotient
Functional Communication	Communicative Effectiveness Index <i>(Lomas et al, 1989)</i>
Multi-modal Communication	Scenario Test <i>(van Der Meulen et al, 2010)</i>
Discourse	CIUs picture description and monologue <i>(Nicholas et al, 1995)</i> 10-min conversation with significant other Measure of Participation in Conversation <i>(Kagan et al, 2004)</i>
Quality of Life	SAQOL <i>(Hilari et al, 2003)</i> ; EQ-5D-3L <i>(EuroQol Group, 1990)</i>
Health Economics	Cost effectiveness questionnaire

*** Primary outcome immediately following treatment**



Predictor Assessments

Domain	Assessment
Stroke Severity	Modified Rankin Scale
Non verbal reasoning	Raven's Coloured Matrices
Working Memory	Picture Span Verbal Memory Test
Attention and cognitive flexibility	Test of Everyday Attention
Apraxia of Speech	Apraxia of Speech Rating Scale
Aphasia Severity	WAB-AQ
Semantic Processing	Pyramids and Palm Trees
Phonologic Processing	Error analysis on COMPARE naming battery

Tertiary Aim



Investigate costs of CIAT and M-MAT in comparison to Usual care at high and low intensity

Expected outcomes of COMPARE

- **High level evidence for constraint and multimodal treatments in chronic aphasia**
 - **Impairment**
 - **Activity/participation**
 - **Quality life**
- **Evidence for *comparative effectiveness* of constraint and multimodal treatments**
- **Evidence for intensity in chronic aphasia**
- **Evidence of cost effectiveness of intensive and non-intensive therapy**

Expected outcomes of COMPARE

- **Contribute to evidence base for clinicians' decision making**
 - **Costs**
 - **Treatment response predictors**

Progress on COMPARE

- **Randomised 36 participants to date**
- **Expecting data collection completed by June 2019**

SUMMARY



- **Constraint** and **multimodal** aphasia therapies show **positive** effects at acute, sub-acute and chronic phases
- Doses of **30 hours over 2 or 3 weeks** have shown **positive** effects
- **Maintenance** data are **needed**
- Data on **functional communication** and **participation** measures are **needed**
- **No compelling evidence** to suggest **constraint therapies are superior to multimodal** when given in a socially relevant interaction and similar dose
- **Sub group analysis** likely to be useful **for individual prescription**



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**Aphasia
Lab**

Maintenance in aphasia therapy

The Cochrane collaboration review – 2016

Aim: to assess the effects of speech and language therapy (SLT) for aphasia following stroke

SLT vs No therapy



Immediate results: SLT > No SLT



Follow-up results : SLT = No SLT

Follow-up durations in Months Chronic aphasia – 10 trials

0-1m	1-2m	3m	12M
10%	50%	30%	10%



(Brady, Kelly, Godwin, Enderby and Campbell, 2016)

Intensive treatment?
We may have a problem



Intensive practice makes people improve rapidly but forget rapidly as well

May need maintenance doses to preserve gains from intensive programs

The level of maintenance (retention)

19 intensive programs included follow-up data at 12, 24, 28, 32 weeks

Decline	Percentage of studies
At least one outcome measure	58% (11/19)
Primary outcome measure	44% (8/18)

The level of maintenance at 24 weeks

- 3/4 studies reported good maintenance after 24 weeks
- All 3 included additional therapy/practice (Barthel et al, 2008; Johnson et al, 2014; Meinzer et al, 2005)

Original intensive therapy = **30hrs / 2 weeks**

Additional therapy = **36hrs / 6 months (1.5hrs /week)**