The long and winding road to the COMPARE RCT: multi-modality communication in aphasia and what CIAT/ILAT isn’t

Miranda L. Rose, PhD
Before I begin....thank you

Lucy Dipper, Madelaine Cruice and Rachel Holland for the invitation to speak
Ben Cope for travel arrangements
My thesis

Human communication is multimodal
- Speech, reading, writing, drawing, gesture, prosody, body posture
My thesis

Human communication is multimodal

Verbal approaches have dominated aphasia therapy research and practice
- Listening, speaking, reading, writing activities
Human communication is multimodal

Verbal approaches dominate aphasia therapy

To prevent learned non-use constraint approaches focused on speech comprehension and production

- Requesting, naming, confirming picture names, social interaction
- Visual barriers to minimise nonverbal communication
My thesis

What is *non-use* in human communication given its multimodal nature?

- Not just not talking....perhaps its not gesturing, not writing, not drawing, not using body language
My thesis

What is non-use in human communication given its multimodal nature?

Gesture, drawing, reading, writing approaches efficacious

- No evidence of harm
- Evidence of benefit
My thesis

We should be employing multimodal approaches & cueing

• Perhaps particularly for subgroups
• → COMPARE trial
Every new idea starts somewhere
• It all started with Joan.......1981: new graduate sole SLP in rural hospital

• 72 year old woman; severe Broca’s aphasia; dense right hemiplegia; 5 years post stroke; living at home with husband; large extended family; little or no speech; independent in most ADLs but communication activity significantly restricted

• What should I do?
• SPA Conference Brisbane
• Madge Skelly’s AMER-IND
Overview of the talk

1. Recap principles of neuroplasticity and intensive treatments

2. Review constraint induced and multimodal approaches to aphasia intervention
   – Background to their development and current practices
   – evidence for these approaches

3. Why 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

(Kleim & Jones, 2008)
# 10 Main Principles of Neuroplasticity

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

## Table 1. Principles of experience-dependent plasticity.

<table>
<thead>
<tr>
<th>Principle</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Use It or Lose It</td>
<td>Failure to drive specific brain functions can lead to functional degradation.</td>
</tr>
<tr>
<td>2. Use It and Improve It</td>
<td>Training that drives a specific brain function can lead to an enhancement of that function.</td>
</tr>
<tr>
<td>3. Specificity</td>
<td>The nature of the training experience dictates the nature of the plasticity.</td>
</tr>
<tr>
<td>5. Intensity Matters</td>
<td>Induction of plasticity requires sufficient training intensity.</td>
</tr>
<tr>
<td>6. Time Matters</td>
<td>Different forms of plasticity occur at different times during training.</td>
</tr>
<tr>
<td>7. Salience Matters</td>
<td>The training experience must be sufficiently salient to induce plasticity.</td>
</tr>
<tr>
<td>8. Age Matters</td>
<td>Training-induced plasticity occurs more readily in younger brains.</td>
</tr>
<tr>
<td>9. Transference</td>
<td>Plasticity in response to one training experience can enhance the acquisition of similar behaviors.</td>
</tr>
<tr>
<td>10. Interference</td>
<td>Plasticity in response to one experience can interfere with the acquisition of other behaviors.</td>
</tr>
</tbody>
</table>
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)
• Led to the development of *Constraint-induced movement therapy* for chronic stroke motor impairments (CIMT; Taub 2002)

• 4 main principles:

  1. Overcoming non-use by constraining non-affected limb with sling/splint
  2. Massed practice- several hours per day x 2+ weeks
  3. Shaping- difficulty of task is gradually increased
  4. Behaviourally relevant treatment settings to enhance transfer of learning
Constraint induced movement therapy (CIMT) → Constraint induced aphasia therapy (CIAT)
• 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 the CIMT principles to address the non-use→ Constraint Induced Aphasia Therapy
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 (Johnson, Taub, et al 2014)
  Enhanced protocol: variety of tasks; increasing the dose; transfer package
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

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

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
Typical hierarchy of difficulty: gradual increase during therapy

Clock?
Pass clock?
Could you pass the clock?
Could you pass the blue clock?
Joe, could you please pass the blue clock?
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
  - 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 \(\rightarrow\) increases dysfluency and word retrieval difficulty

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 the most 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 wide array of 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 vs current research protocols and their evidence
Constraint studies (26)  
(Pierce, O’Halloran, Togher, Rose)

Multimodal self-cueing allowed?

<table>
<thead>
<tr>
<th>Explicitly banned</th>
<th>Permitted</th>
<th>??</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>6</td>
<td>18</td>
</tr>
</tbody>
</table>
Constraint studies (26)

Cues provided by clinician?

- Not provided: 1
- Provided: 14
- ??: 11
Releasing the Constraints on Aphasia Therapy: The Positive Impact of Gesture and Multimodality Treatments

Miranda L. Rose

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 an option as constraint-based aphasia treatments.

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 ????
Questions about CIAT

• **Is CIAT for all patients?**
  - Rates of nonresponse poorly reported
  - Approx 15-30% of participants 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 LAGs

  – **Need to understand patient-related factors**
The Weight of Evidence
First Decade of Research on Constrained-Induced Treatment Approaches for Aphasia Rehabilitation

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


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)
## CIAT Effect Sizes

<table>
<thead>
<tr>
<th>Comparison</th>
<th>N</th>
<th>ES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulvermuller 2001 CIAT SLT Distributed</td>
<td>17</td>
<td>Large AAT</td>
</tr>
<tr>
<td>Meinzer 2005 CIAT CIAT Plus</td>
<td>27</td>
<td>Small AAT</td>
</tr>
<tr>
<td>Pulvermuller 2005 CIAT</td>
<td>9</td>
<td>Small AAT</td>
</tr>
<tr>
<td>Richter 2008 CIAT</td>
<td>16</td>
<td>Medium AAT</td>
</tr>
<tr>
<td>Sickert 2014 CIAT (3 wks) SLT</td>
<td>100</td>
<td>20% AAT</td>
</tr>
</tbody>
</table>
• 5 trials compare CI to other therapy
  – FUATAC; Pulvermuller, 2001; VERSE; Wilssens, 2015; Sickert, 2014

• No difference in
  – Functional communication (n=126, 3 trials)
  – Aphasia severity (n=34, 2 trials)
18 pw chronic Broca’s or Global aphasia

ILAT and Naming therapy cross over design

Naming Rx same as ILAT – the social games
Fig. 4 — Aphasia test results. Changes in language performance on the Aachen Aphasia Test (AAT), based on mean scores across all subscales (Panel A) and speech production measures only (Panel B). Individuals with chronic aphasia were randomly assigned to one of two Groups: Intensive Language-Action Therapy (ILAT) administered prior to Naming Therapy, or vice versa. Patients were tested at three points in Time: before treatment onset ($T_1$), after the first treatment ($T_2$), and after the second treatment ($T_3$). AAT results indicate significant interactions of Time and Group in the first training period [$\Delta(T_2-T_1)$] and in the second training period [$\Delta(T_3-T_2)$], as revealed by repeated-measures analyses of variance ($^* p < .05$; $^{**} p < .01$).
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)
- Phrase repetition drills (25m)
- Language card game (30m)
- Picture description (30m)
- Role play (30m)
- Home skills assignment (5m)
- Post Rx practice and follow up
An Enhanced Protocol for Constraint-Induced Aphasia Therapy II: A Case Series

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

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

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

- 4 participants
- All good improvements on WAB-AQ (mean 13.1)
- Verbal Activity Log changes
• CIAT v Semantic Therapy (BOX) (Visch-Brink, 2001)
• 9 chronic moderate fluent aphasia
  – (Wernickes; Transcortical Sensory
• 4 BOX; 5 CIAT
• Sig improvements from both but treatment specific effects
  – BOX→ better language comprehension and semantics
  – CIAT→ better language production and phonology
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

<table>
<thead>
<tr>
<th>Follow-up durations in Months</th>
<th>Chronic aphasia – 10 trials</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1m</td>
<td>10%</td>
</tr>
<tr>
<td>1-2m</td>
<td>50%</td>
</tr>
<tr>
<td>3m</td>
<td>30%</td>
</tr>
<tr>
<td>12M</td>
<td>10%</td>
</tr>
</tbody>
</table>

(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.

Manipulations that maximize performance during training can be detrimental in long term.

(Schmidt and Bjork, 1992)
The level of maintenance (retention)

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

<table>
<thead>
<tr>
<th>Decline</th>
<th>Percentage of studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>At least one outcome measure</td>
<td>58% (11/19)</td>
</tr>
<tr>
<td>Primary outcome measure</td>
<td>44% (8/18)</td>
</tr>
</tbody>
</table>
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)
Multi-Modality Approaches to Aphasia Intervention
Principles underlying multi-modal treatment approaches

• Human communication is multi-modal
  • We speak, gesture, write, read, draw, act out in everyday life
  • Unlike the idea of one limb being dominant and the other not usually being involved in a specific act (e.g., brushing your teeth), gesture, writing, reading etc are not “compensatory” in everyday life- they are inherent to successful and natural communication
Principles underlying multi-modal treatment approaches

• Neural networks are 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)
• Re-establishing language and speech with the aide of **previously used multimodal cues and unimpaired brain networks** 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
Woodall & Folger investigated the **encoding specificity principle** and found when a gesture is presented simultaneously with a sentence, the gesture can later be used to gain access to the mental representation of the sentence, thus the gesture is a retrieval cue.

Sentences learnt with gestures showed **less decay over time** than those without gesture, particularly if the gesture contained similar semantic properties, especially with iconic gestures rather than beats.

(Woodall and Folger 1981; 1985)
Long history of successful cueing in word retrieval therapy (Nickels, 2002)

Writing

Reading/orthographic

Music

Gesture

Drawing
Pair a damaged system with an intact system in tasks to restore or improve the damaged system.
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
  - Sig 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, de Ruiter, Rose, AJSLP in press; Rose, Mok & Sekine, 2016; van Nispin et al submitted)

- So perhaps these gestures are useful in aphasia intervention??
Series of SCEDs (2001-2011)

• **Treatment Comparison research**
  – Gesture
  – Verbal
  – Combined gesture + verbal therapy
  – Nouns; Verbs
  – Trained items, untrained items, picture description, procedural discourse, semi-structured conversation

• **In detailed single subject multiple baseline designs**
  – Detailed cognitive neuropsychological profiles
  – Acquisition data across time
  – Maintenance data
The efficacy of repetition, semantic, and gesture treatments for verb retrieval and use in Broca’s aphasia

Michelle Boo and Miranda L. Rose
La Trobe University, Bundoora, Victoria, Australia
Boo and Rose (2011)

- 2 pw chronic post stroke aphasia
  - GF: 63 yo severe Broca’s aphasia (WAB-AQ 39), apraxia of speech, multiple level word retrieval impairments
  - PF: 57 yo moderate Broca’s aphasia (WAB-AQ 75.8), phonologic level word retrieval impairments
• Therapy
  1. Repetition: say word 3 times
  2. Gesture: produce related gesture while naming
  3. Semantic: SFA
  4. Semantic + Gesture: combined SFA and gesture production

• 40 hrs treatment
What (______ is needed to do this)

Who (______ is needed to do this)

Where (This is done ______________)

How (______ moves in this action)
Figure 1. Standard case charts for GF.
Boo and Rose (2011)

- Significantly improved naming
  - Semantic + Gesture treatment → better acquisition and maintenance for GF
  - Repetition treatment best for PF
A systematic review of gesture treatments for post-stroke aphasia

Miranda L. Rose\textsuperscript{1,2}, Anastasia M. Raymer\textsuperscript{3}, Lucie E. Lanyon\textsuperscript{1,2}, and Michelle C. Attard\textsuperscript{1,2}

\textsuperscript{1}Department of Human Communication Sciences, La Trobe University, Melbourne, Australia
\textsuperscript{2}NHMRC CCRE in Aphasia Rehabilitation, Brisbane, Australia
\textsuperscript{3}Department of Communication Disorders, Old Dominion University, Norfolk, VA, USA

\textit{Background:} Gesture is often used as a modality to promote recovery of communication in aphasia, both as a compensation device and as a facilitator of language recovery. To date, there has been no systematic analysis of the quantitative effects of gesture training for aphasia in light of the quality of the research methods undertaken.

\textit{Aims:} The aim of the current project was to systematically evaluate the scientific evidence for the effects of symbolic and nonsymbolic gestural training in post-stroke aphasia. Specifically, we aimed to evaluate the effects of gesture treatment for measures of verbal and nonverbal communication.
177 potential citations for inclusion in the systematic review

140 not included because:
- Not a treatment study
- Did not address gesture treatment in aphasia

37 were initially included after abstract review

14 not included because:
- No data available from gesture treatment phase
- Case study with no experimental control and no evidence of multiple probe or assessment data

23 studies were included in the final analysis

Figure 1. Process for identification of included studies.
Systematic Review Results

• Gesture training alone had non sig. effects on verbal production and non-symbolic gesture training inconclusive

• Combined verbal + gesture training efficacious
  • shows advantage over verbal alone for some individuals
  • particularly for maintenance of improved skills

• Sig gain in gesture production for trained gestures

• No evidence of negative impact of combined verbal + gesture training
Multi-modality communication/stimulation not harmful to language (re)-learning

• Taken together, there is little current evidence to support the idea that learning or reestablishing language through multi-modal cueing is harmful AND

• If language cannot be reestablished in aphasia, the use of multi-modal supports during the failed language retraining may provide the basis for the development of total communication strategies ⇒ efficient intervention
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

- Aim to directly *contrast CIAT/ILAT to M-MAT*

(Rose & Attard, 2011)
Multi-Modality Aphasia Therapy (M-MAT)

Shares 3 main components with CIAT/ILAT:

- **Intensive**: massed practice; 30 hours over 2 weeks
- **Shaping** of responses
- **Social** imperative to communicate in group using LAGs

X No constraint to verbal modality

- Highly structured multi-modal cued protocol
- Goal is *spoken production of targets* via multi-modal support
- Speak, gesture, draw, write, and read the targets
- *Verbal production elicited at each multi-modal step*

(Rose & Attard, 2011)
<table>
<thead>
<tr>
<th>Feature</th>
<th>CIAT</th>
<th>MMAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensive training</td>
<td>✔️ 15 hours/week, 2 weeks</td>
<td>✔️ 15 hours/week, 2 weeks</td>
</tr>
<tr>
<td>Communicatively relevant</td>
<td>✔️ Communication Action Games</td>
<td>✔️ Communication Action Games</td>
</tr>
<tr>
<td>Shaping of responses</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Constrained to verbal</td>
<td>Constrained to verbal No cueing</td>
<td>Multimodal cues - gesture, drawing, writing, reading</td>
</tr>
</tbody>
</table>
## CIAT Plus vs M-MAT

<table>
<thead>
<tr>
<th></th>
<th>Attard et al, 2013</th>
<th>Rose et al, 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N</strong></td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>56.5 (SD=2.12)</td>
<td>58.09 (39-74 SD= 10.73)</td>
</tr>
<tr>
<td><strong>Time post on set</strong></td>
<td>82, 117</td>
<td>17–88</td>
</tr>
<tr>
<td><strong>Aphasia type</strong></td>
<td>Broca's</td>
<td>4 Anomic, 6 - Broca's, 1- Conduction</td>
</tr>
<tr>
<td><strong>Aphasia severity</strong></td>
<td>Severe</td>
<td>4- Mild, 6- Moderate, 1- Severe</td>
</tr>
</tbody>
</table>

### Single-subject multiple baseline designs for treatment type (with a cross-over)

- **Baseline**
  - Assessment (M-MAT)
  - Assessment (CIAT plus)

- **2 Weeks**
  - Assessment (CIAT plus)
  - Assessment (M-MAT)

- **2 Weeks**
  - Assessment (M-MAT)
  - Assessment (CIAT plus)

- **4/6 week Assessment**
  - Assessment

- **3 Month Assessment**
Outcome measures

- WAB-AQ
- Boston Naming Test
- 180 noun/verbs (3)
- 20-min conversation
- CETI
- SAQOL-39
- Scenario Test

Descriptor Measures
- Pyramid & Palm Trees
- Ravens Matrices
- Rey Figure
Results.....

• Aphasia severity significantly reduced at the
  – 1-month follow-up (M=71.55, SD=17.67) as compared to pre-treatment (M=66.27, SD=18.30); t(10)= 3.474, p=.006)
  – 3-month follow-up (M=70.48, SD=16.98); t(10)= 4.276, p=.002)

• No significant difference between 1- and 3-month follow-up WAB AQ scores indicating maintenance of improvement for the group (t(10)= 0.852, p=.414)
Mean effect sizes for confrontational naming – treated items

<table>
<thead>
<tr>
<th>CIAT</th>
<th>MMAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>d = 8.58</td>
<td>d = 8.00</td>
</tr>
</tbody>
</table>

Differential response

• 5 participants better outcomes after MMAT
• 4 participants better outcomes after CIAT Plus

No significant correlations between ES’s calculated from combined noun and verb naming probes and

• Aphasia severity (WAB AQ) \( r_s = -.282, p=0.401 \)
• Auditory comprehension (WAB Auditory Comprehension) \( r_s = -.236, p=0.484 \)
• Semantic knowledge (Pyramids and Palm Trees), \( r_s =-.105, p=0.759 \)
• Non-verbal reasoning (Raven’s Matrices) \( r_s =-.195, p=0.565 \)
• Visual memory (Rey Figure delayed) \( r_s =-.436, p=0.18 \)
Results: *Participant satisfaction*

- All generally satisfied with 2 treatments

- 6 preferred M-MAT
  - Enjoyed multi-modal activities, liked solving communication breakdown in multiple ways which may be beneficial in future repair, disliked barriers

- 3 preferred CIAT Plus
  - Liked repetition and verbalisation focus, one found barriers took pressure off

1. The treatment was **enjoyable**

   ![Rating Scale Image]
TAU-U comparisons

No change

All points improved

<table>
<thead>
<tr>
<th>Constraint</th>
<th>LL</th>
<th>Tau-U</th>
<th>UL</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rose 2013</td>
<td>0.020</td>
<td>0.240</td>
<td>0.460</td>
<td>3.3</td>
</tr>
<tr>
<td>Karland 2012</td>
<td>0.266</td>
<td>0.692</td>
<td>1.000</td>
<td>1.2</td>
</tr>
<tr>
<td>Attard 2013</td>
<td>0.200</td>
<td>1.000</td>
<td>1.000</td>
<td>0.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Combined Multimodal</th>
<th>LL</th>
<th>Tau-U</th>
<th>UL</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rose 2013</td>
<td>0.446</td>
<td>0.684</td>
<td>0.921</td>
<td>2.5</td>
</tr>
<tr>
<td>Attard 2011</td>
<td>0.149</td>
<td>0.813</td>
<td>1.000</td>
<td>0.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gesture</th>
<th>LL</th>
<th>Tau-U</th>
<th>UL</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rayner 2006</td>
<td>0.528</td>
<td>0.670</td>
<td>0.812</td>
<td>21.0</td>
</tr>
<tr>
<td>Rose Susserich 2002</td>
<td>0.543</td>
<td>0.731</td>
<td>0.918</td>
<td>14.1</td>
</tr>
<tr>
<td>Rayner 2012</td>
<td>0.045</td>
<td>0.252</td>
<td>0.460</td>
<td>13.6</td>
</tr>
<tr>
<td>Boo 2011</td>
<td>0.616</td>
<td>0.857</td>
<td>1.000</td>
<td>12.8</td>
</tr>
<tr>
<td>Rose Douglas 2002</td>
<td>0.482</td>
<td>0.738</td>
<td>0.995</td>
<td>7.6</td>
</tr>
<tr>
<td>Ferguson 2012</td>
<td>-0.341</td>
<td>-0.043</td>
<td>0.256</td>
<td>4.3</td>
</tr>
<tr>
<td>Rose Douglas 2008</td>
<td>0.633</td>
<td>0.913</td>
<td>1.000</td>
<td>5.3</td>
</tr>
<tr>
<td>Rodriguez 2008</td>
<td>0.175</td>
<td>0.464</td>
<td>0.753</td>
<td>4.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Writing</th>
<th>LL</th>
<th>Tau-U</th>
<th>UL</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hillis 1989</td>
<td>0.669</td>
<td>0.997</td>
<td>1.000</td>
<td>4.7</td>
</tr>
<tr>
<td>Wright 2000</td>
<td>0.612</td>
<td>0.896</td>
<td>1.000</td>
<td>3.1</td>
</tr>
<tr>
<td>Beeson 2006</td>
<td>0.539</td>
<td>0.864</td>
<td>1.000</td>
<td>1.8</td>
</tr>
</tbody>
</table>
• Australian national 3 arm RCT (n=216)
  • CIAT Plus
  • M-MAT
  • Usual care

• Predictors of response
  • Large sample across full severity range may reveal patterns

• Economic analyses

• Discourse outcomes- significant other

• Sub study investigates intense vs non-intense protocol
Method

3-arm prospective RCT

- Constraint-induced aphasia therapy
  - n=72
- Multi-modality aphasia therapy
  - n=72
- Usual Care
  - n=72

6 months -15 years post single LH stroke

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

Baseline assessment

30 hours CIAT or M-MAT intervention over 2 weeks or Usual Care

Immediate Post intervention assessment

12 week follow up assessment

Primary Outcome
Sub-study

3-arm prospective RCT

Constraint-induced aphasia therapy
n=72

Multi-modality aphasia therapy
n=72

Usual Care
n=72

Distributed CIAT
n=36

Distributed M-MAT
n=36

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
Overview of the trial

1. Pre-screening evaluation
   - Recruiter

2. Consent and screening visit
   - Blinded Assessor

3. Randomisation
   - Centralised process

4. Baseline assessments
   - Blinded Assessor

5. Treatment period
   - Intervention therapist

6. Post intervention assessment
   - Blinded Assessor

7. 12 week follow up assessment
   - Blinded Assessor
Overview of Predictor and Outcome Measures

**WAB-AQ**
- WAB – Part 2
- Naming Battery (180)

**Additional:**
- A simplified handedness questionnaire
- Health economic survey and diary

**Scenario test**
- Connected speech measures
- CETI

**Additional:**
- SADQ-10
- EQ-5D-3L
- SAQOL-39g

**Pyramids and Palm Trees**
- Picture Span Verbal Memory Test
- Apraxia Severity Rating Scale

**Test of Everyday Attention**
- Raven’s Coloured Progressive Matrices
- Test of Everyday Attention
Timelines

2015
- Start up
- Ethics approvals
- REDCap

2016-2017
- Recruitment
- Staff training
- Assessment + Treatment

2018
- Analysis and Dissemination

4 year NHMRC funded trial
www.latrobe.edu.au/compare
CONTACT

@COMPAREAphasia

latrobeaphasia

Email: compareaphasia@latrobe.edu.au
What should I have done?

Almost there..........