Technological applications in aphasia therapy

Jane Marshall

Overview

- Rationales for using technology
- Examples of
  - Language Remediation
  - Compensation
  - Treatment of non verbal modalities
  - Remote Delivery
  - Virtual Reality
- Final Conclusions

Rationales

- Efficiency savings
- Delivery of an intensive treatment dose
- Autonomy and self determination for the person with aphasia
- Opportunities for personalisation of therapy materials
- May be more acceptable to clients than paper and pencil materials
- May enable the person to compensate for their impairment
- Opportunities for social inclusion and 'authentic' uses of language
- Face saving

Language Remediation

Language Remediation

- Computerised delivery of therapy exercises
- Self administered or administered with therapist support
- Can target different aspects of processing and different language modalities
- Can be hierarchically structured and personalised
- Several reports of positive outcomes, e.g. for
  - Word finding (Adrian et al, 2011; Doesborgh et al, 2004; Fink et al, 2005; Laganaro et al 2006; Palmer et al, 2012)
  - Comprehension (Archibald et al, 2009)
  - Reading (Cherney, 2010)
  - Writing (Beeson et al, 2013)
  - Verb and sentence processing (Furnas & Edmonds, 2014; Thompson et al, 2010)
  - Discourse and dialogues (Cherney, 2010; Lee et al, 2009; Nobis-Bosch et al, 2011)
  - Speech (Whiteside et al, 2012)
- Single case, small group and RCT evidence
- Evidence of acceptability to users (Cherney et al, 2011; Palmer et al, 2013)

Example: StepByStep ©

Graded exercises

- Repetition

- Naming

- Spelling

- Word comprehension

- Sentence production
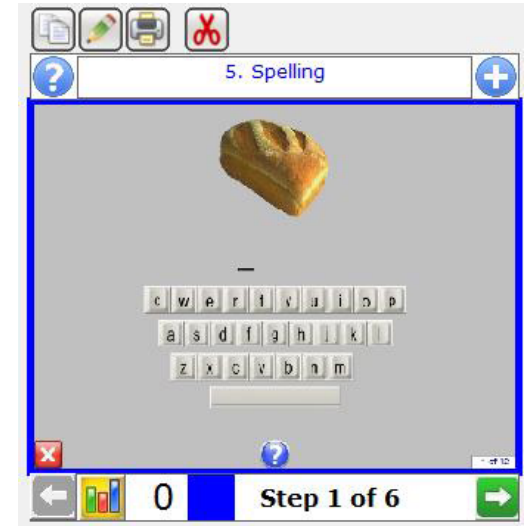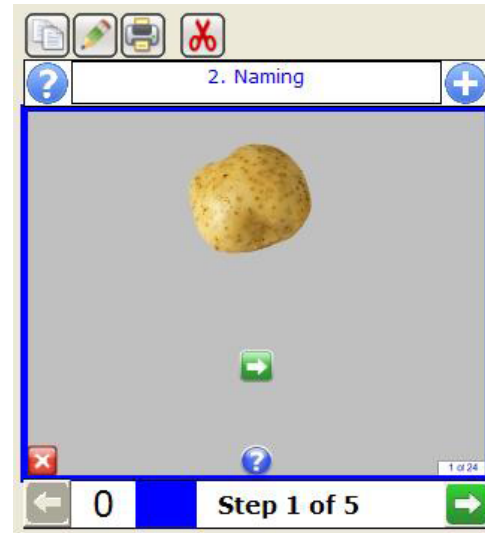
e.g. Mortley, Wade, Hughes & Enderby, 2004; Palmer et al, 2012

Palmer et al 2012

- 34 participants
  - Randomised to intervention and control group

Control group:

Usual care

Communication support groups

Intervention group:

Usual care + Step by Step

Personalised progression through exercises

Supported by volunteer

Advised to practise at least 3 times a week for 20 minutes
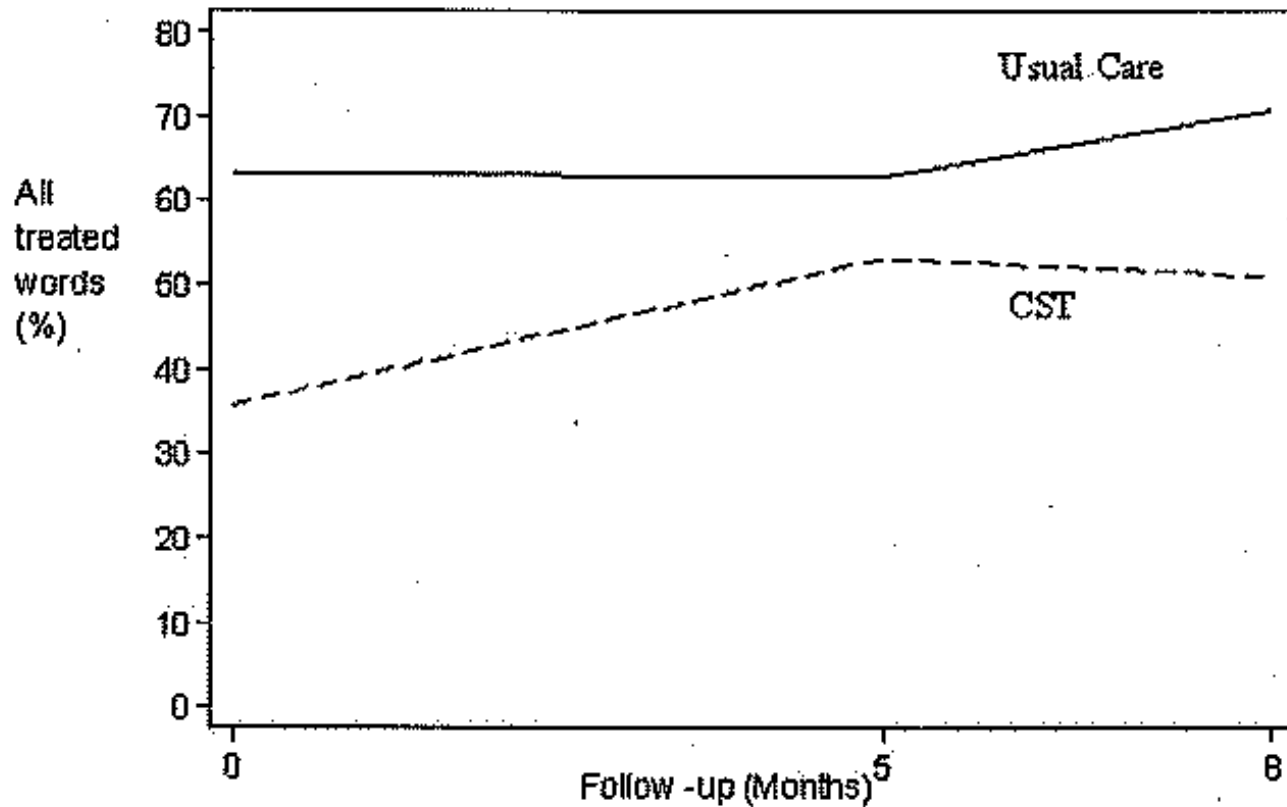
5 months

Results

- 11 people completed the intervention with the recommended intensity
- 4 practised less intensively (of these, 3 had no volunteer support)

  Participants undertook an average of 25 hours independent practice with 4 hours volunteer support and 4 hours 23 minutes SLT input

Improved word retrieval for Intervention Group

Only participants with primary outcome data during follow up (complete cases) included

Figure 2. Percentage of words named correctly in intervention and control groups.

# Compensation

Compensation

- Uses computer
  - To scaffold, rather than remediate output
    - SentenceShaper (Linebarger et al 2000; 2004; 2007)
  - As a communication aid
    - Touchspeak (van de sandt Koenderman et al, 2007)
  - To bypass problems
    - Text to speech software (Bruce et al, 2003; Estes & Bloom, 2011; Caute & Woolf in press)

  Small group and single case evidence

SentenceShaper
(Linebarger et al 2000; 2004; 2007)

- Computer aid that:
  - Stores snippets of recorded speech
  - Replays snippets, when the relevant icon is pressed
  - Allows snippets to be ordered into connected speech:
    - First into sentences
    - Then into narratives
  - Provides lexical supports via side buttons
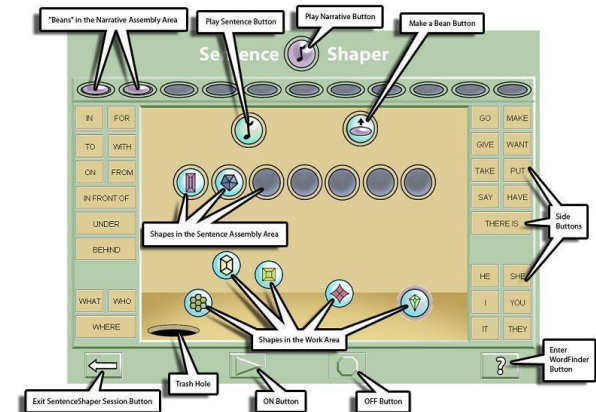
Typical Therapy Programme

- The therapist trains the aphasic person to use the soft ware, e.g:
  - How to record fragments of speech
  - How to order the fragments
  - How to make use of the side buttons

- The aphasic person then practises with SentenceShaper at home

- Regular catch up meetings with the therapist

- Use of the soft ware can be remotely monitored.

Findings

- Practice with SentenceShaper makes speech:
  - More grammatical
  - More informative
- Gains have been observed in aided and *unaided* production; i.e. after a period of practice with SentenceShaper participants produce improved narrative speech even without the aid.

  - (Linebarger et al 2000; 2004; 2007)

TouchSpeak

- Hand held aid to support communication
- Personalised vocabulary of words, and sentences

35 participants show improved performance on Scenario Test following TouchSpeak intervention

(Van de Sandt-Konderman et al, 2007)

Bypassing the Problem

– Use of voice recognition software to treat dysgraphia (Bruce et al, 2003; Estes & Bloom, 2011; Caute & Woolf, 2015)

– Use of e readers to address reading impairments (Caute et al, 2015)

– CommuniCATE project at City

Treatment of non verbal modalities

GeST

Marshall et al, (2013)

9 people with severe aphasia

6 weeks practice with GeST

      3 with weekly therapist support

      3 unsupported

Results

Significant gains in production of treated gestures

Only on gestures practised with therapist support

Remote Delivery

Background and Rationale

- Inadequate therapy services, particularly in the community
  - (Care Quality Commission, 2011; Code & Petherham, 2011)

- Need to serve those who cannot travel to clinics

- Remote delivery via Internet Video Conferencing Technology (IVCT) achieves efficiency while retaining therapist contact
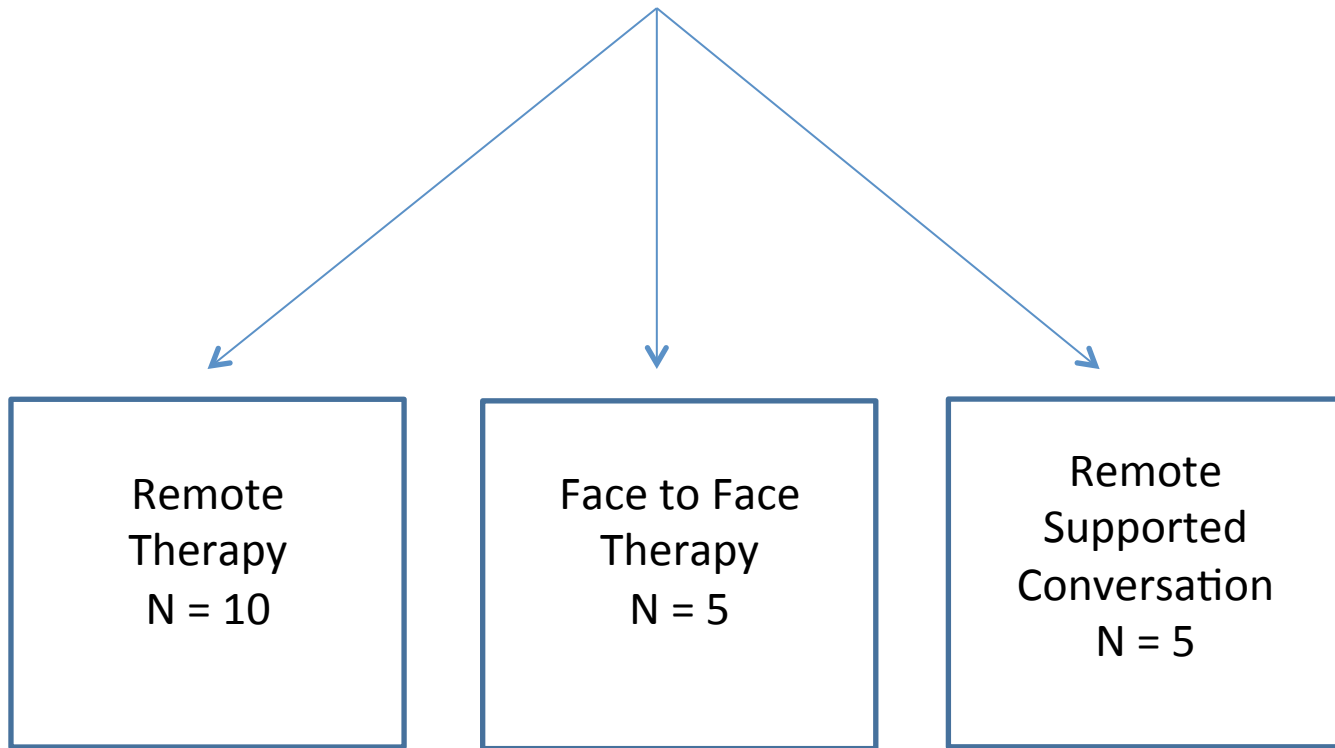
Findings

- Some positive findings for remote aphasia assessment
  - (e.g. Georgeadis et al 2004; Hill et al, 2009)

- Positive findings from studies of remote aphasia therapy using IVCT
  - (Dechene et al, 2011; Fridler et al, 2012; Woolf et al, 2015)

Woolf et al, 2015

- Can the same protocol of word finding therapy be delivered face-to-face and remotely?

- Does therapy improve word production in
  - picture naming?
  - conversation?

- Do gains vary across delivery modes?

20 Participants

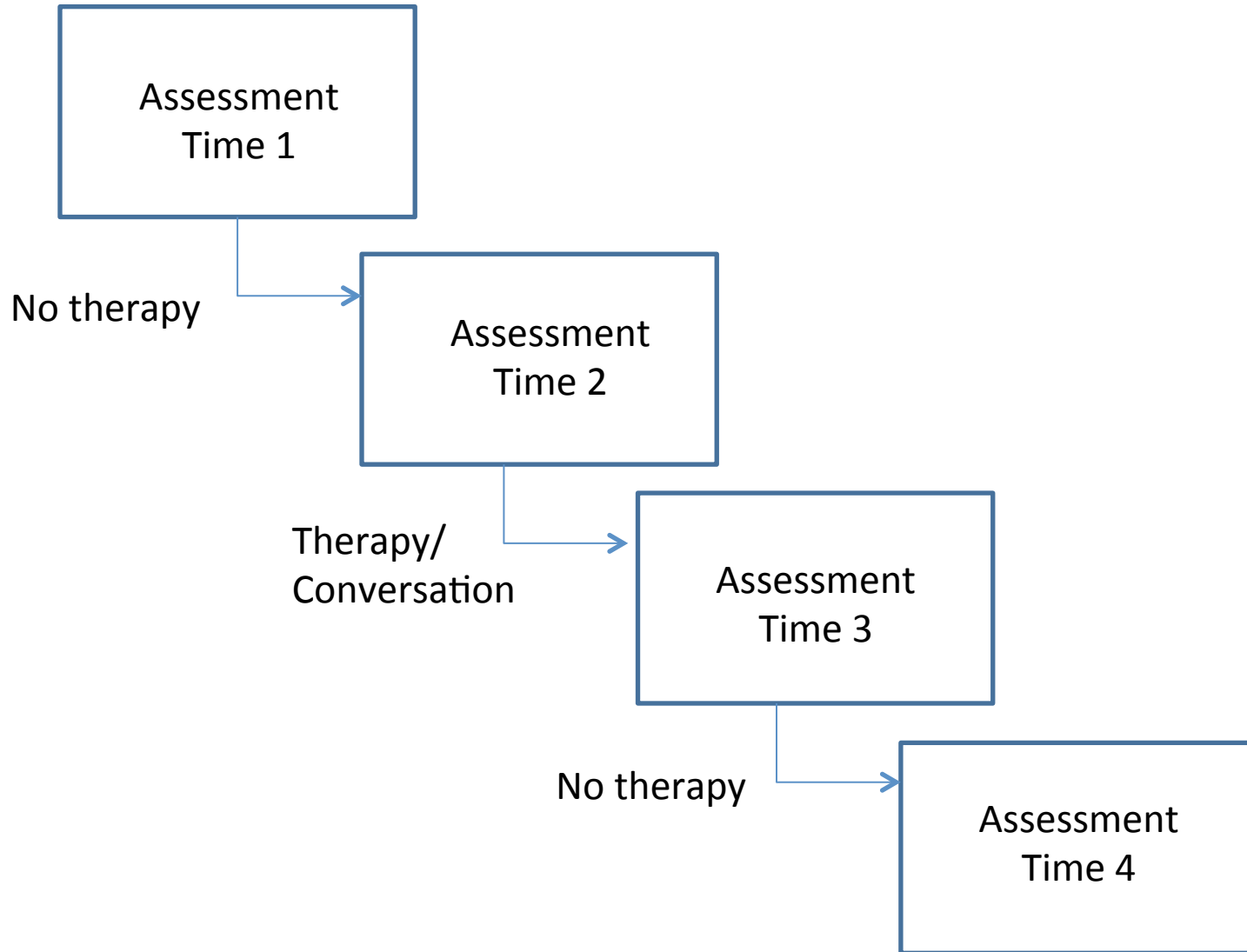| Remote Therapy N = 10 | Face to Face Therapy N = 5 | Remote Supported Conversation N = 5 |

Conditions

- Remote word finding therapy delivered over Facetime

- The same word finding therapy delivered face to face

- Remote supported conversation

- All 8 sessions over 4 weeks

Design

Assessment
Time 1

No therapy →

Assessment
Time 2

Therapy/
Conversation →

Assessment
Time 3

No therapy →

Assessment
Time 4

Outcome Measures

Picture naming assessment conducted at each time point

- 100 items that are difficult to name at baseline

- Words divided into two matched sets:
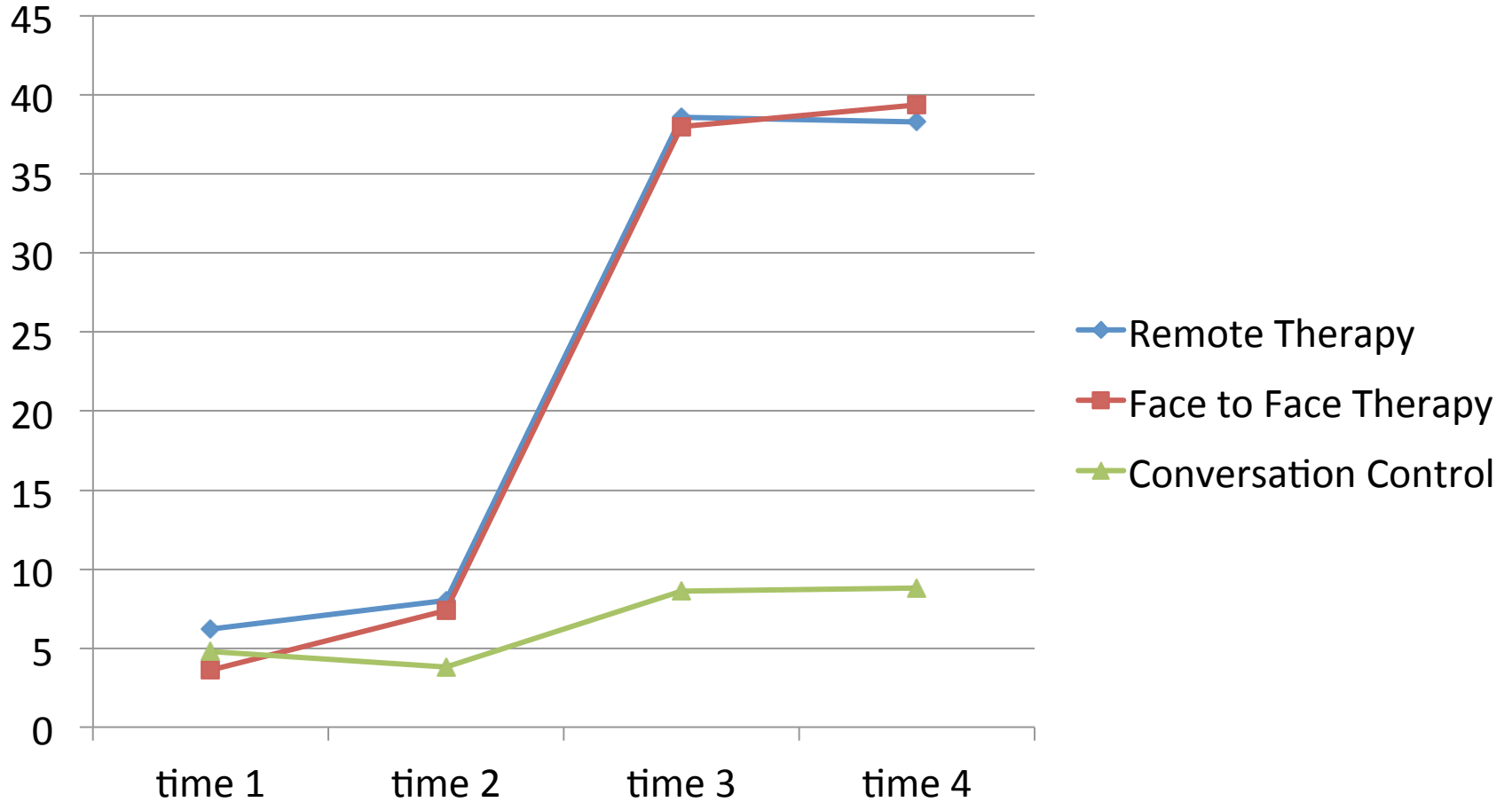 - 50 treated (for those receiving therapy)
  - 50 untreated

Administered by non treating therapist
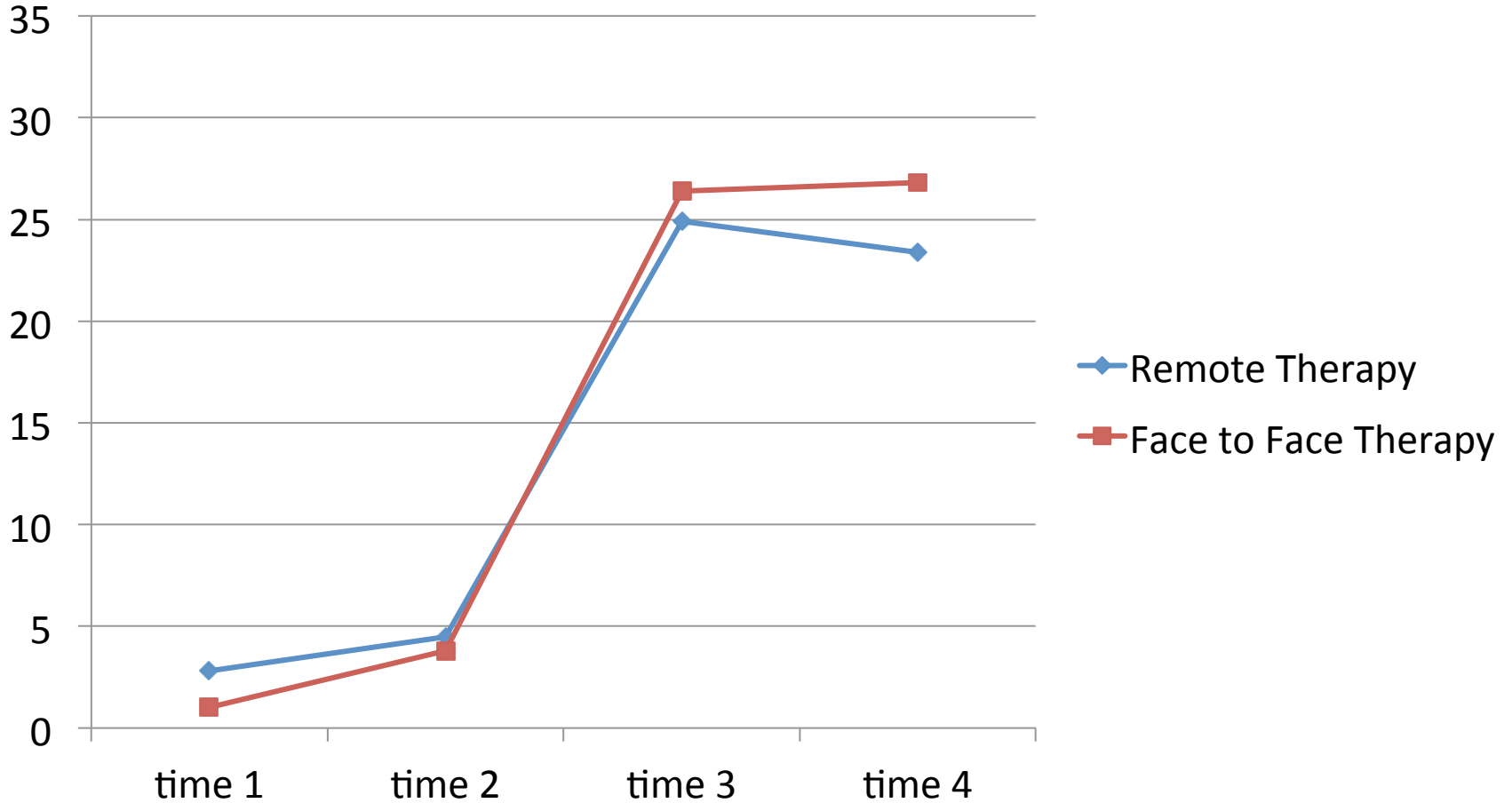
Outcome Measures

Conversation

- 10 minute conversation with a familiar partner at each time point

- Topic unconstrained

- Middle 5 minutes analysed using POWERS procedure (Herbert et al, 2013)
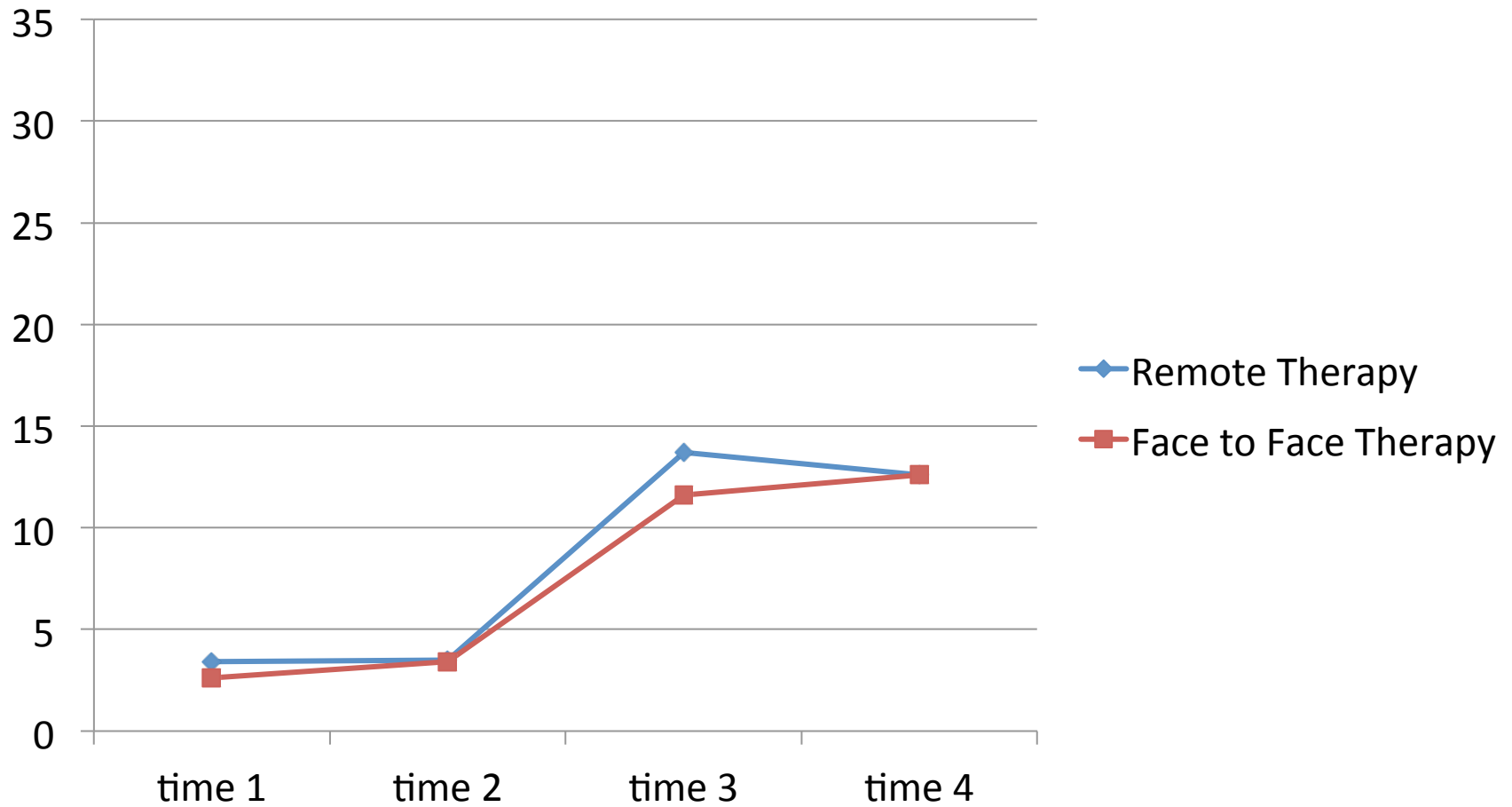
Picture Naming: 100 words

Picture Naming: Treated Words

Picture Naming: Untreated Words

Conversation

- Data analysed for:
  - Number of nouns per turn
  - Number of content words per turn
  - Percentage of turns containing at least one content word (Substantive turns)
  - Number of errors

- No change over time
- No interaction between group and time

Conclusions

- Remote delivery of word finding therapy, using mainstream technology, was feasible

- Participant views were positive and participants easily mastered the technological challenges

- Outcomes were no different from face to face delivery with highly significant benefits for treated words

- Conversation did not benefit, but this was unrelated to delivery mode

# Virtual Reality

Virtual Reality

AphasiaScripts
(Cherney et al, 2012; 2011; Lee et al 2009)

- Practice in personally chosen conversations, such as:
  - Ordering a coffee
  - Talking to a grandchild
- Computer Avatar acts as virtual therapist and conversational partner
- Evidence of improved output with practised scripts and gains on the Burden of Stroke Scale

and see ORLA (Cherney 2010)
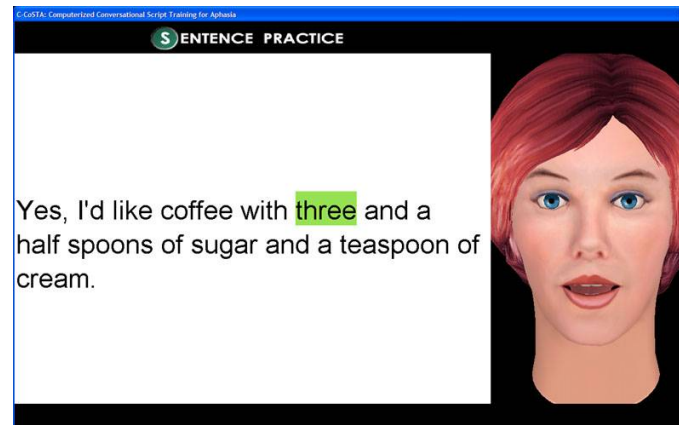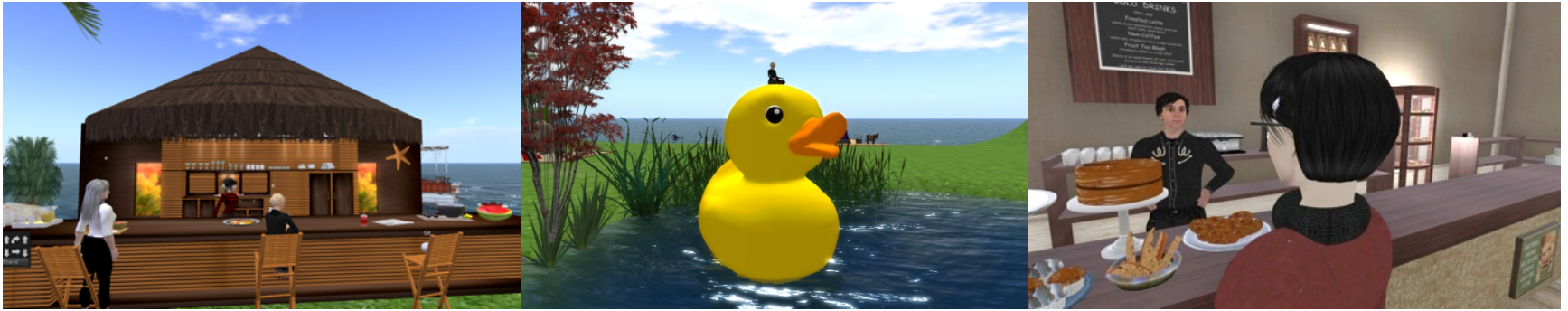
Evaluating the effects of a virtual communication environment for people with aphasia

CITY UNIVERSITY
LONDON

EST 1894

Stroke
association

Study Questions

Can we build a virtual communication environment for people with aphasia?

Will involvement in the environment:
• Benefit the communication skills of 20 people with aphasia?
• Reduce feelings of social isolation?

What are participants views about the environment?

EVA Park

- An enclosed island for people with aphasia (uses Open Sim)

- Developed through participative design sessions with consultants who have aphasia (Wilson et al, 2015)

- Participants represented by avatars

- Communication is speech based, with optional text support

EVA Park

- Contains distinct regions, e.g.:
  - Houses
  - A Cafe
  - A Tropical Bar
  - A Versatile Counter (e.g. for booking a holiday)
  - A Health Centre
  - A Hair Dressers

Intervention

- 20 people with aphasia
  - 5 weeks intervention (in 4 'live' periods)
  - Daily sessions with support workers
  - Personal goals/programme of activities
  - Unlimited independent access

Examples of Goals

- Breaking messages down into manageable segments
- Coping with specific situations, such as:
  - A doctor's appointment
  - Speaking to a receptionist
- Talking in groups
- Giving a speech

Examples of Activities

- Role plays
  - Ordering a drink
  - Getting a hair do
  - Dealing with an incompetent waitress
  - Reporting a suspicious character to the police
  - Holding a board meeting to discuss a new sports centre in Eva Park

Examples of Activities

- Conversation
  - Education and career history
  - Plans for the weekend
  - Past experiences of travel
  - Wife's trip to hospital
  - Experiences in Eva Park

  Weekly group discussions

Examples of Activities

- Eva Actions:
  - Dancing
  - Swimming
  - Visiting the tree houses, boats, light house
  - Fun day (diving, run round the lake and stroke the donkey)

EVA Park fun days

The Design

Recruit and Screen

Time 1

5 weeks access to EVA

Nothing

Time 2

Time 2

Nothing

5 weeks access to EVA

Time 3

Time 3
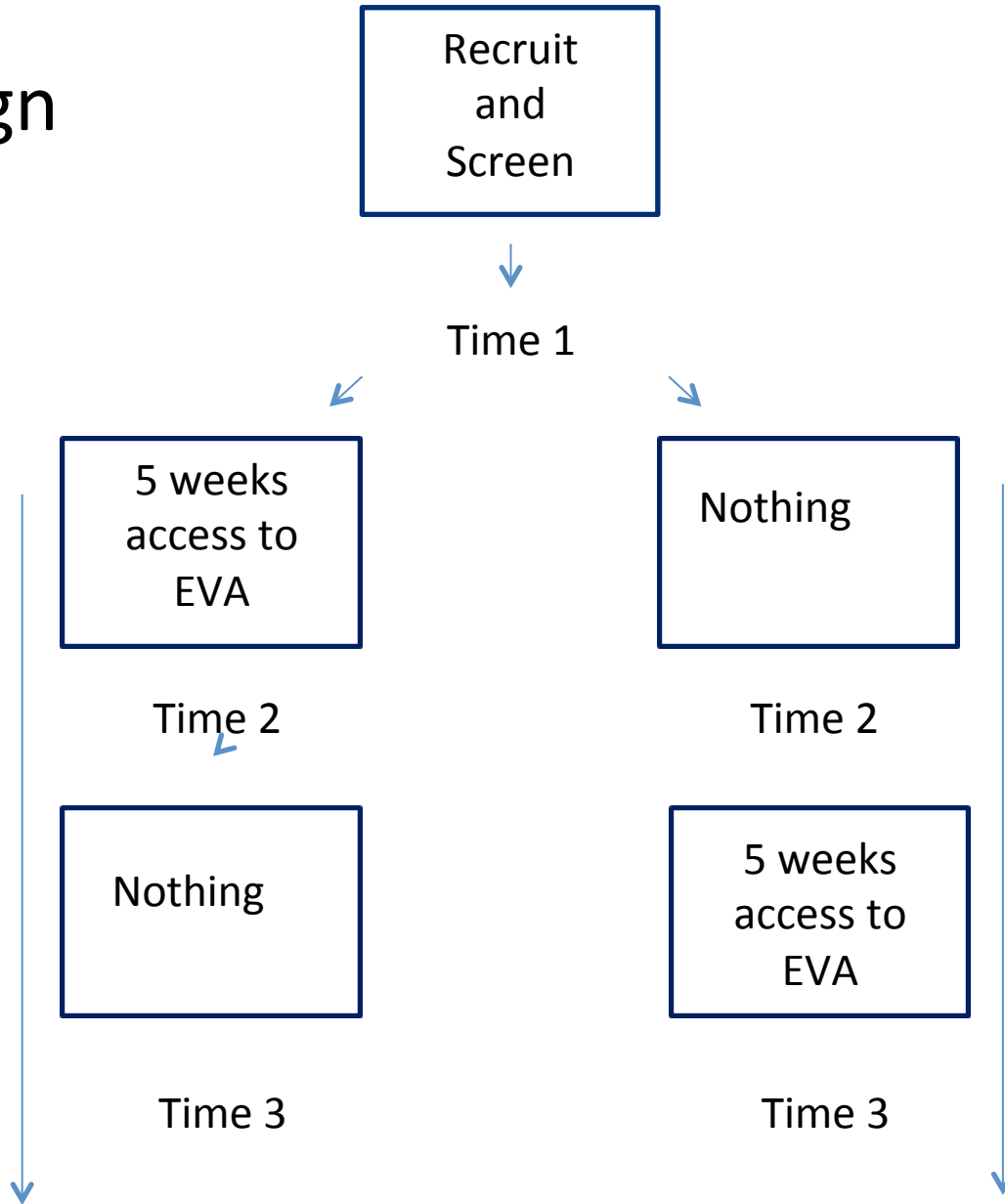
The Results

Communication

- Did Eva Park intervention improve participants' communication skills?
  - CADL (Communication Activities of Daily Living)
  - Naming (Thinking of words in categories)
  - Narrative (Telling a story)
  - Conversation

Good News

- Scores on the CADL improved significantly
- Gains only occurred after Eva Intervention

CADL Scores: Immediate vs Delayed Group
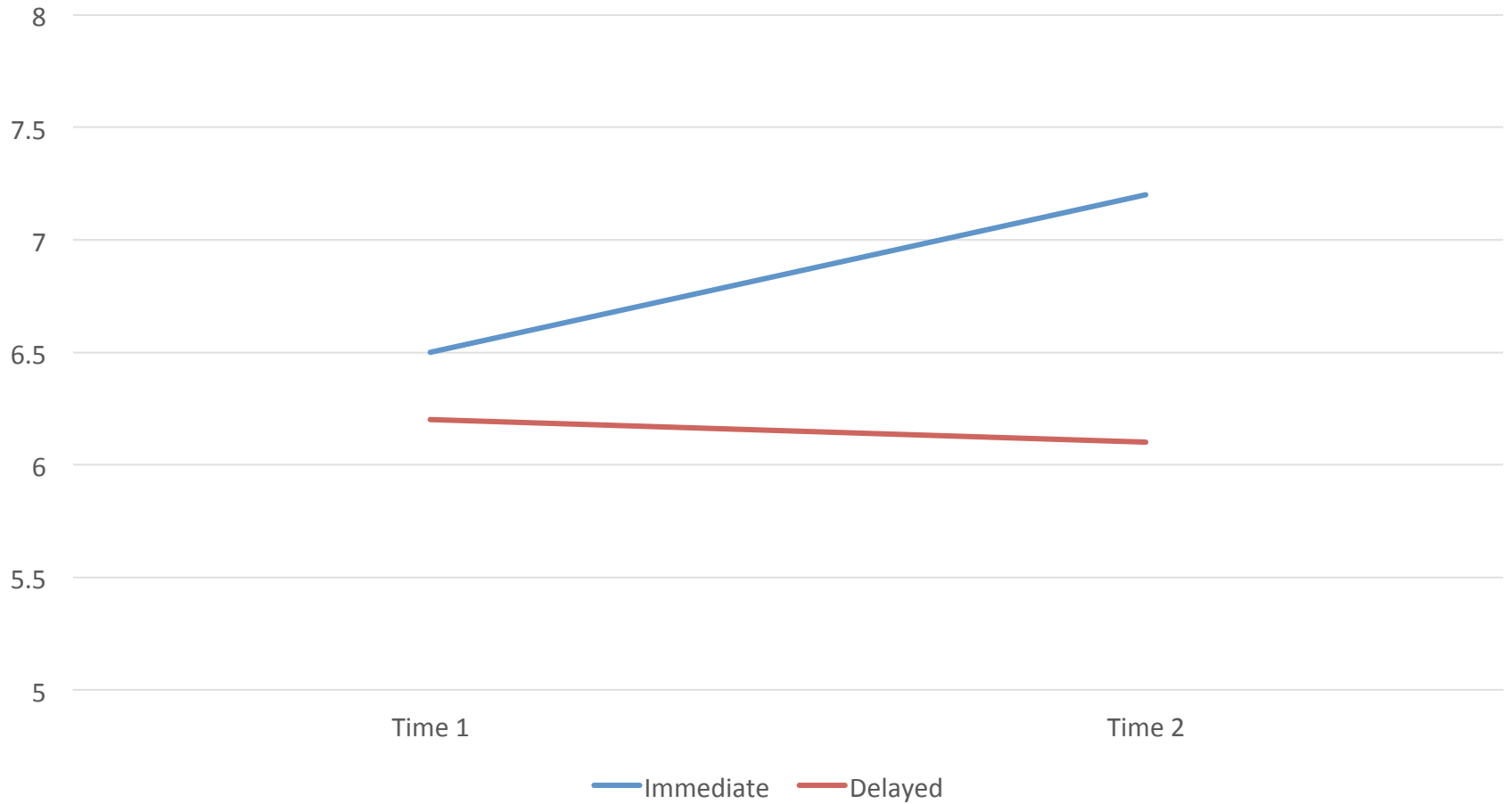
More (Partially) Good News

- Word production improved during the study
- The categories related to Eva improved most

- But findings were not significant
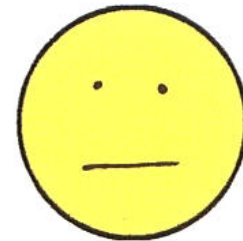
But …

- Changes on the narrative test were not significant

- Conversation showed no change

Confidence

- Will Eva Intervention improve communicative confidence?
  - Scores on the Confidence Rating Scale improved significantly, but even before access to Eva

Social Isolation

- Will access to Eva reduce feelings of social isolation?
  - Scores on our social measures did not change

What are participants' views about Eva?

- 'Wonderful. Well it's wonderful. Well it's all my expectations are real'
- "Brilliant!"
- "The whole experience was something else"
- "On the decking up the top by one of the houses, and I'm thinking 'oh god I'm on holiday here'"
- 'Its been very good. I'm still finding new places to go'
- 'Tried them all. Sat on elephant. Swam on turtle. Dancing in Tardis and disco.'
- 'Cut and dyed A's hair. Drunk. Played on the diving board. Had pizza. Had band.'
- 'Fantastic. Chatting.'

Views of Family Members

- 'When we go to church, he's more confident in having conversations with people, whereas before he would hold back more. Now he's been more spontaneous. Talking about sports etc and I know he's been talking about the same topics in EVA Park. He's had a practice so he's extending what he's talking about outside.'

Conclusions

- It was possible to create a virtual communication environment with and for people with aphasia

- Intervention in Eva Park had significant benefits for communication

- Participants were extremely positive about their experiences in Eva Park

Final Conclusions

- Technology can:
  - Deliver 'conventional' therapy tasks
    - Allow intensive practice
    - Allow remote delivery

  - Circumvent aphasic impairments & enable individuals to exploit their residual language skills

  - Bring novel additions to aphasia therapy, e.g. via gaming technologies and virtual reality

- User views are positive

- Feasibility has been shown for a range of applications

Final Conclusions

- Technology can
  - Release the therapists' time for aspects of rehabilitation that require face to face input
  - Enable us to extend services to hard to reach individuals
  - Allow a degree of autonomy and self management for people with aphasia

- We need to define the roles of technology further; it must not become a threat to face to face therapy

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