Assistive technology approaches to facilitate reading and writing in aphasia

The CommuniCATE project

Dr Celia Woolf, Dr Anna Caute and Katie Monnelly

@Communi_CATE
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.15</td>
<td>Introduction</td>
</tr>
<tr>
<td>14.25</td>
<td></td>
</tr>
<tr>
<td>14.25</td>
<td>Practical workshop: Reading and writing</td>
</tr>
<tr>
<td>15.10</td>
<td>technologies</td>
</tr>
<tr>
<td>15.10</td>
<td>Presentation: CommuniCATE Project reading</td>
</tr>
<tr>
<td></td>
<td>and writing therapy approaches and case</td>
</tr>
<tr>
<td></td>
<td>studies</td>
</tr>
<tr>
<td>15.30</td>
<td>Conclusion &amp; discussion</td>
</tr>
<tr>
<td>15.45</td>
<td></td>
</tr>
</tbody>
</table>
Thanks to our generous funders
The Barts Charity
The CommuniCATE Research Team

Joint Project Leads

Celia Woolf
Jane Marshall

Human Computer Interaction researchers

Katie Monnelly
Anna Caute
Madeline Cruice
Carol Stokes

Speech & Language Therapy Researchers

Stephanie Wilson
Julia Galliers
Technology in aphasia therapy

Offers many potential solutions:

- compensatory strategies
- improving access to therapy
- increasing intensity of therapy

Technology may also present barriers for people with aphasia
Aims

1. Provide **technology-enhanced therapy** services to people with aphasia
Aims

2. Enhance social participation and reduce isolation
Aims

3. Provide **training in the use of technologies in aphasia rehabilitation**

- NHS Speech & Language Therapists
- Rehabilitation Support Workers
- SLT students
- Stroke Association volunteers
Aims

4. **Research the benefits** of technology-based treatment for aphasia

- Language
- Communication
- Social Participation
- Quality of Life
Aims

5. Explore accessibility of the technologies and participants’ views about the packages
Participants

• 85 people took part in therapy
• Screening assessments pre therapy for cognition and language
• Jointly decide on most appropriate therapy strand
CommuniCATE Project

- Speaking
- Supported conversation
- Reading
- Writing
Background

• Reading and writing in the 21st Century: written communication increasing technology-based (Dietz et al., 2011)

• Increasing importance of reading and writing

• Risk of digital exclusion (Menger, Morris & Salis, 2015)
Therapy
2 x weekly, 1 hour sessions

Tech training
pre-therapy
2 x hours

Study Design
What participants chose

Reading
- 21 participants
- 9 used Claro
- 12 used Kindle

Writing
- 25 participants
- 12 used Write Online
- 13 used Dragon
Workshop

In groups, you will rotate between four work stations:

<table>
<thead>
<tr>
<th></th>
<th>Writing:</th>
<th>Reading:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Dragon on iPad</td>
<td>ClaroRead</td>
</tr>
<tr>
<td>B</td>
<td>WriteOnline</td>
<td>Kindle Fire</td>
</tr>
</tbody>
</table>


CommuniCATE Project

- Speaking
- Supported conversation
- Reading
- Writing
Background

• PWA’s reading supported by:

  – Text size adjustment and key word highlighting (Rose et al., 2003)

  – Manipulating white space and text layout (Worrall et al., 2005)
ClaroRead

• Changes font size and spacing
• Screenruler
• iPad or PC
E-reader: Kindle Fire

Kindle Fire HD

- Synch to audiobook
- “Reading View”
- “Word wise”
Choosing technology

- Reading material
  - Reading interview

- Technology experience
  - What do they already use?

- Ability to learn to use technology
  - Dynamic assessment of computer learning
Early sessions

• Setting up technology

• Setting broad goals: what do they want to read?

• Trialling assistive features of technology

• Negotiating/modifying goals
Technology training: Challenges

- PC
  - Selecting text to read aloud in webpages
  - Operating touchpad/mouse
- iPad
  - Sequencing steps (e.g. copy & paste)
  - Switching between apps
Technology training: Challenges

• Understanding zones on touchscreen

• Tapping v swiping

• Searching for books (typing)
CASE STUDY
Case study- Kindle Fire

“Linda”
- 48 years old
- 3 years post-stroke
- Moderate Broca’s aphasia
- Reading impaired at single word, sentence and paragraph level

Background
- Previously worked as youth worker
- Not reading at all since stroke, except TV subtitles
- Before stroke read ++ since childhood, particularly biographies and true stories
Goals

Technology goals:
• To independently operate text to speech/audiobooks
• To independently use VoiceAloud app to listen to webpages
• To independently search for and purchase books/audiobooks in Amazon store

Reading goals:
• To read and understand at least one full-length biography/true-life story
• To read and understand news articles on BBC news app

Participation goals:
• To read a children’s book with her 6-year old granddaughter, using text-to-speech/audiobook
• To visit local library and ask librarian for book recommendations
Therapy

Features used:
• Large font and spacing
• Listened using text-to-speech or audiobook where available
• VoiceAloud app
• Dictionary/Wikipedia

Therapy activities
• Answering comprehension questions
• Discussing and expressing her opinions about a book/article
• Re-reading passages if misunderstood
• Finding suitable books
Challenges

• Some difficulties navigating around Kindle and operating menus

• Finding suitable books to read

• Difficulties using Store, particularly typing to search for authors/titles
Progress in therapy

• Operated all key features of Kindle independently
• Completed four books (two “Quick Read” books, two full length books)
• Independently downloaded a sequel (full length book for teens)
• Read and listened to BBC News
• Read on the Kindle every day and bought one of her own
• Also started reading newspapers and magazines (on paper)
Video: Street Cat Bob
Results: Reading Comprehension Battery for Aphasia (Paper)
Results: Gray Oral Reading Tests-4

- Kindle
- Paper

T1, T2, T3, T4
Results: Reading Confidence and Emotions Questionnaire

[Graph showing trends over time for confidence and emotions]
Interview feedback

• Linda described Kindle Fire as a “miracle” and “beautiful” and how she can “lay down” and read a book and “laugh”

• “Well it’s just nice you know cos you can follow on the, on these Kindles... you can hear the words and also hear it as well”

• “Using the Kindle was an absolute joy”
Conclusions

• People with aphasia were able to learn to use ClaroRead and Kindle Fire

• Many read books again for the first time since stroke

• Technology compensated for reading difficulties

• Feedback from participants was overwhelmingly positive
CommuniCATE Project

Speaking

Supported conversation

Reading

Writing
• WriteOnline

• Dragon voice recognition software

Reducing our carbon footprint

Carbon footprint is the amount of carbon you put into the atmosphere. Cars that use petrol or diesel emit carbon, and so do power stations that run on coal, oil or gas.

We need to reduce our carbon footprint because carbon in the atmosphere traps the sun’s heat and causes the earth to get warmer. Global warming is a serious problem because it will disrupt weather patterns and cause sea levels to rise.
Software for dyslexia: WriteOnline

- Word prediction
- Word bars
- Highlighting
Laptop
• Software learns to recognise voice
• Can train it to recognise names

iPad
• Voice transcribed by server
• Copy text into other apps
Recruitment criteria

- Spoken output markedly better than written output
- No significant motor speech disorder
- ≥ 9/15 spoken OR written word to picture matching (CAT, Swinburn et al., 2004)
Learning to use Dragon

Challenges

• Editing longer passages

• “Thinking for writing”?  

Strategies

• Writing sentences (chunking)

• Narrative planning
Learning to use Write Online

Challenges

• Some participants had more impaired language overall and need more language support

Strategies

• Strategic construction of word bars and repetitive tasks using them (e.g. sentence construction)
CASE STUDY
Case study- WriteOnline on iPad

“KB”
Aged 60

- 2.5 years post stroke
- Mild mixed aphasia
- Severe writing impairment- often word initial letter only
- Cognitive issues- severe memory impairment and executive functioning difficulties

Background
- Originally from India
- High level accountant dealing with international companies
- Pre-stroke proficient technology user
Goals

Technology goals:
• To learn how to use the WriteOnline app alongside news apps to send emails

Writing goals:
• To learn how to structure simple sentences to write about recent events
• To be able to write emails including content about his interests (news, economy, business)

Participation goals:
• To re-connect with friends and family living overseas via email
Technology features and challenges

Write Online features used:

• Predictive text
• Word bars
• Text to Speech

Therapy Activities

• Developing new word bars with target vocabulary
• Practice emailing therapist
• Sequencing & structuring activities
• Identifying suitable contacts to email
• Downloading apps of interest
Video: Editing an email
England's housing market is "broken", ministers have admitted, as they unveil plans to build more affordable homes.

This is challenging.

What should be done?

The government which however. She

Sent from my iPad
Outcomes

- More socially valid (i.e. acceptable to reader) emails when written using iPad
- Handwritten emails did not improve
Outcomes

Large increase in lexical quality after therapy using WriteOnline on iPad
Progress in therapy

- KB was able to consistently send emails with range of content:
  - News information
  - Recent events
  - Questions
  - Opinions
  - Making plans
Feedback from writing participants

• “Because before I can always ask my friend, boyfriend can you write, can you write for me this, can you write this for me, but now I not go there every time, so I just do it for myself”

• “before I didn’t have confidence to write an email, but now oh I can write a little bit!”

• “I like, like emails and doing things like social media... it’s helped”.

• “I said there is no way I’m going to give [Dragon] back to [names therapist] until I know my own, because it’s like an opening wow, I can” (gesture opening arms)
Conclusions

• People with aphasia were able to learn to use Dragon and WriteOnline

• Gains generalised to everyday tasks, e.g. sending emails

• Technology compensated for writing difficulties

• Feedback from participants was overwhelmingly positive
CommuniCATE Project

- Speaking
- Supported conversation
- Reading
- Writing
Overall Conclusions from therapies

• People with aphasia were able to learn to use the different technologies

• Technology enhanced therapy
  – compensated for reading and writing difficulties
  – helped people to re-connect socially

• Feedback from participants was overwhelmingly positive
Mainstream technologies in aphasia therapy

• Possible advantages of using mainstream technologies
  – Widely available
  – Low cost
  – Socially acceptable
  – Technically robust

• Possible disadvantages
  – Not designed for PWA

BUT PWA were able to use these technologies successfully when provided with aphasia friendly support and training
Choosing technology for PWA

Individualised assessment is essential:

• Consider how technology will be used in person’s daily life
• Take account of language and cognitive abilities vs. complexity of user interface
• Dynamic assessment: observe how easily PWA picks up tech skill when facilitated
• Demo tech options and let people try them with support before jointly deciding
Technology training for PWA

• Individualised approach to training
  – which tech features are important or can be skipped?

• Importance of aphasia friendly technology manuals

• One to one support needed, especially early on
  – Not an ‘out of the box’ solution
Technology is always changing...

- SLTs need to adapt therapies
e.g. updating aphasia friendly tech instructions, new apps

- PWA need ongoing access to support
e.g. for trouble shooting when things go wrong, or top up training when software gets updated

... but general principles for technology enhanced therapies are transferable
Group discussion

- Which piece of technology would be most useful in your clinical practice?

- Which piece of technology would be most challenging for a person with aphasia to use?

- Could you suggest an improvement to a piece of technology?

- What future research into reading and writing technologies would you find most useful to inform your practice?
Twitter: @Communi_CATE

Email: aphasiaclinic@city.ac.uk

Web: https://blogs.city.ac.uk/communicate/