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Functional Assessment & Therapy for Acquired Writing Impairment in Aphasia after Stroke using Mainstream Technology

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CommuniCATE

Background

Aphasia (or *dysphasia*) is used to describe the acquired language condition that is caused by left hemisphere brain injury. Aphasia may persist as a chronic disability, and presents in around one third of **stroke** cases. **Writing skills** may be selectively or co-morbidly impaired in aphasia.

Traditional approaches to **writing impairments** (*or dysgraphia*) for people with **aphasia** seen in the literature largely focus on single word spelling practice as **therapy** and single word spelling tests as the primary **assessment** (e.g . Raymer et al., 2010, Beeson, Higginson & Rising, 2013, Tsapkini & Hillis, 2013). Recently, rehabilitation has begun to integrate **technology** into these interventions (such as software that guides an individual through spelling exercises e.g. Step-by-Step (Mortley, Wade & Enderby, 2004)) as an innovative and current alternative.

Despite their rigour and effectiveness, single-word approaches to writing **therapy and assessment** (with or without technology) may be challenged in terms of their contribution to an individual's **activity and participation**, two health-related domains defined in The World Health Organisation's (WHO) International Classification of Functioning, Disability and Health Framework (ICF) (WHO, 2007). These domains are major aspects of health-related **quality of life** (HRQoL) which is repeatedly reported to reduce for people with aphasia (e.g. Hilari & Byng, 2009). People with aphasia may experience barriers to many aspects of activity and participation when their writing skills are impaired. The writing skills required for good functioning in these domains are referred to as **functional writing.**

As yet, there does not appear to be an established tool to measure **functional writing** of people with aphasia, though those for functional verbal communication are increasingly used in practice. While some case studies on participants using technology for functional writing have been published, there is little larger scale research. This paper presents findings addressing these two key issues.

Keywords:
Aphasia	Stroke
Writing	Dysgraphia
Technology	Functional Communication
Assessment	Therapy
Speech and Language	

What this study contributes:
1. Evaluate efficacy of **functional writing therapy using technology** for a group of people with aphasia.
2. **Psychometrically test** a **novel functional writing assessment** for aphasic writing impairments.

This poster reports interim findings from on-going work, which forms part of a larger research project at City Language & Communication Sciences (CommuniCATE Project).

Methodology

Design
Within subjects, repeated measures design involving participants with aphasia after stroke (findings presented n=10).

Assessment
Writing samples were obtained via handwriting and technologically-aided writing at three time points:
1. pre-therapy
2. post-therapy
3. 6 weeks follow up.

Samples were generated from the *Email Generation Task*. This asks for the production of three 'fictional' emails with varied degree of creative constraints.

Participant's scores from a **Social Validity Measure** at each time point were averaged for technology-assisted versions and handwritten-versions.

This was a reader-judgement on the level of:
Informativeness, Efficacy, Grammar Quality & Reader Comfort

Therapy
Therapy involved use of 2 mainstream writing technologies on **iPads and laptops**:

•**Dragon** DRAGON
(voice recognition software)

•**Write Online** Write ONLINE
(word prediction & retrieval of saved words/phrases).

Participants receieved **12 hours of therapy** over 6 weeks with a Speech and Language Therapist in addition to technology training sessions.

Participants were **loaned devices** in order for them to practice writing at home.

Results

Rater's scores were rationalised onto a 0-10 scale where 0 represents the most negative perspective and 10 represents the most positive.

Technology Assisted Writing

Figure 1:
- There was **a significant difference in scores of social validity across the different time points (Friedman χ^2 (2)= 7.2; p=.0.027)** People post-therapy scored the highest [median(IQR)= 6.80(2.77)], followed by follow-up scores [5.96(2.24)], with baseline scores being the lowest [4.75(4.63)].
- Pairwise comparisons reveal that social validity scores **post-therapy were significantly higher than at baseline (Z=-2.70, p=0.007)**. Scores between pre-therapy and follow-up (Z=-1.68, p=0.093 (ns)), and post-therapy and follow-up (Z= -1.99, p=0.047 (ns)) were not significant.
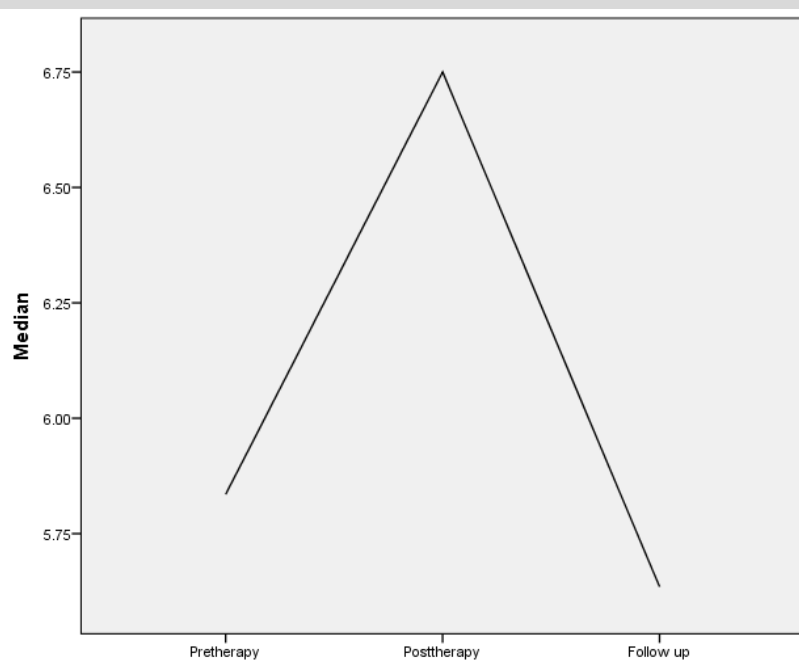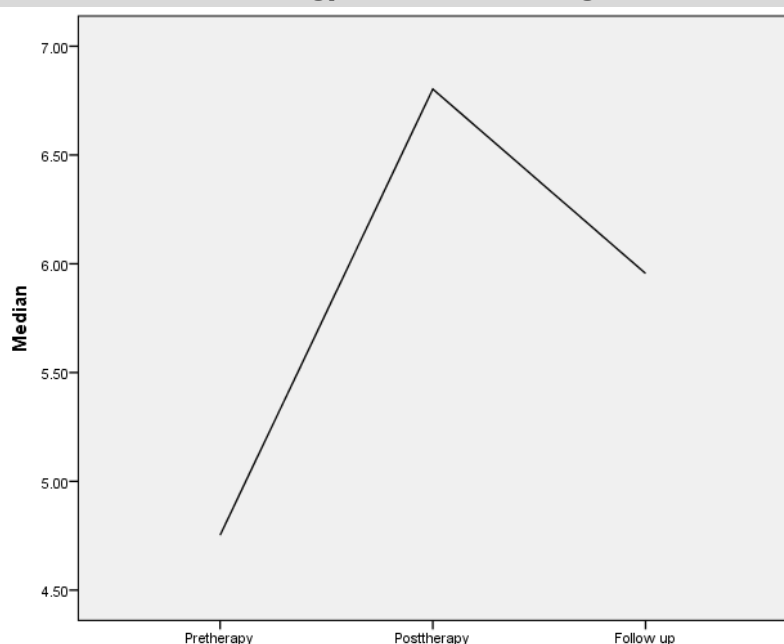
Results continued

Handwritten

Figure 2:
There was **no significant difference** in scores of social validity across the different time points (Friedman χ^2 (2)= 0.8; p=0.67(ns)). There was a general trend that scores increase post-therapy, with these scores being the highest [median(IQR)= 6.75(2.81)], surprisingly followed by pre-therapy scores [5.84(1.45), with follow up scores being the lowest [5.64(4.06)].

Conclusions

1. **Statistically significant** differences between pre and post-therapy social validity measures of writing when using technology suggests this **therapy approach may act as a beneficial compensatory approach** for writing impairments in aphasia.

1. However, this change was **not maintained at 6 weeks follow up** indicating further research could be done into strategies to promote preservation of skills.

2. There was not a significant improvement in handwritten scores, suggesting that **it may not act as a remedial therapy approach,** i.e. no generalisation to handwriting skills. There was however **a trend that handwriting improved** after therapy, though this was not significant.

3. Therapy of this nature may **improve the ability of people with aphasia to complete functional writing tasks** such as writing emails.

4. This in turn may **reduce the barriers to activity and participation** in daily life for people with writing impairments in aphasia.

Continuing Work

- Completing the data set (n=22)
- Linguistic analyses of writing samples
- Testing psychometric properties of Email Generation Task

References

Beeson, P., Higginson, K. and Rising, K. (2013). Writing Treatment for Aphasia: A Texting Approach. *Journal of Speech Language and Hearing Research*, 56(3), p.945.
Hilari, K. and Byng, S. (2009). Health-related quality of life in people with severe aphasia. *International Journal of Language & Communication Disorders*, 44(2), pp.193-205.
Mortley, J., Wade, J. and Enderby, P. (2004). Superhighway to promoting a client-therapist partnership? Using the Internet to deliver word-retrieval computer therapy, monitored remotely with minimal speech and language therapy input. *Aphasiology*, 18(3), pp.193-211.
Raymer, A., Strobel, J., Prokup, T., Thomason, B. and Reff, K. (2010). Errorless versus errorful training of spelling in individuals with acquired dysgraphia. *Neuropsychological Rehabilitation*, 20(1), pp.1-15.
Tsapkini, K. and Hillis, A. (2013). Spelling Intervention in Post-Stroke Aphasia and Primary Progressive Aphasia. *Behavioural Neurology*, 26(1-2), pp.55-66.
World Health Organisation. (2007). *ICF, International Classification of Functioning, Disability, and Health*. Geneva, World Health Organization