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Title: ***Preliminary outcomes from a pilot study of personalised online supported conversation for participation intervention for people with aphasia***

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Abstract

Background: Aphasia negatively impacts face-to-face social participation and the difficulties that people experience using the phone exacerbate these challenges in staying in touch with family and friends. Videoconferencing enables multimodal communication, and teamed with supported conversation, could facilitate access to conversation and thereby increase social participation for people with chronic aphasia.

Aims: This pilot study examined whether supported conversation provided over Skype could improve people's social participation. It reports on preliminary outcomes of this intervention on people's social network, communication confidence, aphasia-related quality of life and mood.

Methods & Procedures: 29 participants with chronic aphasia received an initial 2-hour technology training session followed by 16hours of online supported conversation for participation intervention provided by qualified or student speech and language therapists. Intervention was personalised by individualising goals in technology, communication and participation. An observational prospective cohort study design was used with baseline, immediately post-intervention, and 8-week follow-up assessments. Measures of social network and communication confidence (primary outcome measures), and aphasia-related quality of life, life participation, and mood (secondary outcome measures) were undertaken. Shapiro-Wilk tests were conducted to examine normality of distributions of each of the variables. Where data were normally distributed, one-way repeated measures ANOVAs were used to examine the effect of time. Where data were not normally distributed, Wilcoxon Signed Ranks test was used.

Outcomes & Results: 27 participants completed the intervention. As a group, participants reported significantly more social contacts, more life participation, and higher aphasia-related quality of life post-intervention, which were maintained. There was a group gain on the measure of communication confidence post-intervention, although this was not maintained. As a group, participants' mood did not significantly change through intervention and follow-up. Individual variability was noted across all outcome measures.

Conclusions: These preliminary findings suggest that relatively low dose and non-intensive online supported conversation for participation intervention delivered by qualified or student speech and language therapists improved social participation in some people with aphasia and improved their quality of life. Communication confidence also improved for some, although benefits were short-term. Findings make novel contributions to the existing supported conversation evidence base with positive social participation and quality of life outcomes, likely achieved by the explicit participation focus. Whilst preliminary findings are positive, study limitations need addressing. Further investigations are merited to refine the intervention and outcome measure choice, and capture feasibility data. Finally, a definitive controlled trial is needed to explore clinical efficacy and cost effectiveness.

Keywords: aphasia, supported conversation, telerehabilitation, social isolation, quality of life, participation

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Introduction

Social impact of aphasia

The social consequences of aphasia are substantial and have profound impact. People with chronic aphasia report reduced conversation and communicative engagement with others (particularly with friends), smaller social networks, reduced social activities (particularly leisure), loss of shared activities with friends (through loss of work, religious engagement, sport, cultural activities), changing social desires, and unhelpful responses of others (Cruice, Worrall, & Hickson, 2006; Davidson, Howe, Worrall, Hickson, & Togher, 2008; Naetterlund, 2010; Northcott & Hilari, 2011). Interviews with stroke survivors with and without aphasia revealed feelings of sadness, despair, anxiety, loneliness; a lack of energy, interest and motivation to engage in activities; low self-esteem; and a sense of feeling stuck which made people withdraw or retreat from social engagement (Naetterlund, 2010; Northcott & Hilari, 2011). Reduced social networks are significantly influenced by aphasia and disability severity and are important because they are significantly associated with low mood, depression, and reduced quality of life (Cruice, Worrall, Hickson, & Murison, 2003; Northcott, Moss, Harrison, & Hilari, 2016; Hilari, Wiggins, Roy, Byng, & Smith, 2003). People with chronic aphasia consider the characteristics of the communication partner (knowledge, willingness and skills) an important social factor influencing engagement in social participation (Dalemans, de Witte, Wade, & Heuvel, 2010).

Communication and participation are rehabilitation priorities to both service users and service providers and are reflected in clinical guidance documents. Improved communication and increased life participation are the first and second most desired rehabilitation outcomes according to people with aphasia (Wallace et al., 2017a). In this international study, people with aphasia specifically identified they wanted to have normal and meaningful conversations both with individuals and groups, to have increased social life/ friendships and less isolation, and to maintain existing relationships. Using technology to support communication was also highlighted (Wallace et al., 2017a). People with aphasia and speech pathologists consider living *successfully* with aphasia to be influenced by communication, social companionship in meaningful relationships, participation, and community engagement (Brown, Worrall, Davidson, & Howe, 2010, 2011). Social support and social relationships are important for living successfully from the outset of stroke (Grohn, Worrall, Simmons-Mackie, & Brown, 2012). Aphasia clinicians and managers agree on priority rehabilitation outcomes for clients with aphasia. They see these as having opportunities to communicate, ability to engage in conversation, and confidence in communicating, as well as increased socialisation and ability to participate in life (Wallace, Worrall, Rose, & Le Dorze, 2017b). Finally, national and international clinical guidance emphasize both communication and social participation aims in stroke and aphasia rehabilitation (Enderby, Pickston, John, Fryer, Cantrell, & Papaioannou, 2009; Herbert et al., 2016; Power et al., 2015; Royal College of Physicians Intercollegiate Stroke Working Party, 2016).

Supported conversation

In this study we used Supported Conversation (SC) that "focuses on the creation of opportunities for conversation as a means to increase participation" (Kagan, 1998, p818). It involved the use of communication ramps that support and facilitate access to communication. Communication ramps can be a skilled conversation partner, materials that facilitate conversation such as paper and pen or pictures, and/or the provision of an aphasia friendly communication environment i.e. one that is quiet with few distractions. In supported conversation therapy, conversation partners are taught "generic skills for use with many individuals in varying contexts" (Kagan, 1998, p818). SC is one form of communication partner training which is an environmental intervention in aphasia rehabilitation with a substantial evidence base (see systematic reviews by Simmons-Mackie et al., 2010, 2016). It seeks to positively influence the functional communication, participation and wellbeing of people with aphasia (Simmons-Mackie et al., 2016). Training ‘others’ (i.e. volunteers, students) in supportive communication skills and resources use is effective and positively affects how the person with aphasia participates in conversation with that person.

We took inspiration from communication partner studies that *integrated* communication and participation. Lyon and colleagues (1997) trained volunteers in communication techniques and then they supported the individual into meaningful local community participation. Clear benefits in people with aphasia’s communication, wellbeing, and social engagement were qualitatively noted e.g. establishing a new circle of friends, increased socialization with friends, enrolment in community classes, and volunteering. McVicker and colleagues (2009) trained volunteers to provide opportunities for conversation and social inclusion to people with long-term aphasia. Their rationale was clear wherein “by communicating with trained and understanding communication partners, people with aphasia would have more confidence in their communication and be more willing to try new things” (McVicker, Parr, Pound, & Duchan, 2009, p54). Their evaluation demonstrated that hypothesized benefits were indeed experienced by many taking part. Thus, in our pilot study, we explored preliminary communication and social outcomes from this integrated intervention. We also explored impact on mood and quality of life, knowing that currently there is insufficient evidence to date that communication partner training intervention affects these areas (Simmons-Mackie et al., 2016).

Telerehabilitation

Giving people with aphasia access to supported conversation can be challenging, particularly for those who lack communication partners, are unable to travel or who are hard to reach by domiciliary services. Indeed, most studies have provided intervention face-to-face with some occasional use of telephone and email for support (Cruice, Blom Johansson, Isaksen, & Horton, 2018). Making such provision available remotely, using video-conferencing technology, might overcome a number of these hurdles. Telerehabilitation is becoming a growing feature in general healthcare provision (Greenhalgh et al. 2016) and is now emerging in aphasia rehabilitation with treatment delivered via tele-conferencing. For example, Woolf and colleagues (2016) delivered twice weekly naming therapy for 4 weeks to 21 participants using Facetime on iPads. Ora and colleagues (2020) delivered daily naming therapy for 4 weeks to 32 participants using Cisco Jabber/ Acano. Meltzer and colleagues (2018) delivered once weekly therapy targeting a range of skills and conversation for 10 weeks to 17 people with aphasia using WebEx. Pitt and colleagues (2019) delivered once weekly group therapy for 12 weeks to 19 people with aphasia using Adobe Connect. Findings suggest remote delivery is equivalent to in-person delivery and a range of therapeutic benefits can be achieved.

Recent findings show that people with aphasia consider aphasia treatment delivered with information communication technologies acceptable (Kearns, Kelly, & Pitt, 2019). This review of 17 studies found that people perceived their language, confidence and independence increased following treatment. People were largely satisfied and enjoyed using the technologies, although some frustration was noted in specific studies. Technologies were not always easy to use for a range of reasons, but training and support manuals were positively received. Regardless of difficulties experienced, people tended to recommend the treatment to others suggesting an overall positive experience.

In the study reported here, we used Skype which has the advantage of low cost, almost universal availability and possible familiarity to our user group. Supported conversation over Skype also has the advantage of being able to access resources from the Internet to use as communication ramps, e.g. if discussing music, one can listen to recordings via YouTube; if discussing holidays, one can access maps, Wikipedia pages etc; if discussing someone's home, one can give the conversation partner a virtual tour. Skype enables sharing of resources with the conversation partner instantly via messaging or screen-sharing. Concerns about confidentiality can be countered by the various cryptographic functions that are embedded within Skype[1]. Furthermore, Skype was an approved teleconferencing system in the project's National Health Service (NHS) partner site. We extended the existing concept of supported conversation intervention to include explicit goals targeting technology, communication, and participation (see Methods and Appendix 1 for further information). We drew on elements of the SMARTER framework (Hersh, Worrall, Howe, Sherratt, & Davidson, 2012) for collaborative and personalised goal-setting for each participant. Specifically, goals were developed through shared-decision making, were relevant to each person's life, and transparently configured to address skills and impact on life.

Aims and hypotheses

This pilot study investigated whether this integrated and personalised intervention improved participants' social participation (social network) and perceived communication (confidence), and whether there was any psychosocial benefit (quality of life and mood) in taking part. We hypothesized that meaningful conversational opportunities for people with aphasia, coupled with the support to access and use communicative technology *and* the support to engage virtually or in local communities, would improve people's social participation. We hypothesized that people with aphasia would connect with *more people* (e.g. reconnect with lost friends and colleagues, make new connections with others by engaging in activities), and/or connect *more often* (e.g. increase the frequency either face-to-face or online), and/or alter the *quality* of their social connection with others. We also hypothesized that the intervention would increase experiences of communication success, both within and outside sessions, thereby

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[1] See https://support.skype.com/en/faq/FA31/does-skype-use-encryption

increasing communicative confidence. Finally, we anticipated gains in social participation and communication confidence, combined with success in using technology, would improve people's quality of life and mood.

Methods

Participants

Twenty-nine participants (20 men, 9 women) aged 37-81 years (mean 61.3yrs, SD 11.1yrs) and between 7-192 months post stroke (mean 64 months, SD 54 months) took part in this study. Participants ID10 and ID22 did not complete the study so demographic data is reported for N=27 with participants renumbered 1-27 for Results figures (Table 1). Participants were recruited from an ethically approved University database of people interested in aphasia research, stroke groups, referrals from Speech and Language Therapists in UK NHS Trusts where ethics was approved, and self-referrals. Participants met the following inclusion criteria: aphasia due to a stroke; were at least 4 months post-stroke; and spoke English fluently (self-report) before their stroke. Participants were excluded if they demonstrated severe impairments in cognition and language that would prevent learning new technologies and engaging in a 1-hour Skype conversation. Participants were screened for eligibility using the Cognitive Linguistic Quick Test (Helm-Estabrooks, 2001). Participants who scored as 'severely' impaired (score of 1) in 4 or 5 cognitive domains were excluded. Participants were screened for eligibility on the spoken word to picture matching subtest of the Comprehensive Aphasia Test (Swinburn, Porter, & Howard, 2005). Participants who scored <40% were considered severely impaired. Additional subtests of the CAT were administered to gather information on participants' functioning (see Supplemental File 1).

Participants were part of a larger research project CommuniCATE (https://blogs.city.ac.uk/communicate/) that investigated technology enhanced aphasia therapy across four different treatment strands. CommuniCATE was funded by the Barts Charity and involved collaborations with the Barts Health NHS Trust, Homerton University Hospitals NHS Foundation Trust, and The Stroke Association, UK. Ethical approval was received from the NHS Health Research Authority NRES Committee London – Bromley on 7th October 2014 and received R&D approval from the Joint Research Management Office for Barts Health NHS Trust and Queen Mary University of London on 22nd July 2015. Skype was approved by the Information Governance team and installed by Trust Information Technology staff (two participants took part from the NHS partner site, and remainder at the university clinic).

Insert Table 1 about here

Technology Measures

At baseline, participants completed a technology use assessment (Roper, Marshall, & Wilson, 2014). This measure presents 18 items of technology, using a picture and the written name. Nine of the items are computer applications, such as online shopping; nine are everyday technologies, such as a microwave. The participant is asked to indicate whether they have employed the technology in the last month and rate their confidence in using the technology. Thus, the measure yields a use score (/18) and a mean confidence rating. We also developed two novel tools. The first was the Dynamic Assessment of Computer Learning (DACL; contact author[2]) to evaluate participants' technology use and ability to learn. This tool drew on the principles of dynamic assessment, which have been advocated for some time to investigate developmental language disorders (see Hasson & Joffe, 2007). Dynamic assessment aims to reveal the learning potential of the person being assessed. It contrasts with standardised 'static' assessment, which explores the person's unaided ability. In dynamic assessment the tester provides some instructions, or cues. The results record not only the person's un-cued

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performance but also their response to that instruction. This approach is particularly valuable for exploring a participant's potential to learn to use hardware and software, with which they may be unfamiliar at the start of the project. The findings informed the decision about which type of technology individual participants should use during the project (e.g. tablet with touchscreen access or a PC/ laptop with mouse/ touchpad/ keyboard access), giving insight into facilitators, barriers and participant preferences.

The second tool was the Skype Levels of Difficulty (SLD) which classifies 25 Skype tasks into four levels of difficulty. It was inspired by Estes and Bloom’s (2010) measure of practical computer skills for their single case study participation, and included different levels for practical skills versus mastery, and graded completion of tasks. SLD Level 1 skills included open Skype, answer call, turn microphone on/off, turn camera on/off adjusting position of device/ seating. SLD Level 4 skills were more advanced including sign into Skype, send a contact a photo or file/ video message/ another contact’s details/ an instant message during a call, share own screen with a contact/ in a group call, add other contacts to a call, and end screen sharing. Participants were observed operating Skype (typically following a demonstration from the qualified/ student therapist) and the SLD helped identify skills a participant could learn during the therapy and the degree of support that may be needed.

Outcome Measures

Four assessments yielding five scores were used in this study, with the first and second assessments being primary outcome measures, and the third and fourth assessments being secondary outcome measures. The latter were chosen as consistent across all strands in the larger research project; the former were chosen specifically for this strand. Individual semi-structured interviews were also conducted with participants to explore their experience of the intervention (not reported here). The social network convoy model (Antonucci & Akiyama,

1987) was used to assess social contacts. This is hereafter referred to as the Social Network Assessment (SNA). This was chosen as a primary outcome measure of participation, as it quantifies the number of social contacts experienced by the individual. This approach is configured as three concentric circles that surround the focal person being interviewed. Each circle represents a level of closeness of relationship between the focal person and the social contact. Each participant was asked to name people who they felt were important in their life right now, and assign these to the inner, middle, or outer circle, and answer a number of further questions about each contact, namely relationship, and frequency and type of social contact. Communication supports were provided to participants to enable them to complete this assessment. This approach has previously been used successfully with people with a range of language functioning (WAB AQ 21.9 – 95.8; Cruice et al., 2006) and in treatment studies (Caute & Woolf, 2016). Various metrics can be derived from the data collected. In this paper, we use total social network size, i.e. total number of contacts named, and subtotals for each circle.

The Communication Confidence Rating Scale for Aphasia (CCRSA: Babbitt, Heinemann, Semik, & Cherney, 2011) was used to evaluate communication confidence. It was chosen as a primary outcome measure as it taps self-reported feelings about communication. It contains 10 items phrased as "*How confident are you about your ability to…?*" (e.g. *Talk with people? Stay in touch with family and friends? Speak on the telephone? Speak for yourself?*), and participants rate each item on a 100mm horizontal line with 10mm anchor points from 0-100, and three labeled anchors: Not Confident, Moderately Confident, Very Confident. Scores are then collapsed into four categories, yielding a score of 1-4 per item, and a total score of 10-40. Individuals with a range of language functioning have completed the CCRSA (i.e. WAB AQ range 10.9 – 94.9, Babbitt et al., 2011). The CCRSA has sound core psychometrics (Babbitt et al., 2011), although inter- and intra-rater reliability still need full investigation. Sensitivity to different aphasia treatments has been demonstrated on shorter versions (Cherney, Babbitt, Semik, & Heinemann, 2011; Ryan et al., 2017) and very recently on the 10-item version in response to personalized clinician-guided computer-based aphasia treatment (Meltzer, Baird, Steele, & Harvey, 2018).

The Assessment for Living with Aphasia (ALA: Simmons-Mackie et al., 2014) was used to evaluate aphasia-related quality of life and also life participation. Heavily pictographic and designed for individuals with aphasia, the ALA covers five domains of language, participation, environment, personal, and moving on with life, with 57 items. It yields a number of scores; for this study, the total score and participation domain average scores were used. The ALA has acceptable test re-test reliability, internal consistency, and construct validity (Simmons-Mackie et al., 2014). This testing was conducted on 99 PWA with a wide range of WAB AQ scores (6.6-99), with an average of 69.11 and SD of 24.52 (Simmons-Mackie et al., 2014).

Finally, mood was assessed using the Visual Analog Mood Scales – Revised (VAMS-R: Kontou, Thomas, & Lincoln, 2012), which tests eight mood states (Afraid, Confused, Sad, Angry, Energetic, Tired, Happy and Tense) and was specifically designed for neurologically impaired adults in medical settings. The revised version reverses the scale for mood states Happy and Energetic. Participants mark on a 100mm vertical line how they are feeling in relation to each state. High scores represent maximal level of the mood i.e. sadder; low scores represent absence of that mood. Hence a negative change score is desirable. The VAMS can be used to measure treatment efficacy. In the current study, we used the Sad item only, following the study by Thomas and colleagues where the Sad item was used to both determine eligibility and as a secondary outcome measure (Thomas, Alker, MacNiven, Haworth, & Lincoln, 2013). This approach was also in line with previous reports from the CommuniCATE project (Caute et al., 2019; Marshall et al., 2019).

Assessment Procedure

An observational prospective cohort study design was employed. Participants were assessed at baseline (T1), immediately following intervention (T2), and at 8 weeks follow-up (T3). All outcome measures were administered at each time point. The order of test administration was randomised at each time point. Each assessment was administered face-to-face (i.e. not over Skype) by a qualified or student SLT following standardised instructions. Most assessments were administered by the treating qualified/ student SLT.

Intervention Description and Procedure

Intervention comprised (1) selecting the technology at the outset (determining whether to use Skype on desktop computer, laptop, or iPad with each resulting in slightly different training); (2) collaboratively generating a technology, communication and participation goal with each participant personalised to their situation and context, using assessment findings and goal discussion (goals were revisited and collaboratively refined throughout the therapy block); (3) brief initial technology training conducted onsite at the clinic; and (4) twice-weekly intervention delivered remotely through Skype. If participants possessed suitable hardware, this was employed during the intervention. If not, they were loaned devices which they retained until the follow up assessment.

Participants completed a 2-hour initial technology set-up training session conducted face-to-face in the university clinic (and two participants completed this at the NHS site). This included connecting the participant to Wi-Fi, setting up a Skype account, and learning most basic functions. Such functions included switching on/unlocking device, launching Skype, answering a call, and checking video on, in order that the participant was able to use Skype independently in their own home. If a participant wasn’t able to operate basic features independently, early sessions took place at university, or we explored additional support from family member/carer or SLT student. Following this session, providing the participant was confident, s/he engaged in therapy from home.

Participants then received 16 hours of online supported conversation for participation intervention[3] (further detail below), 2 one-hour sessions per week for 8 weeks, with qualified or student SLTs. Qualified SLTs were conversant with supported conversation practices from considerable experience in the field. Student SLTs received training in supported conversation that included the theoretical background to the approach, the principles of acknowledging and revealing competence, videos demonstrating a range of presentations of aphasia, and videos and/or live sessions of clinicians and people with aphasia demonstrating supported conversation practices. A supported conversation training manual was also provided for ongoing reference. During training, student SLTs also identified and reflected on using therapeutic conversational skills. These included recapping conversation, clearly indicating a new topic of conversation, rephrasing sentences if required, checking they were understood, using shortened sentences, and using simplified language. Research demonstrates that students who are trained in supported conversation use more props and introduce more ideas in conversation than those not trained (Finch et al., 2017). Typical communication ramps used in face-to-face conversations were adapted for Skype. For example, pen and paper was adapted as typing keywords using instant messenger and holding written words/ drawing up to the camera. Photos and pictures were adapted to sending photos via instant messenger, screen sharing with Google images, and holding photos/ pictures up to the camera. Physical maps were adapted to screen sharing Google maps, and geo-tagging.

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[3] Participants were able to attend the university clinic during the therapy block if they experienced particular difficulty learning to use a feature of Skype.

The online supported conversation for participation intervention had three stages and was manualised for the therapist / student, with an accompanying manual for the participant. Both manuals are freely available[4]. Stage 1 constituted sessions 1-4 and focused on continuing to set up technology, support for learning basic skills, and setting broad goals. This stage had a substantial emphasis on technology learning, practice and mastery. Different Skype features were trialled to determine benefit, and capacity for independent learning and support needed was gauged. Treatment activities included basic technology training, setting up Skype and email accounts as necessary, experiential activities exploring response to cues, trialling aphasia friendly user guides, simulation (e.g. answering Skype calls from different clinic rooms), and Skyping family members at home if available. Goals were negotiated and not infrequently modified in this early stage. The first goal related to learning Skype technology skills, for example, how to make Skype calls[5], add contacts, and share pictures. The second goal related to improving communication, such as adapting total communication strategies for Skype and practising these. The third goal related to increasing social participation, for example, using Skype with family members abroad, identifying local community activities of interest, and finding new social clubs online. The goal setting process is illustrated in Appendix 1.

Stage 2 comprised sessions 5-13, with an increased emphasis on activities to achieve the participant's communication and participation goals. Emphasis on the participant's technology goal continued and was either general ongoing support (e.g. enabling participants to maintain their skills and included provision of an accessible Skype manual for ongoing support in all sessions) or actively extending their technology competence (e.g. supporting the participant to learn more advanced Skype features such as screensharing). Sessions involved an active dual focus of (1) practising communication strategies, and (2) connecting with and/or exploring the

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[4] Both clinician and participant manuals are available by contacting aphasiaclinic@city.ac.uk.
[5] This would later become drilled down to component parts such as to independently initiate a video call, to turn back on the camera if it was accidentally turned off, and so on.

participant's social network and local community activities, groups and events. Exemplar treatment activities included holding stimuli up to camera to encourage PWA to initiate conversation, practising using communicative drawing by holding drawings up to the camera, sharing screens to look at items that may be added to a person's communication book/board, collaboratively creating prompts to use in conversation over Skype to remind PWA to employ recommended strategies (e.g. slow down), devising strategies for PWA to avoid communication breakdown (e.g. signalling they are talking about a new topic via a written prompt or a gesture), helping the PWA write an email to a friend asking them to join Skype so they can video-call, guiding PWA through process of adding a new contact by holding another version of their device up to camera, and sharing screens to collaboratively research local activity groups.

Stage 3 comprised sessions 14-16 and involved largely facilitating the participant to maintain and generalize new skills in preparation for when treatment ended and included how to access ongoing support. Treatment could focus across all three areas, for example, how will they continue to use Skype to video call relatives i.e. do they have their own laptop (technology goal); do they have the skills, knowledge and confidence to regularly attend the cooking class they trialled during therapy (participation goal); and have they used gestures in scenarios other than those rehearsed via Skype (communication goal). For some individuals much emphasis however was placed on transitioning technology for participants, that is from research project devices to their own devices for long-term use. Thus, treatment activities included browsing online laptop deals, assisting with completing applications for equipment grants, setting up alternative personal devices (e.g. they may have a smart phone but not their own iPad so could set up Skype on here), compiling Skype data in accessible format to refer to in future e.g. their username and password or creating Skype contact cards (e.g. cards with the PWA's Skype name on and explanation of use of Skype to encourage them to add them & video call), and liaising with local charities, organisations, libraries or healthcare services to see what support was available.

In summary, each treatment session typically involved a session goal targeting (1) technology learning, practice or mastery of use of a range of the features available in Skype, (2) communication skills and strategies practice, conversation practice, and (3) discussing and problem-solving ways to increase social engagement whether this be connecting with their own social network or identifying new opportunities in the local community through researching online. Early and late sessions in the intervention had an increased technology focus as each participant commenced and concluded the study.

Data Analysis

Shapiro-Wilk tests were conducted to examine normality of distributions of each of the variables. Where data were normally distributed, one-way repeated measures ANOVAs were used to examine the effect of time (baseline, post-intervention, and follow-up). A treatment effect would be supported by a main effect of time, with comparisons showing a significant difference between baseline and post-intervention. Maintenance of gain would be indicated by a significant difference between baseline and follow-up. Where data were not normally distributed, Wilcoxon Signed Ranks tests were used. Following group analyses, participants' change scores from baseline to immediately post-intervention were visually inspected to identify any specific patterns in individual participant's response to the intervention.

Results

Ninety-nine (99) individuals expressed interest in the wider CommuniCATE study and were screened. In total, six (6) did not meet the inclusion criteria, eight (8) declined or were unable to participant, and 56 were allocated to another treatment strand (totalling n=70), with 29 allocated to this intervention strand. Two individuals passed the cognitive screen but not the communication screen. Both individuals however used technology in their everyday lives, and had good total communication skills, trialled using Skype (and succeeded), and were able to generate relevant goals. For these reasons, they were accepted into the study and the communication screen score was treated flexibly. Twenty-nine (29) individuals took part in the Supported Conversation strand either as a first choice or because they were unable to travel twice a week to the University clinic as required to partake in the other strands. The remote delivery therapy option made it the most popular strand in the wider CommuniCATE study. Two participants (ID10 and ID22) did not complete intervention and/or subsequent T2 and T3 testing, one due to an unexpected change in life circumstances and the other due to technical challenges. The remaining 27 participants attended 16 sessions of intervention provided over eight weeks with an occasional gap or extension due to holidays. There was one participant who did not have Wi-Fi in the home, but he attended the clinic twice a week instead and Skyped from a neighbouring room. Most participants managed to successfully attend sessions remotely once they were familiar with answering Skype calls and mastering the basics. However occasionally a participant returned to the University due to a Skype update or to learn additional technology skills that could not be taught easily over Skype. Participants' demographic and screening measures data are reported in Table 1 (see above), and descriptive outcome measures data are reported in Table 2 below.

Insert Table 2 about here

SNA data were normally distributed. A repeated measures ANOVA showed that the main factor of Time was statistically significant (F(2,52) = 11.512, p <.000, η_p^2=.307) (Figure 1). Pairwise comparisons revealed gains in total network size between T1 to T2 (mean difference = 8.3, p = .004) and between T1 to T3 (mean difference = 8, p = .000). There was no difference between

T2 to T3 indicating that gains were maintained (F = 10.567, p = 1.00). Participants had on average a mean of 22 social contacts pre-therapy, and a mean of 30 social contacts post-therapy. Post-hoc repeated measures ANOVAs revealed where those gains were made, with the inner circle network size remaining stable (F(2,52) = .467, p = .629), whilst the middle circle and outer circle network sizes significantly increased (Middle: F(2,52) = 10.759, p < .0005; Outer: F(2,52) = 5.789, p < .005). Whilst group analysis revealed an average 8 more social contacts following intervention, individual participants' responses were varied. Between T1 and T2, nine participants increased their social network by 10 or more contacts, and eight participants changed minimally.

CCRSA total scores at all three time points were normally distributed. Of note, three data points are missing from the analyses: at T1, participant ID8 had no score for item 5; at T2, participant ID1 had no score for item 8; and at T2, participant ID16 had no score for item 10. Subsequently their total scores were calculated only from the items that were completed at all time points. Repeated measures ANOVA showed a significant effect of time (F(2,52) = 3.3, p=.045, η_p^2=.113) (Figure 2). Pairwise comparisons revealed significant gain in communication confidence between T1 and T2 (p=.034), with no difference between T1 to T3 (p=.215) or T2 to T3 (p=.142) indicating treatment-period only gain of 2.38 points. Between T1 and T2, all but three participants increased in their confidence scores, although this varied from minimal change to 20 points. One participant (ID15) notably decreased by more than 10 points.

ALA total scores at all three time points were normally distributed. Repeated measures ANOVA showed a significant effect of time (F(2,52) = 7.631, p <.001, η_p^2=.227) (Figure 3). Pairwise comparisons revealed gains in aphasia-related quality-of-life between T1 to T2 (p=.014 with an average gain of 0.25[6] points) and between T1 to T3 (p=.001). There was no difference between T2 to T3 (p=.378) indicating gains were maintained. Between T1 and T2, eight participants made a gain < 0.5, and one participant (ID15) declined almost 0.5.

ALA participation scores at T1 and T2 were normally distributed, but not at T3 (.914, p=.029). Given that T1-T2 is the more important comparison and these data were *normally* distributed, parametric statistics were employed but considered cautiously. Repeated measures ANOVA revealed a significant effect of time (F(1.16,41.859) = 4.893, p=.018, η_p^2=.158) (Figure 4). Pairwise comparisons revealed gains in participation between T1 to T2 (p=.033 with an average gain of 0.25[7] points) and T1 to T3 (p=.018). There was no difference between T2 to T3 (p=.422) indicating gains were maintained. Between T1 and T2, seven participants gained < 0.5 points, and three participants (including ID15) declined 0.5 or more.

VAMS-Sad at all time points were not normally distributed (p=.001 and .002). Subsequently, Wilcoxon Signed Ranks test was used. There was no significant difference between T1 to T2 (Z=-.552, p=.581), between T2 to T3 (Z=-1.856, p=.063), and between T1 to T3 (Z=-.504, p=.615). Box and whisker plots illustrate group findings across time points (Figure 5). Between T1 and T2, substantial variation in change score was noted. Three participants improved <25 points, and three participants declined by <25 points (including ID15).

Insert Figures 1-5 about here

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[6] This gain scaled up (i.e. 0.25 x 37 items) = 9.25 and was calculated for drawing comparisons in the Discussion

[7] This gain scaled up (i.e. 0.25 x 16 items) = 4 and was calculated for drawing comparisons in the Discussion

Change scores from baseline to immediately post-intervention for each participant on each outcome measure were calculated to explore individual responses on measures. Patterns of notable improvement and decline were identified for 12 participants. Participant ID24 improved in four outcomes, participants ID 1, 11 and 19 on three outcomes, and participants ID6, 8, 18, 27 and 28 in two outcomes. Participant ID16 declined in four outcomes. Participants ID3 and 7 declined in two outcomes yet improved in one outcome (social participation). Some limited post-hoc analysis was undertaken comparing n=9 (substantial responders) to n=18 (remaining participants) on three variables using independent t-tests. There were no significant differences for age (62.11yrs vs 61.06yrs, t=0.22, p=0.82), months post-onset (63.78months vs 65.28 months, t=0.06, p=0.95), or CAT Spoken word to picture matching (24.11 vs 25.76, t=0.96, p=0.35).

Discussion

Key findings of this study were that delivering this pilot of supported conversation for participation online was possible with a 93% retention rate. Compliance with intervention was also excellent. All participants who remained in the study completed the intended dose of 16 supported conversation sessions. With one exception, delivery was remote, and involved participants working with therapists from home. Preliminary outcomes indicated group gains in social participation (size of social network), aphasia related quality of life and communication confidence. These gains were achieved in a group of participants with chronic aphasia, although individual variability was noted across all outcome measures as reported in the Results. Findings are considered largely within the broader communication partner training (CPT) evidence base, where our 1:1 treatment study makes a novel contribution with respect to both social and quality of life outcomes.

As a group, people with aphasia reported significantly more social contacts using the SNA following online supported conversation therapy, specifically middle and outer circle social contacts, and they maintained this gain during a two-month period of no treatment. The size of the gain is substantial at an average of eight more contacts, and we posit that the magnitude of this gain does suggest a treatment effect that cannot be attributed to normal variability. However, we cannot be certain of this as this was not a controlled study, and various metrics - standard error of measurement error, minimal detectable change, and minimal clinically important difference - are not established for this measure. We noted with interest that participants in our study had a very similar total social network size (N=22) to the original report of the SNA in people with aphasia (N=21 in Cruice et al., 2006). Furthermore, they achieved an average of 30 people post-intervention, the same number reported by the healthy older adult comparison group in Cruice et al. Whilst the SNA is not intended for normative comparison, this does suggest that people with aphasia may have achieved a more typical social network size post-intervention. The *personal* significance of any gain in network size is also difficult to establish. For example, the addition of one person or improved quality of conversations through use of Skype rather than telephone may be of huge individual importance.

Turning now to the CPT literature, previously the participation outcomes from these interventions have almost entirely been considered as participation *in communication and conversation*, with only one other study to our knowledge assessing broader participation (Hinckley & Packard, 2001). In the current study, we hypothesize our social gains are due to people reconnecting with individuals previously lost from their network or making new connections, either online or face-to-face, as were often the participation goals of individuals in this study. It is possible that some of the social benefits gained from within supported conversation interventions (see Introduction McVicker et al., 2009) translated to interactions outside that context and into broader social engagement (as per Lyons et al., 2009 see Introduction). Further analysis is needed to explore the relationships between participants' personalised participation goals and their participation outcomes.

Improved participation was also evidenced for participants as a group in the ALA Participation domain (secondary outcome measure) and strengthens this above argument for treatment effect (on the primary outcome measure). Items within this domain pertain to getting out and about to places, and doing what one wants (e.g. work, volunteering, leisure, recreation). Items also cover six items on having conversations of different types (simple/ complex) and in different contexts (home/ community; Simmons-Mackie et al., 2014). We hypothesize that people's actual life participation did change as they achieved goals in exploring and attending local community organisations (e.g. libraries) and events. Similar gains in life participation from an online aphasia intervention (TELEGAIN) have been noted by Pitt et al. (2019). People with aphasia participated in 18 hours of group intervention via videoconferencing. The intervention focused on creating opportunities for communicative success, sharing personal life history, and providing support for living successfully with aphasia through networking with others. The average participation gain noted in Pitt et al. (5.28 points) is not dissimilar to our study (4 points). Considered collectively, the SNA and ALA Participation findings suggest that relatively low dose and non-intensive online supported conversation for participation therapy can improve social engagement in people with chronic aphasia (group analysis). It is important to note however that not every participant made social participation gains, and some remained unchanged. Further research is warranted to investigate who responds to this treatment more than others and explore strategies or amendments to the intervention to address those who are currently not responding. This may be achieved through theoretical intervention modelling as well as interviews with participants exploring their perception of change and impact leading to intervention refinement.

Communication confidence (primary outcome measure) increased for the group following intervention but returned to within range of baseline at the follow-up period. We have interpreted this as treatment-related but again cannot be certain as the various metrics mentioned above for the SNA are also not established for the CCRSA. This positive treatment-period finding aligns with the broader literature where CPT is considered probably effective at improving the communication of people with aphasia (Simmons-Mackie et al., 2010, 2016). It also resonates with the positive ease of communication and increased confidence with conversation findings from McMenamin and colleagues (2015) and McVicker et al. (2009) where conversation partners were students and volunteers respectively. Additionally, the size of average CCRSA gain (2.38) in our study is not dissimilar to average gain (2.18) for those receiving telerehabilitation in Meltzer and colleagues' study (2018). Interestingly though, improvements in the current study were not maintained, and two scenarios may explain this finding. It is possible that communication confidence gains are not robust unless supported long-term. Alternatively, it is possible that communication confidence is susceptible to the influence of other life situations or events that occur close to the timing of the assessment (e.g. a challenging conversational interaction with an unskilled member of the public may cast a negative view on one's perceptions of one's communication abilities). In the absence of positive therapeutic input at the follow-up time point, instances such as these may have affected these ratings.

As a group, people with aphasia also reported improved aphasia-related quality of life following the intervention and maintained this for the subsequent two months. Previously, there has been insufficient evidence to make any recommendations about quality of life outcomes for people with aphasia from 1:1 supported conversation/ communication partner training studies (Simmons-Mackie et al., 2010; 2016), so this finding makes a novel contribution to this field.

Improved quality of life was also an outcome of TELEGAIN (Pitt et al., 2019), and their gain of 11.83 points on ALA total score is again not dissimilar to the gain in the current study (9.25 points). We posit our findings here may be explained in various ways. Firstly, it is possible that the regular prolonged engagement with a motivated individual (student or qualified speech therapist) resulted in an overall more positive life experience which was reflected in their answers to the ALA questions. A controlled study design (e.g. no-treatment comparison cohort) could further test this explanation. Secondly, it is possible that both the process of engaging in an online intervention and participating in supported conversation (additionally being goal-oriented) resulted in positive quality of life changes that were well detected by the ALA instrument. For example, in domains other than Participation as already described above, items in *Environment* related directly to the intervention. These included talking at home/ community, getting help from others in different contexts, and knowing you are competent. Items in *Language* were targeted during intervention, that is, talking, understanding, reading, and writing. Items in *Personal* include people felt less lonely and more confident, accepted and in charge. Furthermore, participating in an online intervention, learning to use technology, coping with any technological difficulties, and using a mainstream software well known to the general public is likely to have resonated with people in terms of 'aphasia not getting in the way of their lives' and 'feeling competent'. These are sentiments reflected in several ALA items. A third possible explanation is that the intervention very much addressed functional communication ability, which is known to be the strongest predictor of quality of life (Hilari, Needle & Harrison, 2012). Throughout intervention people with aphasia employed speech, written words, drawings, gestures photos, pictures, maps, during their supported conversation sessions, which were the means for communication and/ or targets for improvement as part of the intervention. Fourthly, ALA test authors acknowledge the total score is weighted towards the participation, so a strong participation domain effect will drive a subsequent aphasia-related quality of life outcome. We propose that second, third and fourth explanations account for our findings here.

The mood findings from this study clearly indicate no treatment effect of online supported conversation on participants' mood as a group on this measure. It is noted that in both the 2010 and 2016 systematic reviews of communication partner training, there was insufficient evidence to make recommendations for partner training on the psychosocial adjustment of people with aphasia with inadequate and conflicting data (Simmons-Mackie et al., 2010; 2016). In our study, substantial variability within the sample was clearly evidenced with no consistent pattern in change across time. Indeed, one participant (ID16) substantially declined in mood and other areas following intervention, which may have reflected a depressive episode or coping with a broader life challenge. There are several possible interpretations for these findings. It is possible that: (1) this intervention did not influence how sad one feels; (2) the dose of intervention was insufficient to provoke more robust change across more participants; (3) *general* mood was altered, but not *sad* mood, in which case other mood states and/or outcome measures may be more sensitive to this intervention; and (4) people with aphasia had difficulty completing the measure particularly with the vertical rating scale (although this orientation is recommended to address potential visuo-spatial impairments in stroke survivors) meaning that scores do not reliably reflect people's mood. Further research is clearly needed to establish whether mood is influenced by such an intervention, for example using broader mood measures or different methods such as interviewing participants, which in turn may then inform a more optimal mood assessment choice for future testing of this intervention.

The positive outcomes described above were achieved despite the fact that at least half the sessions were provided by students of speech and language therapy. In most previous studies of communication partner training, the intervention provider has been a qualified practitioner, working alone or in collaboration with another professional, assistant or, on occasion, a person with aphasia (Cruice et al., 2018). However, the involvement of students and/or volunteers in this form of intervention has been reported (Hickey, Bourgeois & Olswang, 2004; Lyon et al., 1997; McMenamin et al., 2015; McVicker et al., 2009; Rayner & Marshall, 2003). Thus, our study adds to the evidence that supported conversation can be provided via a delegated model of care, even when provision is remote. This may add to its clinical feasibility and cost effectiveness.

We acknowledge a number of limitations in this pilot study, several indicated already but also recapped here for comprehensiveness. These include a single pre-treatment baseline measure, a lack of control for intervention effects either through study design or a comparator treatment, a lack of independence between assessment and treating staff and students, and a relatively small sample size. Adherence to treatment delivery was not evaluated, however several aspects of the study aimed to promote good treatment fidelity, such as the availability of a treatment manual, training of the intervention providers, and regular team meetings and supervision. This pilot study has highlighted the limitations of the assessments chosen. Further consideration is needed of screening and language assessments in order to more clearly identify who might benefit from this intervention and enable implications for clinical practice to be more confidently articulated. Our data are also minimally informative about whether candidacy for this approach is related to the severity of aphasia. Our very preliminary post hoc analysis suggests that severity of word comprehension was not predictive of outcome, although those with very severe impairments were excluded by our selection criteria. Future studies might assess overall aphasia severity, e.g. via the Western Aphasia Battery, in order to relate this to treatment outcome. Whilst positive preliminary findings were noted on the SNA and CCRSA (primary outcome measures), various metrics are not established. More independent research is needed to develop these. Alternatively, different outcome measures with more robust psychometrics should be selected, such as the ALA.

Group benefits were reported for social engagement, communicative confidence and quality of life. Nonetheless, there were individuals who failed to respond or even demonstrated negative outcomes. It is difficult to determine why some individuals did not benefit, or factors that affected candidacy. Our post hoc analyses failed to detect any differences between those who did and did not respond, in terms of age, months post onset or baseline comprehension scores. Interviews were conducted with a sub-group of the participants which may throw light on these issues and which will be reported in a subsequent paper. As mentioned earlier in the Discussion, further analysis of participants' personalised goals (and achievement) and whether these relate to outcomes may illuminate why some individuals showed change and others did not. Further research is warranted to investigate candidacy for this intervention, and to explore potential amendments to the intervention that meet the needs of those who are currently not responding. Future papers will also explore whether the baseline technology investigations, such as the DACL, were predictive of outcomes.

Further research refining the intervention and outcome measure choice then scaling up for evaluation of clinical and cost effectiveness is warranted. Similarly, feasibility testing is needed regarding implementation of online supported conversation for participation in clinical settings and the voluntary sector for both rehabilitative and long-term recovery purposes. Aspects such as technological equipment and Internet access, Internet reliability, availability of information technology support, technology skills and confidence, and accessible training and troubleshooting resources would be important considerations (Pitt, Hill, Theodoros, & Russell, 2018). This also includes seeking feedback from participants on the telerehabilitation delivery (Kearns, Kelly, & Pitt, 2020). A nested process evaluation would provide insights into how and why social engagement changes, and whether mood is influenced in any way by this intervention so this could be better understood and captured in outcome measurement where appropriate. Better understanding the resource requirements (technological and human resource in terms of student speech and language therapist as trained communication partner) will inform future implementation studies.

Conclusion

These preliminary findings suggest that relatively low dose and non-intensive personalised online supported conversation for participation intervention delivered by qualified or student speech and language therapists can generate long-term social and quality of life benefits, and short-term communication confidence benefits, for some people with chronic aphasia. Benefits are in line with the existing evidence base in face-to-face Communication Partner Training provision on communication outcomes and extend the existing evidence base in social participation and quality of life outcomes. This is likely due to the explicit related focus on participation in this study. These pilot findings suggest further research is warranted involving intervention modelling and refinement, and feasibility testing. This could lead to a definitive trial to investigate clinical efficacy and cost effectiveness.

References

Antonucci, T., & Akiyama, H. (1987). Social networks in adult life and a preliminary examination of the convoy model. *Journal of Gerontology, 42*(5), 519-527.

Babbitt, E., Heinemann, A., Semik, P., & Cherney, L. (2011). Psychometrics properties of the Communication Confidence Rating Scale for Aphasia (CCRSA): Phase 2. *Aphasiology, 25*(6-7), 727-735.

Brown, K. Worrall, L., Davidson, B., & Howe, T. (2010). Snapshots of success: An insider perspective on living successfully with aphasia. *Aphasiology, 24*(10), 1267-1295.

Brown, K., Worrall, L., Davidson, B., & Howe, T. (2011). Exploring speech-language pathologists' perspectives about living successfully with aphasia. *International Journal of Language and Communication Disorders, 46*(3), 300-311.

Caute, A., & Woolf, C. (2016). Using voice recognition software to improve communicative writing and social participation in and individual with severe acquired dysgraphia: An experimental single-case therapy study. *Aphasiology, 30*(2-3), 245-268.

Caute, A., Woolf, C., Wilson, S., Stokes, C., Monnelly, K., Cruice, M., Bacon, K., & Marshall, J. (2019). Technology-enhanced reading therapy for people with aphasia: Findings from a quasi-randomised waitlist controlled study. *Journal of Speech Language and Hearing Research, 62*(12), 4382-4416.

Cherney, L., Babbitt, E., Semik, P., & Heinemann, A. (2011). Psychometric properties of the Communication Confidence Rating Scale for Aphasia (CCRSA): Phase 1. *Topics in Stroke Rehabilitation, 18*(4), 352-360.

Cruice, M., Blom Johansson, M., Isaksen, J., & Horton, S. (2018). Reporting interventions in communication partner training: A critical review and narrative synthesis of the literature. *Aphasiology, 32*(10), 1135-1166.

Cruice, M., Hill, R., Worrall, L., & Hickson, L. (2010). Conceptualising quality of life for older people with aphasia. *Aphasiology, 24*(3), 327-347.

Cruice, M., Worrall, L., & Hickson, L. (2006). Quantifying aphasic people's social lives in the context of their non-aphasic peers. *Aphasiology, 20*(12), 1210-1225.

Cruice, M., Worrall, L., Hickson, L., & Murison, R. (2003). Finding a focus for quality of life with aphasia: Social and emotional health, and psychological well-being. *Aphasiology, 17*(4), 333-353.

Dalemans, R., de Witte, L., Wade, D., van den Heuvel, W. (2010). Social participation through the eyes of people with aphasia. *International Journal of Language and Communication Disorders*, *45*(5), 537-550.

Davidson, B., Howe, T., Worrall, L., Hickson, L., & Togher, L. (2008). Social participation for older people with aphasia: The impact of communication disability on friendships. *Topics in Stroke Rehabilitation, 15*(4), 325-340.

Enderby, P., Pickstone, C., John, A., Fryer, K., Cantrell, A., & Papaioannou, D. (2009). Resource manual for commissioning and planning services for SLCN. Royal College of Speech and Language Therapists. Accessed from https://www.rcslt.org/speech_and_language_therapy/commissioning/aphasia_plus_intro on 03/08/2017.

Estes, C., & Bloom, R. (2011). Using voice recognition software to treat dysgraphia in a patient with conduction aphasia. *Aphasiology, 25*(3), 366-385.

Finch, E., Cameron, A., Fleming, J., Lethlean, J., Hudson, K., & McPhail, S. (2017). Does communication partner training improve the conversation skills of speech-language pathology students when interacting with people with aphasia? *Journal of Communication Disorders, 68,* 1-9.

Greenhalgh, T., Vijayraghavan, S., Wherton, J., Shaw, S., Byrne, E., Campbell-Richards, D., … Morris, J. (2016). Virtual online consultations: Advantages and limitations (VOCAL) study. *BMJ Open, 6*, e009388.

Grohn, B., Worrall, L., Simmons-Mackie, N., & Brown, K. (2012). The first 3-months post-stroke: What facilitates successfully living with aphasia? *International Journal of Speech-Language Pathology, 14*(4), 390-400.

Hasson, N., & Joffe, V. (2007). The case for dynamic assessment in speech and language therapy. *Child Language Teaching and Therapy*, *23*(1), 9-25.

Helm-Estabrooks, N. H. (2001). *Cognitive Linguistic Quick Test (CLQT)*. The Psychological Corporation.

Herbert, D., Lindsay, M., McIntyre, A., Kirton, A., Rumney, P., Bagg, S., … Teasell, R. (2016). Canadian stroke best practice recommendations: Stroke rehabilitation practice guidelines, update 2015. *International Journal of Stroke, 11*(4), 459-484.

Hersh, D., Worrall, L., Howe, T., Sherratt, S., & Davidson, B. (2012). *SMARTER* goal setting in aphasia rehabilitation. *Aphasiology, 26*(2), 220-233.

Hickey, E., Bourgeois, M., & Olswang, L. (2004). Effects of training volunteers to converse with nursing home residents with aphasia. *Aphasiology, 18*(5-7), 625-637.

Hilari, K., Needle, J., & Harrison, K. (2012). What are the important factors in health-related quality of life for people with aphasia? A systematic review. *Archives of Physical Medicine and Rehabilitation, 93*(1 SUPP), S86-S95.

Hilari, K., Wiggins, R., Roy, P., Byng, S., & Smith, S. (2003). Predictors of health-related quality of life (HRQL) in people with chronic aphasia. *Aphasiology, 17*(4), 365-381.

Hinckley, J., & Packard, M. (2001). Family education seminars and social functioning of adults with aphasia. *Journal of Communication Disorders, 34*(3), 241-254.

Kagan, A. (1998). Supported conversation for adults with aphasia: Methods and resources for training conversation partners. *Aphasiology, 12*(9), 816-830.

Kagan, A., Black, S., Duchan, J., Simmons-Mackie, N., & Square, P. (2001). Training volunteers as conversation partners using "Supported conversation for adults with aphasia^{TM}" (SCA^{TM}): A controlled trial. *Journal of Speech, Language and Hearing Research, 44*(3), 624-638.

Kearns, A., Kelly, H., & Pitt, I. (2019). Self-reported feedback in ICT-delivered aphasia rehabilitation: A literature review. *Disability & Rehabilitation*, Epub ahead of print.

Kearns, A., Kelly, H., & Pitt, I. (2020). Rating experience of ICT-delivered aphasia rehabilitation: Co-design of a feedback questionnaire. *Aphasiology, 34*(3), 319-342.

Kontou, E., Thomas, S., & Lincoln, N. (2012). Psychometrics properties of a revised version of the Visual Analog Mood Scales. *Clinical Rehabilitation, 26*(12), 1133-1140.

Lyon, J., Cariski, Keisler, L., Rosenbek, J., Levine, R., Kumpula, J., … Blanc, M. (1997). Communication partners: Enhancing participation in life and communication for adults with aphasia in natural settings. *Aphasiology, 11*(7), 693-708.

Marshall, J., Caute, A., Chadd, K., Cruice, M., Monnelly, K., Wilson, S., & Woolf, C. (2019). Technology enhanced writing therapy for people with aphasia: Results of a quasi-randomised waitlist controlled study. *International Journal of Language and Communication Disorders, 54*(2), 203-220.

Meltzer, J., Baird, A., Steele, R., & Harvey, S. (2018). Computer-based treatment of post-stroke language disorders: A non-inferiority study of telerehabilitation compared to in-person service delivery. *Aphasiology, 32*(3), 290-311.

McMenamin, R., Tierney, E., MacFarlane, A. (2015). Addressing the long-term impacts of aphasia: How far does the Conversation Partner Programme go? *Aphasiology, 29*(8), 889-913.

McVicker, S., Parr, S., Pound, C., & Duchan, J. (2009). The Communication Partner Scheme: A project to develop long-term, low-cost access to conversation for people living with aphasia. *Aphasiology, 23*(1), 52-71.

Naetterlund, B.S. (2010). A new life with aphasia: Everyday activities and social support. *Scandinavian Journal of Occupational Therapy, 17,* 117-129.

Northcott, S., & Hilari, K. (2011). Why do people lose their friends after a stroke? *International Journal of Language and Communication Disorders, 46*(5), 524-534.

Northcott, S., Moss, B., Harrison, K., & Hilari, K. (2016). A systematic review of the impact of stroke on social support and social networks: Associated factors and patterns of change. *Clinical Rehabilitation, 30*(8), 811-831.

Ora, H., Kirmess, M., Brady, M., Partee, I., Hognestad, R., Johannessen, B., Thommessen, B., & Becker, F. (2020). The effect of augmented speech-language therapy delivered by telerehabilitation on poststroke aphasia – a pilot randomised controlled trial. *Clinical Rehabilitation, 34*(3) 369-381.

Pitt, R., Hill, A., Theodoros, D., & Russell, T. (2018). "I definitely think it's a feasible and worthwhile option": Perspectives of speech-language pathologists providing online aphasia group therapy. *Aphasiology, 32*(9), 1031-1053.

Pitt, R., Theodoros, D., Hill, A., & Russell, T. (2019). The impact of the telerehabilitation group aphasia intervention and networking programme on communication, participation, and quality of life in people with aphasia. *International Journal of Speech-Language Pathology, 21*(5), 513-523.

Power, E., Thomas, E., Worrall, L., Rose, M., Togher, L., Nickels, L., … Clarke, K. (2015). Development and validation of Australian aphasia rehabilitation best practice statements using the RAND/ UCLA appropriateness method. *BMJ Open, 5,* e007641.

Rayner, H., & Marshall, J. (2003). Training volunteers as conversation partners for people with aphasia. *International Journal of Language and Communication Disorders, 38*(2), 149-164.

Roper, A., Marshall, J., & Wilson, S. (2014). Assessing technology use in aphasia. In *Proceedings of the 16th International ACM SIGACCESS conference on Computers & accessibility* (pp.239-240). ACM.

Ryan, B., Hudson, K., Worrall, L., Simmons-Mackie, N., Thomas, E., Finch, E., … Lethlean, J. (2017). The Aphasia Action, Success, and Knowledge Programme: Results from an Australian Phase I trial of a speech-pathology-led intervention for people with aphasia early post-stroke. *Brain Impairment*, *18*(3), 284-298.

Royal College of Physicians Intercollegiate Stroke Working Party. (2016). *National Clinical Guideline for Stroke 5th Edition*. Accessed from https://www.strokeaudit.org/SupportFiles/Documents/Guidelines/2016-National-Clinical-Guideline-for-Stroke-5t-(1).aspx on 03/08/2017.

Simmons-Mackie, N., Kagan, A., Victor, C., Carling-Rowland, C., Mok, A., Hoch, J., … Streiner, D. (2014). The assessment for living with aphasia: Reliability and construct validity. *International Journal of Speech-Language Pathology*, *16*(1), 82-94.

Simmons-Mackie, N., Raymer, A., Armstrong, E., Holland, A., & Cherney, L. (2010). Communication partner training in aphasia: A systematic review. *Archives of Physical Medicine and Rehabilitation*, *91*(12), 1814-1837.

Simmons-Mackie, N., Raymer, & Cherney, L. (2016). Communication partner training in aphasia: An updated systematic review. *Archives of Physical Medicine and Rehabilitation*, *97*(12), 2202-2221.

Swinburn, K., Porter, G., & Howard, D. (2005). *The Comprehensive Aphasia Test*. Hove, UK: Psychology Press.

Thomas, S., Alker, M., MacNivcen, J., Haworth, H., & Lincoln, N. (2013). Communication and Low Mood (CALM): A randomized controlled trial of behavioural therapy for stroke patients with aphasia. *Clinical Rehabilitation, 27*(5), 398-408.

Wallace, S., Worrall, L., Rose, T., & Le Dorze, G. (2017b). Which treatment outcomes are most important to aphasia clinicians and managers? An international e-Delphi consensus study. *Aphasiology, 31*(6), 643-673.

Wallace, S., Worrall, L., Rose, T., Le Dorze, G., Cruice, M., Isaksen, J., … Alary Gauvreau, C. (2017a). Which outcomes are most important to people with aphasia and their families? An international nominal group technique study framed within the ICF. *Disability & Rehabilitation, 39*(14), 1364-1379.

Woolf, C., Caute, A., Haigh, Z., Galliers, J., Wilson, S., Kessie, A., … Marshall, J. (2016). A comparison of remote therapy, face to face therapy and an attention control intervention for people with aphasia: A quasi-randomised controlled feasibility study. *Clinical Rehabilitation, 30*(4), 359-373.

Appendix 1

Illustrative cases of the goal setting process (extract from Clinician Manual)

Johnny completed the SNA and placed his cousin Julie in the outer circle. Julie was important to him but was someone he only spoke to twice a year on the phone because she lived in Australia. Jonny had difficulties with verbal expression and communicated that this interaction was distressing and frustrating for him. **A potential participation goal is for Johnny to Skype Julie a few times during this therapy block.** The SLT's role could be to teach Jonny how to make Skype contact with Julie, explain his participation in the project and why he would like to Skype her. The SLT may help Jonny prepare before the Skype call by increasing his confidence in conversations with her over Skype. There may even be scope for the SLT to join a group call with Jonny and Julie where supported conversation strategies for Jonny could be introduced to Julie.

On the ALA, Priya reported that she used to go to the theatre regularly before her stroke but had not been since. Priya reported this was because her friends she would go with would always engage in discussions about the show afterwards, which Priya no longer felt she could join in since the onset of her aphasia. **A participation goal could therefore be for Priya to set up a theatre trip with her friends and go for a drink afterwards.** The SLT's role could be to support Priya over Skype to choose a show, and spend time reading about it, understanding it and practising some questions for discussion and strategies to manage in group conversation. Priya and her SLT could discuss what would make her feel confident and how to manage communication breakdown. Then the SLT could encourage Priya to contact her friends and arrange the outing.

In the Tech Screen we learn that Mo has never used a computer before but has an iPhone which he uses for texting. Mo is confident in his skills using the smartphone, but on his DACL we see that Mo finds it hard to learn new tasks on the iPad without visual aids for support. He would like to learn how to use Skype. **A technology goal for Mo could be to be able to consistently answer a Skype video call independently.** The SLT's role could be to teach Mo the process of answering a video call over Skype. This could start by lots of demonstration from the SLT, followed by hand-over-hand assistance for Mo. Mo could be taught to use his aphasia friendly user guide to follow the steps. If Mo struggled significantly, the SLT could record a visual tutorial on his iPhone as a reminder which he could watch at home. The SLT would aim to gradually withdraw the facilitators to enhance Mo's independence. He may achieve this goal quicker than expected. If that is the case, the SLT can use the Skype levels of difficulty to explore an additional Skype technology goal with Mo during the therapy block.

In the ALA Maryam reported she did not use any communication strategies besides writing, which she found ineffective as she had spelling difficulties. In her CCRSA in response to the question 'How confident are you that people understand you when you talk?' she reported 'not at all confident'. The therapist observed that in sessions there was often a communication breakdown between herself and Maryam. Maryam would use ambiguous pointing and become frustrated when the therapist could not interpret her communication. **A communication goal could therefore be for Maryam to increase her confidence by learning to use pictures to successfully communicate meaning over Skype.** The SLT's role could be to engage Maryam in supported, 'pre-planned' conversations over Skype, where the topic has been pre-decided the session before. This enables Maryam some time to consider the topic and provides both parties with time to gather picture materials to support the conversation. In the session, the SLT could then set a safe communication space and encourage Maryam to augment her communication by prompting her to show pictures. The therapist may also use strategies of modelling, joint watching of videos, sharing of maps and photographs etc.

Table 1. Participant demographic and screening measures data, N=27.

Participant ID	**Gender**	**Age**	**Months post onset**	**CAT Spoken word to picture matching (30 max score)**	**CLQT**				
					Attention	**Memory**	**Executive Function**	**Language**	**Visuospatial Skills**
ID1	Male	69	170	18	2	3	4	1	4
ID2	Male	66	48	13	3	3	2	3	3
ID3	Female	42	159		2	2	4	1	3
ID4	Male	53	35	25	4	1	4	1	4
ID5	Male	58	39	30	3	3	4	4	4
ID6	Male	72	89	25	2	4	3	4	1
ID7	Male	53	40	24	3	1	3	2	4

ID8	Male	49	84	26	2	2	1	3	1
ID9	Male	71	105	26	2	1	3	1	3
ID11	Female	71	34	28	4	3	4	3	4
ID12	Male	74	22	28	4	3	4	3	4
ID13	Male	58	161	18	2	1	1	1	3
ID14	Female	63	7	29	3	3	1	3	3
ID15	Male	72	25	30	4	4	4	3	4
ID16	Male	70	38	23	2	1	3	1	2
ID17	Male	65	17	28	4	2	4	2	4
ID18	Female	68	34	29	3	2	2	2	3
ID19	Male	65	92	23	2	2	2	2	2
ID20	Female	37	69	29	4	3	4	3	4
ID21	Male	41	7	28	4	2	4	3	4
ID23	Female	63	192	30	3	4	4	4	3
ID24	Female	46	23	21	3	1	2	1	3
ID25	Male	81	53	26	2	4	4	3	3

ID26	Male	59	14	26	4	1	4	1	4
ID27	Male	55	34	22	3	1	2	1	4
ID28	Female	64	14	25	2	3	4	3	3
ID29	Male	73	144	25	3	2	2	2	3
Mean		**61.41**	**64.78**	**25.19**	**2.93**	**2.3**	**3.07**	**2.26**	**3.22**
Max		**81**	**192**	**30**	**4**	**4**	**4**	**4**	**4**
Min		**37**	**7**	**13**	**2**	**1**	**1**	**1**	**1**

Table 2. Descriptive outcome measures data for all assessment measures, N=27

Assessment	**T1 Mean, SD, Range (N=27)**	**T2 Mean, SD, Range (N=27)**	**T3 Mean, SD, Range (N=27)**
SNA	21.85 17.5 4-87	30.11 19.94 5-95	29.85 18.54 8-98
CCRSA	28.1, 5.86. 16-38	30.48, 6.7, 12-40	29.2, 5.94, 20-40
ALA – Total	2.51, 0.61	2.76, 0.7, 1.03-3.97	2.82, 0.54, 1.7-3.68
ALA – Participation	2.59, 0.58	2.84, 0.68	2.9, 0.53
VAMS-Sad	54.93, 15.41, 40-93	56.63, 16.62, 40-97	52.22, 12.94, 40-91

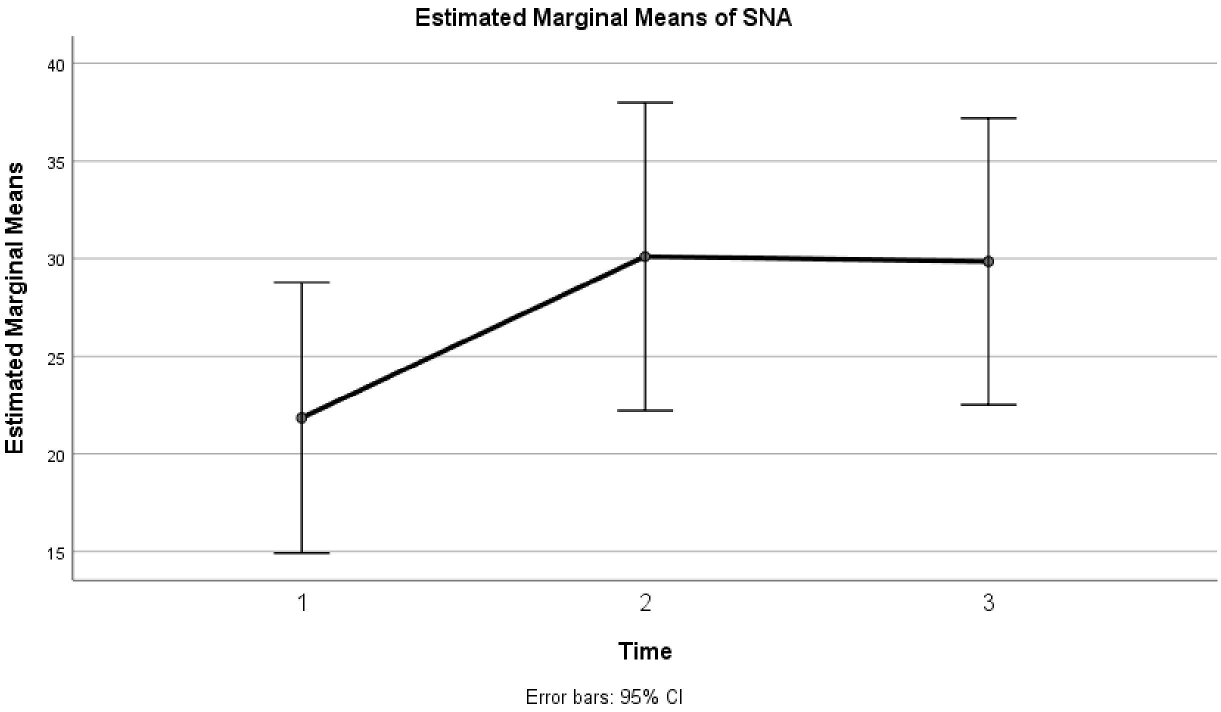

Figure 1. Repeated measures ANOVA of SNA total scores (N=27)

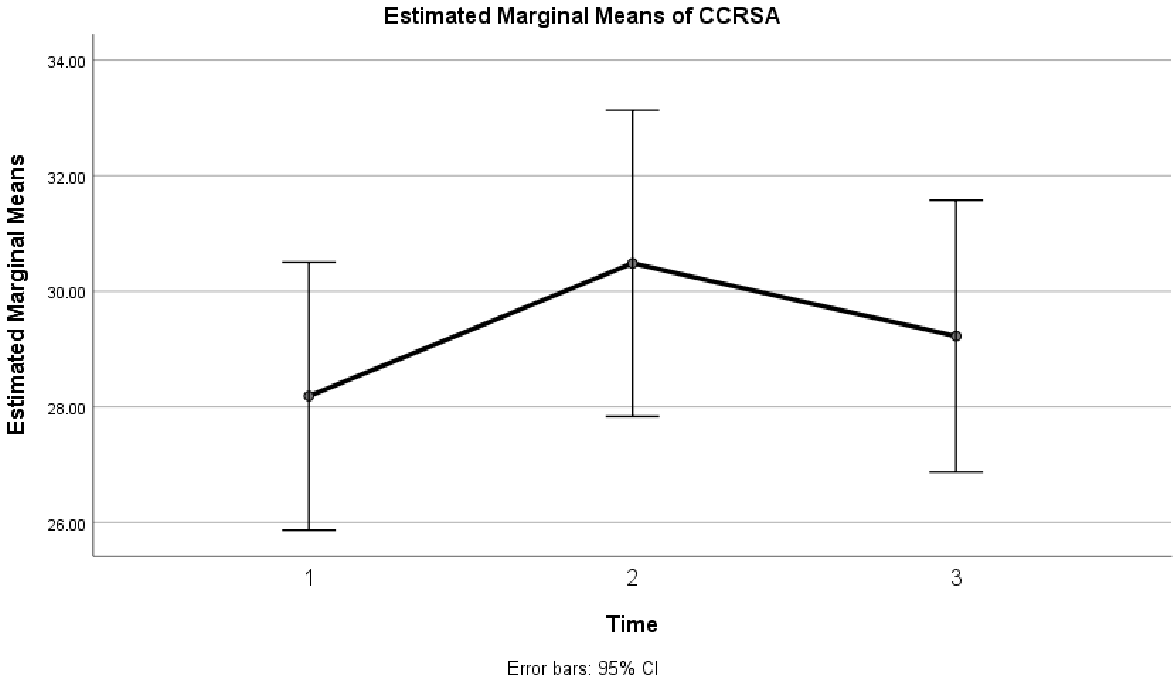

Figure 2. Repeated measures ANOVA of CCRSA total scores (N=27)

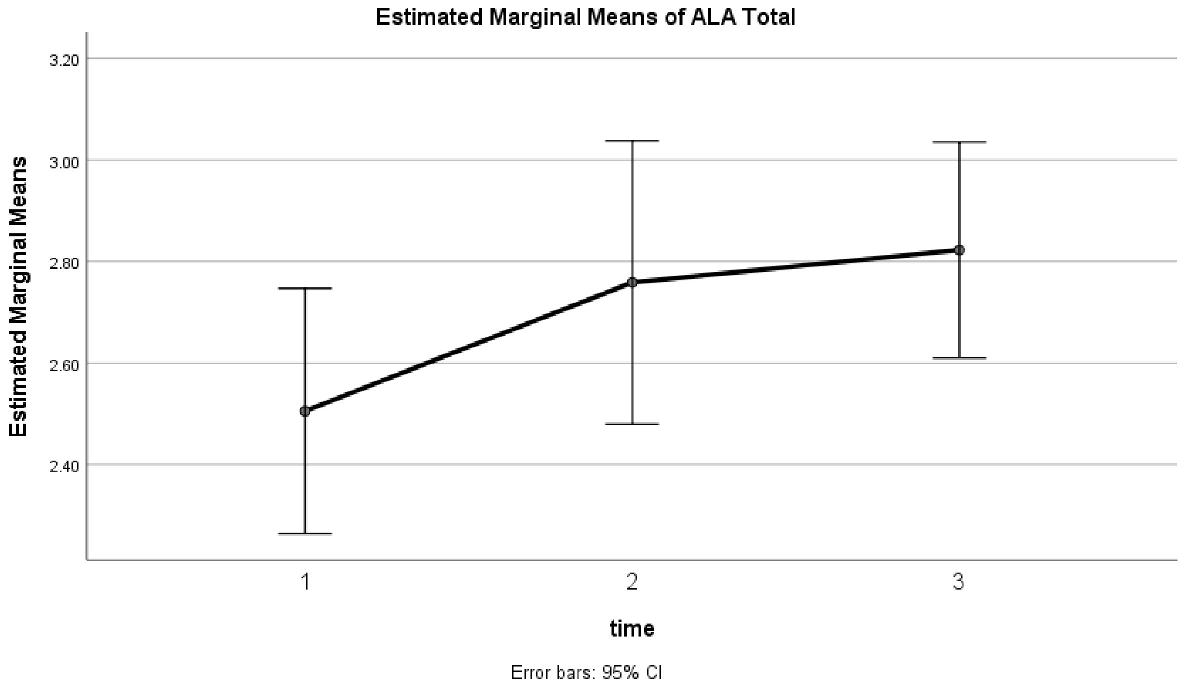

Figure 3. Repeated measures ANOVA of ALA Total scores (N=27)

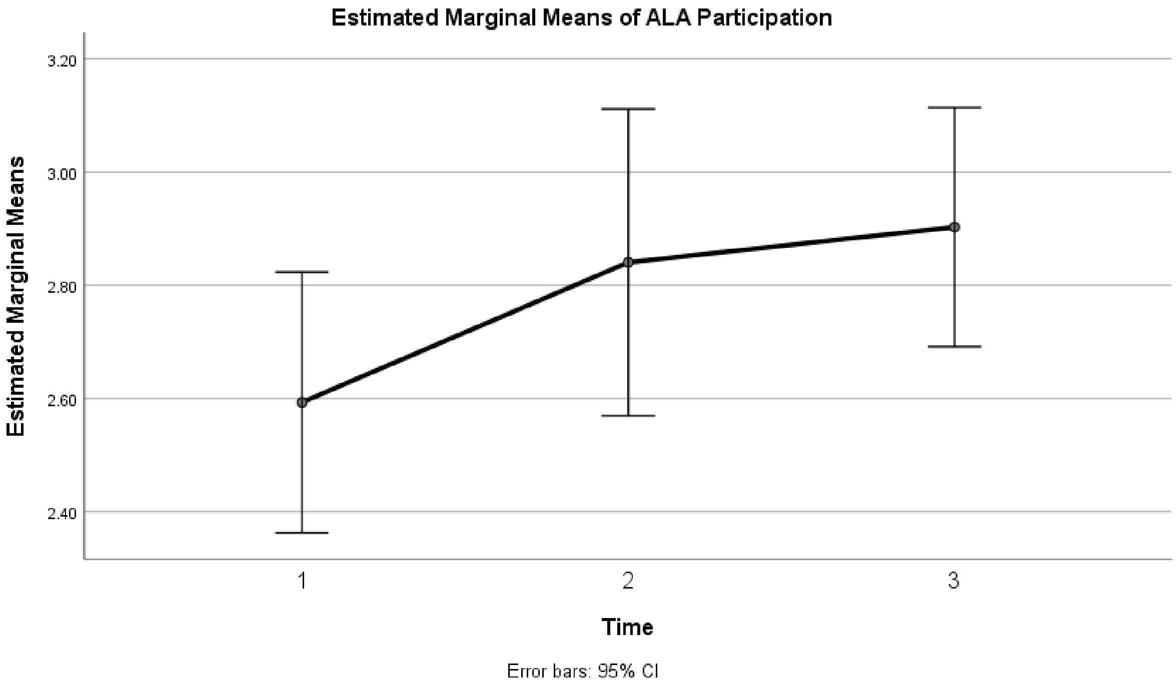

Figure 4. Repeated measures ANOVA of ALA Participation domain scores (N=27)

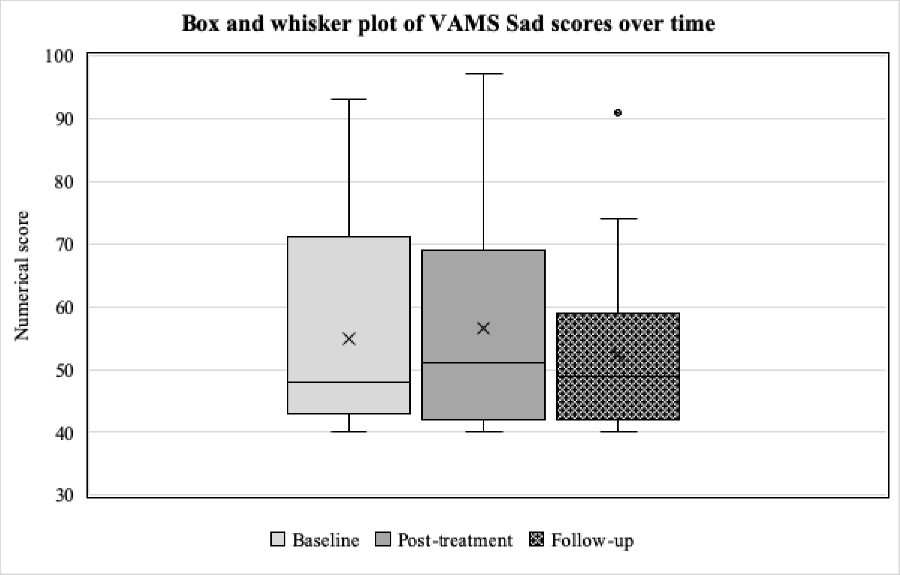

Figure 5. VAMS Sad Box and Whisker Plots across time points (N=27)

Supplemental file 1. Additional language functioning data on Comprehensive Aphasia Test subtests, N=27.

Participant ID	**CAT Spoken picture description**	**CAT Naming objects**	**CAT Repetition**	**CAT Written word to picture matching**
ID1	3	10	18	24
ID2	15	23	20	13
ID3				
ID4	28	16	18	20
ID5	36	38	29	30
ID6	0	0	0	22
ID7	5	0	0	20
ID8	26	8	23	26
ID9	10	0	7	17
ID11	33	47	38	28
ID12	29	40	31	28
ID13	0	0	0	0
ID14	25	42	36	29
ID15	35	30	34	30
ID16	2	0	23	12
ID17	37	42	38	28
ID18	27	45	38	30

ID19	15	24	26	23
ID20	46	47	38	27
ID21	15	27	14	30
ID23	47	48	29	30
ID24	11	0	0	22
ID25	17	32	28	30
ID26	0	6	11	25
ID27	0	0	0	21
ID28	27	45	29	27
ID29	15	42	22	24
Mean	**19.3846154**	**23.53846**	**21.1538462**	**23.69231**
Max	**47**	**48**	**38**	**30**
Min	**0**	**0**	**0**	**0**