



ARTICLE

Development of fidelity of delivery and enactment measures for interventions in communication disorders

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Abstract

Objectives: This study was part of a process evaluation for a single-blind, randomized controlled pilot study comparing Better Conversations with Primary Progressive Aphasia (BCPPA), an approach to communication partner training, with no speech and language therapy treatment. It was necessary to explore fidelity of delivery (delivery of intervention components) and intervention enactment (participants' use of intervention skills in the form of conversation behaviours comprising facilitators, that enhance the conversational flow, and barriers, that impeded the flow of conversation). This study aimed to: (1) Outline an adapted methodological process that uses video observation, to measure both fidelity of delivery and enactment. (2) Measure the extent to which the BCPPA pilot study was delivered as planned, and enacted.

Design: Observational methods were used alongside statistical analysis to explore the fidelity of intervention and enactment using video recordings obtained from the BCPPA pilot study.

Methods: A 5-step methodology, was developed to measure fidelity of delivery and enactment for the BCPPA study using video-recorded data. To identify delivery of intervention components, a random sample of eight video recorded and transcribed BCPPA intervention sessions was coded. To examine the enactment of conversation behaviours, 108 transcribed 10-min-video recorded conversations were coded from 18 participants across the control and intervention group.

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Results: Checklists and guidelines for measurement of fidelity of treatment delivery and coding spreadsheets and guidelines for measurement of enactment are presented. Local collaborators demonstrated 87.2% fidelity to the BCPPA protocol. Participants in the BCPPA treatment group increased their use of facilitator behaviours enacted in conversation from a mean of 13.5 pre-intervention to 14.2 post-intervention, whilst control group facilitators decreased from a mean of 15.5 to 14.4, over the same timescale.

Conclusions: This study proposes a novel and robust methods, using video recorded intervention sessions and conversation samples, to measure both fidelity of intervention delivery and enactment. The learnings from this intervention are transferable to other communication interventions.

KEYWORDS

communication disorders, complex intervention, dementia, enactment, fidelity

BACKGROUND

The Medical Research Council process evaluation guidelines propose that in addition to exploring intervention outcomes, it is important to explore processes through which an intervention may work (Moore et al., 2015; Skivington et al., 2021). This includes the context, how an intervention is implemented (e.g., fidelity) and mechanisms of impact through which interventions work (Moore et al., 2015; Skivington et al., 2021). Previous research outlines many different frameworks of treatment fidelity (e.g., Bellg et al., 2004; Borrelli et al., 2015; Carroll et al., 2007; Century et al., 2010). However, this work draws on Bellg et al.'s (2004) framework of treatment fidelity, which proposes five aspects of treatment fidelity: design, training, fidelity of delivery (whether interventions are delivered as planned), receipt (whether participants understand the skills that they are taught during the intervention) and enactment (whether participants can put the skills into practice in their daily lives; Bellg et al., 2004; Borrelli, 2011).

Methods for monitoring fidelity in complex health behaviour change interventions commonly include observation via audio recording (identified as the current gold-standard) and self-report (Breitenstein et al., 2010; Lorencatto et al., 2013; Toomey et al., 2017; Walton et al., 2017). The most common methods for measuring engagement (receipt and enactment) are self-report measures, attendance, or a combination (Borrelli, 2011; Hankonen et al., 2015; Rixon et al., 2016; Walton et al., 2017). Video observation (e.g., Harting et al., 2004; Skidmore et al., 2017) and direct observation (e.g., Dannhauser et al., 2014) have been used to measure fidelity of delivery and enactment in a small number of studies (see Walton et al., 2017). However, these methods are perceived to be more resource intensive and more invasive than audio recording (Breitenstein et al., 2010) and thus have not been commonly used to measure fidelity of delivery and enactment in practice.

Previous research has highlighted a need to develop high-quality measures that can be used to objectively measure fidelity of delivery and engagement (Walton et al., 2017). To address this, a five-step method was recently proposed to support the development of fidelity and engagement checklists (Walton, Spector, Roberts, et al., 2020), and used to measure fidelity of delivery of, and engagement with a complex dementia intervention (Walton, Spector, Williamson, et al., 2020). The five steps are: (1) reviewing previous measures, (2) analyzing intervention components and developing a framework outlining the content of the intervention, (3) developing fidelity checklists and coding guidelines, (4) obtaining feedback about the content and wording of checklists and guidelines and (5) piloting and

What is already known of this subject?

- Measurement of fidelity of treatment delivery has traditionally used audio recordings of intervention sessions and self-reports. Exploration of enactment to date has been limited across complex intervention research. The Better Conversations with Primary Progressive Aphasia pilot study describes a novel communication partner training (CPT) intervention delivered across 11 NHS sites to 18 participants with primary progressive aphasia and their communication partners. Evaluating outcomes of CPT interventions has proved challenging to date.

What does this study add?

- Video recording is a viable and feasible alternative to audio recording for measuring the fidelity of treatment delivery.
- A rigorous 5-stage method, using video data, for measurement of enactment.
- The Better Conversations with Primary Progressive Aphasia pilot study had high fidelity of delivery and enactment.

refining checklists and coding guidelines to assess and improve reliability (Walton, Spector, Roberts, et al., 2020). In previous research, this method has been used to assess fidelity using ratings of audio-recorded sessions together with provider and participant self-report, and enactment using participant self-report only (Walton, Spector, Williamson, et al., 2020).

Whilst a wealth of research has focused on objectively measuring fidelity, there is no gold standard for measuring engagement. According to Resnick et al. (2005) enactment is particularly difficult to measure due to the overlap with intervention outcomes. Outcomes refer to the target behaviour the intervention aims to achieve or change, and enactment refers to the skills that should be enacted as part of the intervention (Resnick et al., 2005). It is possible that a unique and robust way of exploring and measuring both fidelity of delivery and enactment may be offered by drawing on and combining methods used in both the speech and language therapy literature (e.g., video recordings used to observe speech and communication behaviours; Best et al., 2016) and fidelity literature (e.g. observing and identifying the frequency of health care professionals' behaviours using coding guidelines and checklists; Walton, Spector, Roberts, et al., 2020).

Speech and language therapy for dementia

Dementia describes a group of progressive neurological conditions associated with a deterioration in cognitive skills over time, ultimately resulting in increased care and support needs as individuals become unable to live independently. There are currently estimated to be 944,000 living with dementia in the UK (Luengo-Fernandez & Landeiro, n.d.) and more than 57.4 million worldwide (Nichols et al., 2022). One type of dementia, primary progressive aphasia (PPA), presents with language difficulties as the leading symptom. PPA is associated with Alzheimer's or frontotemporal dementia (Marshall et al., 2018; Ruksenaite et al., 2021) and people with PPA experience difficulties in using and understanding language. There are three distinct variants of PPA, each resulting in a unique communication profile. Semantic variant PPA (svPPA) causes difficulties in understanding word meanings, resulting in difficulties in producing nouns or understanding nouns, logopenic variant PPA (lvPPA) causes an individual to have difficulties in assembling words and retaining lengthy spoken information and nonfluent variant PPA (nfvPPA) causes groping and effortful speech (apraxia) and/or difficulties in using and understanding grammar (agrammatism).

Given these obvious speech, language and communication difficulties, it seems logical that people with PPA would benefit from speech and language therapy. The research evidence in this area is developing, and impairment-focused interventions that target the maintenance of speech and language through lexical retrieval practice (word practice; Croot, 2018) and script therapies (practising personally relevant sentences; Henry et al., 2018) have shown positive outcomes. However, functional interventions that target a person's ability to participate in communication activities such as conversation are often favoured in clinical practice (Volkmer et al., 2019). One such intervention is communication partner training (CPT), an approach that supports people with PPA and their family members to improve the flow and ease of conversations.

Communication partner training has the potential to reduce the risk of low mood developing into clinical depression, as demonstrated in stroke aphasia (Baker et al., 2018), and is an intervention approach that people with PPA and their family members feel is important to them (Loizidou et al., 2022). To date, the research evidence for CPT in PPA has been limited to individual case studies (Volkmer et al., 2020).

Research examining the effectiveness of CPT with people with stroke aphasia has revealed challenges in measuring outcomes. Saldert et al. (2018) highlight the challenge in CPT of aligning the objective of the intervention with the projected outcome. They report that despite the main objective of CPT being more closely aligned with distal outcomes such as the emotional impact of a communication disorder, intervention effects are more likely to be demonstrated in proximal outcomes such as changes in interactional behaviours. This may explain why measures such as communication confidence and carer stress may, at least immediately post-intervention, demonstrate little change (Volkmer et al., 2020). Indeed, it is ambitious to expect a 4-week intervention to result in immediate gain, and there is some evidence from the chronic disease literature that treatment effects following self-management interventions may be more observable in the period following an intervention, as participants establish proficiency in using in daily life what they have learnt (Luszczynska & Schwarzer, 2005a, 2005b).

One proximal measure that appears to hold promise for evaluating the impact of CPT interventions is observation of change in targeted conversation behaviours. For example, Best et al. (2016) and Barnes and Nickels (2018) captured CPT outcomes for stroke aphasia by evaluating changes in frequency of specific interactional behaviours. They jointly set goals, with the person with stroke aphasia and their CP, to change specific behaviours during the intervention. They then used independent masked raters to code and count behaviours captured on video recorded conversation samples, demonstrating changes in the intended direction after CPT. Azios et al. (2021) added to this by defining and coding both the speaker behaviour and next turn response from the communication partner (CP).

Better conversations with PPA

BCPPA is a manualized CPT intervention delivered by SLTs comprising four 1-h sessions for people with PPA and their CPs. Fidelity and enactment were evaluated as part of a process evaluation for a single-blind, randomized controlled pilot study (Volkmer et al., 2018) comparing BCPPA with no speech and language therapy treatment, employing a randomization ratio of 1:1. Local collaborators were trained to deliver the BCPPA program by the first author and were given access to an online BCPPA manual and training resource. Tables 1 & 2 present an overview of the intervention content and training of local collaborators, respectively. For development of the intervention, see Volkmer et al. (2021) and for detailed descriptions of each session and its aims see Supplementary material Appendix S1 and Volkmer et al. (2018). Results of the pilot study itself are reported elsewhere (Volkmer et al., 2023). To fully interpret effectiveness of communication interventions, such as BCPPA, it is important to explore whether these interventions have been delivered as planned (fidelity of delivery) and engaged with by participants (enactment). In this study, we aimed to:

TABLE 1 BCPPA session overview and aims.

Session	Aims
1: What is conversation?	<ul style="list-style-type: none"> • Discuss aims of therapy • Discuss and explore what conversation is and how it can go wrong • Initial viewing of their own conversation video
2. Goal setting	<ul style="list-style-type: none"> • Identify barriers and facilitators in their own conversation • Set goals for therapy based on this discussion
3. Practice	<ul style="list-style-type: none"> • Practice conversation using the strategies identified during goal setting • Problem solve any issues that have arisen in using identified strategies in conversations outside of therapy sessions
4. Problem solving and planning for the future	<ul style="list-style-type: none"> • Practice conversation using the strategies identified during goal setting • Consider planning for future changes in communication

Note: Each session was accompanied by handouts and home-based tasks which were made available for collaborators in the BCPPA pilot study on the UCL eXtend website and are anticipated to become publicly available following a future effectiveness study.

1. Outline an adapted methodological process to measure both fidelity of delivery and enactment that uses observation via video
2. Evaluate the extent to which the BCPPA pilot study was delivered as planned, and enacted.

METHODS

Design

Observational methods were used in this study, with statistical analysis to examine the behaviour counts collated from the video-recorded conversations and intervention sessions obtained from the BCPPA pilot study (Volkmer et al., 2023). Participants were recruited to the BCPPA intervention study and were involved for a total of 6 weeks, see Table 3. Each dyad used a tablet device to record four 10-min video recordings of everyday conversation before and after receiving the BCPPA or no treatment condition resulting in a total of 108 video recordings. Nine participants were randomized to have BCPPA, each receiving four intervention sessions, all of which were video recorded by the therapist on a tablet device resulting in a total of 36 recordings.

Ethical approval

The study protocol, participant information sheets and consent forms were coproduced with people with PPA and their family members who were members of the Better Conversations Patient and Public Involvement Steering Group. They advocated the use of video recordings for this study. The study conformed to recognized standards in the Declaration of Helsinki. This research study was granted ethical approval by London-Camden and Kings Cross Research Ethics Committee (reference: 17/LO/0357, received 26 April 2017). Participant dyads (a person with PPA and their CP) consented to video recording samples of their everyday conversations outside of intervention sessions and being video recorded during the delivery of the intervention. Only the first author, her supervisors and the junior researchers [student speech and language therapists (SLTs) assisting with the analysis] had access to the video data set. Where conversation data were transcribed for evaluation, they were anonymized using pseudonyms for people and places. Participants' faces were fully visible in these video recordings as facial expression forms a significant part of natural human communication, the

TABLE 2 Overview of training of local collaborators.

Training goals	Pre-training work	Day 1. (4.5 h)	Day 2. (4.5 h)
To be able to:	Local collaborators were given access to	Review study procedures	Discuss and practice completing formal outcome measures
Identify potential participants who meet the study inclusion criteria	the online BCPPA manual and training resource and sent reading materials from the Study Training Pack.	Discuss inclusion/exclusion criteria with vignettes to problem solve	Discuss therapy sessions and practice completing notes boxes on session plans, e.g., writing down what video clips they would show in session 1 and 2, circling the choice of activities for session 3 and what further information they would provide in session 4.
Consent participants to the study	Pre-training work required local collaborators to familiarize themselves with:	Discuss consent procedures and flow chart with accompanying casestudy	Complete a role play task from the BCPPA intervention session plan 1 to introduce the discussion on what conversation is.
Deliver the BCPPA program	Study inclusion and exclusion criteria Diagnostic criteria for PPA (Gorno-Tempini et al., 2011),	Recording conversation samples as an outcome measure and to support intervention	Observe and discuss BCPPA training video recordings demonstrating delivery of intervention, including goal setting and dealing with emotional therapeutic interactions
Collect pre-intervention measures	Online BCPPA Module 3, How to make a video, o Online BCPPA Module 4, What to target in therapy, o Online BCPPA Module 5, BCPPA therapy	Practice video recording of conversation samples	Discuss fidelity measures (video recordings, local collaborator fidelity questionnaire and participant feedback questionnaire)
Collect fidelity measures		Observe sample video recordings and identify barriers and facilitators to conversation with a view to planning intervention	Provide researcher contact information for ongoing support
Access the support and advice of the author throughout the study			

TABLE 3 Schedule of when recordings were made.

	Consent session			Pre- randomization assessment (1 week)				Video recorded BCPPA treatment sessions/control (4 weeks)				Outcome assessment (1 week)	Final data collection		
Week	0			1				2 3 4 5				6	7		
Video recording of everyday conversation	1a	2i	3i	4a								5a	6i	7i	8i

Note: Video recording of everyday conversation: a—assessor present but not in room; i—dependent home recording.

focus of this intervention. As a result, while confidentiality could be guaranteed in the use of footage for analysis, the preservation of anonymity was not possible. Judicious selection of recordings minimized this risk (e.g., footage where personal details were discussed was not used). Video data were stored on an encrypted hard drive, only accessible to members of the research team at UCL.

Sampling

Participants were recruited to the BCPPA pilot study from across 11 participating NHS sites in England and Wales. Local speech and language therapy collaborators identified suitable participants (inclusion criteria can be found in the protocol paper, Volkmer et al., 2018). Local collaborators were asked to identify patients referred to their service, between 30 November 2017 and 31 December 2020, who met the inclusion criteria, and to invite them to participate. Potential participants who met the inclusion criteria were not under any obligation to take part and this was made clear from the outset. Accessible information sheets were provided to potential participants and their CPs at least 48 hours before informed consent was obtained (see consent flowchart in published protocol, Volkmer et al., 2018). Consequently, 18 participants consented to participate and were randomized to receive either the BCPPA intervention or no treatment. All the local collaborators were asked to video record themselves delivering the BCPPA intervention sessions with all participant dyads.

This study reports on the analysis of: (1) 36 video recordings of the delivery of the BCPPA intervention sessions and (2) 148 video recordings of everyday conversation between participants with PPA and their CPs.

Fidelity of delivery

Sampling criteria used to investigate and measure fidelity of treatment delivery vary across literature. Recommendations for sampling a representative number of sessions vary between 10% and 20% (Hinckley & Douglas, 2013) and 20% and 40% (Schlosser, 2002). Consequently, 20% of intervention sessions were sampled for analysis of treatment fidelity. To select 20% (8h) of the total 36h of sessions recorded, two dyads were selected at random using an online random list generator. Each dyad attended four 1-h therapy sessions, totaling 8h of therapy sessions. To achieved equal distribution across treatment stages the data represents equal samples across all four BCPPA intervention sessions (two samples of each session). The two dyads sampled (participant 2.01 and 6.01) were from different NHS sites and consequently BCPPA was delivered by different SLTs.

Enactment

Enactment was measured across the entire sample of 18 dyads (from intervention and control groups) using a total of 108 conversation video recordings. Although each dyad recorded eight videos, four

before and four after treatment/control, only six were used. To minimize effects of heightened awareness of being recorded, a dyad's first and fifth videos were discarded and only the final 5 min of each video was sampled, as per the Best et al. (2016) protocol.

Procedures

Transcription

All video data, both intervention sessions and videos of everyday conversations, was transcribed using a verbatim turn-by-turn orthographic transcription system that included relevant non-verbal communication, e.g., gesture and facial expressions, or use of a handout. A transcription guide (see Appendix 1 in Appendix S1) was agreed to ensure consistency in transcriptions. Additionally, a 90-min training session was held during which junior researchers (student SLTs) produced and compared transcriptions for a conversation that was not part of the data sampled for analysis. A 90-min session was felt to be adequate for students to complete the tasks and have the opportunity to explore any outstanding questions.

Fidelity

As recommended by the fidelity literature a minimum of two raters (student SLTs) ensures a checklist can be reliably administered by multiple independent raters in the future (Heilemann et al., 2014). Fidelity data were divided equally between two student SLTs for transcription with each allocated one dyad. Despite having a transcription guide, having each student transcribe an entire set of videos for one dyad promoted consistency. Each transcription was labelled according to participant and session number.

Enactment

Given the volume of enactment data a pragmatic decision was made to for six student SLTs to transcribe and rate these videos recordings. Transcription of video recordings of everyday conversations for enactment analysis was allocated using an online random list generator between six student SLTs. Transcripts were pseudonymized and researchers masked to group allocation (treatment or control) and schedule of recording (pre- or post-intervention). Researchers independently coded the recordings they had transcribed, remaining masked throughout this process to minimize bias.

Coding

Fidelity

To code the video recordings of the intervention delivery, a checklist and accompanying guideline were developed, in line with what is considered the 'gold standard' for measuring fidelity (Bellg et al., 2004) and using methodology outlined in Walton, Spector, Roberts, et al. (2020).

Enactment

Similarly, to code the video recordings of everyday conversations, a coding spreadsheet and accompanying guidelines for enactment were developed, informed by methodology developed by Best et al. (2016) to measure changes in conversation behaviours after CPT. Instead of measuring goal targeted dyad specific outcomes (which are reported elsewhere in Volkmer et al., 2023), the methods outlined in this article allow for the measurement of changes in conversation behaviours representing enactment of intervention content. Table 4 provides a summary of steps taken to develop the fidelity and enactment analysis tools.

Analysis

Inter-rater reliability

Fidelity

The aim of this Inter-Rater Reliability (IRR) assessment was to explore whether the BCPPA fidelity checklists may be reliably administered by multiple independent raters. Previous fidelity literature has recommended that only 10%–20% of the data originally coded by the first rater, needs to be double-coded by a second rater (Heilemann et al., 2014). This study far exceeds this recommendation as 100% of the data was double-coded (four sessions each for two dyads were coded by two student SLTs). However, given this study's comparatively small sample size, it was agreed that this was a necessary provision to ensure the assessment of rater agreement could be applied both between dyads and across all four BCPPA sessions. IRR was assessed using percentage agreement analysis. Consistent with other fidelity studies, 80% was considered an acceptable level of inter-rater agreement (Lombard et al., 2002; Walton, Spector, Williamson, et al., 2020). Agreement was coded as 'yes' or 'no', depending on whether the raters' responses matched. The total number of positive matches provided the figure for the percentage agreement.

Enactment

Student SLTs independently coded from samples they had been allocated to transcribe. Fourteen (12.96%) of the 108 coded everyday conversations were randomly selected using a random number generator, to be double-coded to assess IRR (O'Connor & Joffe, 2020). Student SLTs also independently coded from these transcripts only (as it was not possible to share all recordings across all raters) and then met in pairs to discuss discrepancies. Code 26 (PwPPA uses tone and pitch to vocalize meaning) was excluded from IRR as it was not possible to rate this particular facilitator without access to the video data. IRR was calculated by dividing total agreed codes by total codes in a transcript and multiplying by 100.

Outcomes

Descriptive statistics, including percentages and means, were used to analyse the data. This is consistent with procedures and recommendations from other fidelity studies (Kaderavek & Justice, 2010; Walton, Spector, Roberts, et al., 2020; Walton, Spector, Williamson, et al., 2020).

RESULTS

To what extent was the BCPPA pilot delivered as planned?

Fidelity measures

The finalized checklist comprised 41 standardized intervention components and 40 tailored components. See [Table 5](#) for an overview of components by session.

A scale was developed to define the degree to which each component was delivered (achieved, partially achieved, not achieved). When examining fidelity data rater responses were scored as follows: 'Achieved' scored two, 'Partially Achieved' scored one and 'Not Achieved' scored zero. Any 'Not Applicable' responses (an additional option for the tailored components), also scored zero. Components that required reverse coding were scored as zero for 'Achieved', one for 'Partially Achieved', and two for 'Not Achieved'. An accompanying coding guideline provided definitions of each component and the degree of delivery for each one. [Figure 2](#) presents a blank copy of the fidelity checklist alongside a snapshot of the coding guidelines (see [Figure 1](#)).

TABLE 4 Summary of steps taken to develop fidelity and enactment analysis tools for the BCPPA study.

Steps recommended in Walton, Spector, Roberts, et al. (2020)	Fidelity	Enactment
Step 1: Review previous measures	<p>Review of health behaviour-change dementia related fidelity studies, specifically (Walton, Spector, Roberts, et al., 2020; Walton, Spector, Williamson, et al., 2020). Based on this, we developed multiple fidelity checklists (one for each of the four sessions), using a five-stage procedure adopted from other health behaviour-change dementia related fidelity studies (Walton, Spector, Roberts, et al., 2020)</p>	<p>The research team (AB, CB, CR, TC, AV, HW & SB) familiarized themselves with the original method of coding and counting conversation behaviours, based on the methodology developed by Best et al. (2016) whereby participants goals are converted into an observable behaviour, and transcribed video recorded conversations analysed to identify and count these behaviours</p>
Step 2: Analyse intervention components	<p>The individual components of the four BCPPA therapy sessions were identified from the intervention session plans and compiled into a central framework. Four members of the research team (TC, JC, AV & HW) analysed the session-one plan to agree categories and subcategories for a broad framework. Using the agreed categories, the remaining sessions were analysed by TC & JC. Category components were observable on video recordings. Components were marked as compulsory or optional (here referred to as the standardized and the tailored components, respectively)</p>	<p>During the four BCPPA therapy sessions, conversation behaviours are discussed using educational handouts and video recorded examples. These discussions include identifying both facilitator behaviours, that enhance the flow of conversation, and barrier behaviour, that act as a barrier to conversational flow (Beeke et al., 2021). Participant dyads then jointly set goals addressing these behaviours with the SLT. The 30 goals identified by 9 dyads who took part in the intervention arm of the BCPPA pilot study were analyzed. These goals were converted into 27 behaviour codes. Behaviours were categorized by (1) participant - person with PPA or communication partner, and (2) whether they described a facilitator behaviour or a barrier behaviour</p>
Step 3: Develop checklists and coding guidelines/definitions	<p>Four fidelity checklists were developed, with accompanying guidelines providing definitions for each component (to prevent rater-biases; Chan et al., 2004), for each BCPPA therapy session. Each component was numbered. Although they did not need to be delivered in this order to achieve fidelity, ordering the components in this way made the checklists easier to administer and so improved their implementation, as recommended by previous fidelity studies (Walton et al., 2017). Each component was rated on a three-point scale (Achieved, Partially Achieved, Not Achieved). To ensure the consistent application of this scale, coding guidelines provided criteria and examples of what qualified as achieved versus partially achieved</p>	<p>A coding spreadsheet with accompanying guidelines were developed. The coding spreadsheet captured the presence and frequency of each behaviour, and the sum total of behaviours per video sample. Coding guidelines provided definitions and examples of each behaviour, informed by research on the conversation in stroke aphasia and PPA (Best et al., 2016; Lock et al., 2001; BCA, Beeke et al., 2013; Brady et al., 2019; Herbert & Webb, 2013; Tryfomidis, 2018)</p>

TABLE 4 (Continued)

Steps recommended in Walton, Spector, Roberts, et al. (2020)	Fidelity	Enactment
Step 4: Obtain feedback from relevant stakeholders	Fidelity checklists and guidelines were discussed by the research team for refinement	Coding checklists and guideline definitions were discussed by the research team (AB, CB, CR, TC, AV, HW & SB) over several meetings for refinement. The lead author selected a video recording with an accompanying transcript that was unrelated to the study, of a person with PPA and their communication partner having an everyday conversation. The research team jointly coded the observable behaviours, discussing the coding process and behaviours they were unsure about
Step 5: Pilot and refine checklists and coding guidelines to assess and improve reliability of researcher ratings	Two video-recorded intervention sessions were randomly selected from the BCPPA treatment group using an online random number generator. Two independent raters each orthographically transcribed one of the two videos and then, independently, coded both transcripts before reconvening to discuss potential amendments and compare rating scores. Further refinements to improve clarity of wording were made. As previous research has often noted a lack of transparency when reporting on fidelity measures (Brogan et al., 2019; Walton et al., 2017), the use of a coding spreadsheet aimed to improve on this issue. The checklists and coding guidelines were then finalized for use in this fidelity study	Four video recordings were then randomly selected from all 18 BCPPA participants using an online random number generator. Four independent raters each orthographically transcribed one recording and independently coded two transcripts (their own and that of another rater) before meeting with that rater to compare rating scores. Any disparities in coding were discussed and agreed. The coding guidelines were then finalized for use in this fidelity study. Coders then used these guidelines and checklists to code all dyads' conversation samples (i.e., intervention and control groups in the BCPPA study) for all goal-derived behaviours (i.e., not just goals that a dyad set themselves)

TABLE 5 Standardized and tailored components of BCPPA by session.

Session number	Type of component	Identified number of components per session
Session 1	Standardized components	9
	Tailored components	7
Session 2	Standardized components	13
	Tailored components	8
Session 3	Standardized components	8
	Tailored components	15
Session 4	Standardized components	11
	Tailored components	10

Session 1: What is Conversation?					
Component Number	Component	Description	Criteria		
			Achieved	Partially Achieved	Not Achieved
1	SLT provides an overview of BCPPA therapy	The SLT explains the main aims and components of the therapy and names the therapy in full. Better Conversations for People With Primary Progressive Aphasia: 1. Will raise awareness of conversation in general, and your conversations with primary progressive aphasia , 2. Identify ways for the person with PPA to build successful turns , 3. Identify ways that CP can respond to turns of the person with PPA, 4. Provide and practice strategies to help you do this, 5. Plan for future changes in communication,	The SLT explains all five BCPPA components and names therapy in full.	The SLT explains 1-4 BCPPA components and names/ does not name therapy in full.	The SLT does not explain any of the five BCPPA components and refers to the therapy by its abbreviation.
2	SLT introduces aims of current session	The SLT introduces the current aims of the session. The aims include: 1. Discussing aims of the therapy. 2. Discussing and exploring what conversation is and how it can go wrong. 3. Initial viewing of their own videos.	The SLT introduces all 3 aims.	The SLT introduces 1-2 aims.	The SLT introduces no aims.
3	SLT facilitates a discussion with dyad about their current understanding of conversation to support their learning	The SLT facilitates a discussion with the dyad to reflect on their current understanding of conversation. *Facilitating a discussion includes: • Asking open questions (For example: "What does conversation mean to you?" or "Why do we have conversations?") • Giving prompts to reflect on their own experiences ("Think of a conversation you've had today, what was it for?")	The SLT asks the dyad what they already understand about what 'conversation' means and provides additional prompts when needed.	The SLT asks the dyad what they already understand about what 'conversation' means but does not provide additional prompts when needed.	The SLT does not ask the dyad what they already understand about what 'conversation' means.

FIGURE 1 Snapshot of BCPPA fidelity coding guideline.

Inter-rater reliability

Inter-rater reliability analysis indicated the percentage agreements for local collaborators' delivery of components for participants 2.01 and 6.01 ranged from 81.5% to 100% across sessions (see Appendix 3 in Appendix S1 for a more detailed breakdown). The average percentage agreement for standardized components was lower (87.8%) than that of tailored components (90%) for both dyads across all four sessions, although both are high (Lombard et al., 2002).

BCPPA FIDELITY CONTROL STRUCTURAL CHECKLIST: SESSION 1 *What is Conversation?*

Participant Number: _____ Coder's Initials: _____ Date Completed: _____

Component Number	Component	Please choose:		
		Achieved	Partially Achieved	Not Achieved
1	SLT provides an overview of BCPA therapy			
2	SLT introduces aims of current session			
3	SLT facilitates a discussion with dyad about their current understanding of conversation to support their learning			
4	SLT provides Module 5.0 Handout 1: <i>How Does Conversation Work?</i>			
5	SLT explains how conversation works using Handout 1: <i>How Does Conversation Work?</i>			
6	SLT facilitates a discussion with dyad about how conversation may be affected by PPA			
7	SLT provides Module 5.0 Handout 2: <i>What Can Go Wrong in Conversations?</i>			
8	SLT explains Module 5.0 Handout 2: <i>What Can Go Wrong in Conversations?</i>			
9	SLT shows the dyad a clip of video recording (30 seconds- 2 minutes) in preparation for Session 2**			
10	SLT provides an explanation of the rationale for showing particular clip and use of video**			
11	SLT provides the dyad with Homebased Task 1: <i>Your Conversation Troubles and Repairs**</i>			
12	SLT explains Homebased Task 1: <i>Your Conversation Troubles and Repairs**</i>			
13	SLT provides the CP with Homebased Task 2: <i>Strategies to Help Turn-Taking**</i>			
14	SLT provides the PwPPA with Homebased Task 2: <i>Strategies to Help Turn-Taking**</i>			
15	SLT explains to the CP and PwPPA Homebased Task 2: <i>Strategies to Help Turn-Taking**</i>			
16	SLT uses jargon*			

FIGURE 2 Blank copy of BCPA fidelity checklist. * = barrier to intervention delivery; ** = optional component.

Fidelity outcomes

Overall, local collaborators demonstrated a mean of 87.2% fidelity (87.3% for dyad 2.01 and 87.1% for dyad 6.01) to the standardized components of the BCPA intervention. Compliance to delivering the standardized components (total 86.6% for dyad 2.01 and 85.4% for dyad 6.01) was higher than delivery of tailored components (63.8% across both dyads). Table 6 presents session by session fidelity scores for each dyad. A more detailed analysis of all standardized and tailored components reveals some items were consistently not delivered specifically ‘SLT asks dyad to remember one or two things from the previous session’ was consistently administered with the lowest fidelity scoring ‘Not Achieved’ on all but one occasion. Table 7 reports on which items were consistently partially achieved across dyads.

To what extent did participants enact the intervention?

Enactment measures

The final coding checklist comprised 27 behaviours. Sixteen of these codes related to PwPPA behaviours, and 11 to behaviours of CPs. Twenty-three behaviours were defined as facilitators, behaviours that enhanced the flow of conversation, and four as barriers, behaviours that prevent or halt conversational flow. Figure 3 presents a screen shot of a sample of the refined behaviour definitions developed for the purpose of rating enactment of the behaviours. All the goals and linked observable behaviours can be found in Appendix 2 in Appendix S1. Figure 4 presents a blank copy of the coding spread sheet.

Inter-Rater reliability

The average IRR for the 14 double-coded transcripts was 60.05% (AB, CR, TC & CB: $M=57%$, $SD=7.6%$; NT & MC: $M=63.1%$, $SD=8.9%$). This study demonstrated a lower percentage than Best et al. (2016) who report an IRR of 69% for facilitators and 64% for barriers. Given that Best

TABLE 6 Fidelity scores for standardized and tailored components of BCPPA.

Dyad no.	Session no.	Fidelity score for standardized components	Percentage fidelity score for standardized components	Fidelity score for tailored components	Percentage fidelity score for tailored components
2.01	1	16	88.9	14	100
	2	22	84.6	9	56.3
	3	15	93.8	17	56.7
	4	18	81.8	11	55
	Total	71	86.6	51	63.8
	Mean	17.6	87.3	12.8	67
6.01	1	17	94.4	14	100
	2	18	69.2	10	62.5
	3	15	93.8	18	60
	4	20	90.9	9	45
	Total	70	85.4	51	63.8
	Mean	17.5	87.1	12.8	67
Total		141	86	102	63.8
Mean		17.6	87.2	12.8	67

TABLE 7 Session components that were coded as 'partially achieved' for both dyads and the accompanying rationale.

Components rated as partially achieved	Rationale	
	Dyad 2.01	Dyad 6.01
'SLT provides an overview of BCPPA therapy'	Did not explain the fifth aim of the BCPPA therapy (to discuss future changes to communication)	Did not explain the fifth aim of the BCPPA therapy
'SLT explains Module 5.0 Hand out 3: Goal Setting'	Does not provide definition of 'goal' or explain the hand-out scoring systems	Does not explain how to complete the table on hand-out
'SLT facilitate role-play task to practise target conversation strategies'	Does not explain the purpose of the task	Does not explain the purpose of the task

et al comprised 22 coded behaviours, and this study comprised somewhat more (27 behaviours) the authors considered 60.05% to be high IRR. During analysis IRR was hindered by codes 9, 10 and 17 as they were identified more difficult to objectively rate without viewing the video recording and required further discussion and agreement. Code 9 was only relevant for participant 1.01 and code 17 only for participants 4.04 and 6.01.

Enactment outcomes

Overall, participants in the BCPPA treatment group increased their use of the 23 facilitator behaviours from a pre-intervention mean of 13.5 to 14.2 (in the anticipated direction) following intervention. The control group decreased their use of facilitator behaviours over the same time period from a mean of 15.5 to 14.4. However, following intervention the BCPPA treatment group enacted more barrier behaviours from a mean of 2.4 before intervention to 2.7 after intervention, whilst the control group enacted 2.9 pre intervention and 2.8 post intervention. See Table 8 for a detailed overview of pre- and post-intervention participant and group behaviours.

	Behaviours	Definition
1.	PwPPA responds with a substantive turn when asked a question (F)	<p>“A substantive turn is defined as a turn which contains <i>at least one content word*</i>, even where this is a repetition of a previous token from another person’s turn. We also include semantic and phonological paraphasias as content words in this context, i.e. where the target word is known.”</p> <p>“Content words are defined as nouns, proper nouns, verbs, adjectives, adverbs and numerals. Adverbs are defined as ending in –ly. Highly frequent verbs such as get, have, be, do, know, used as main verbs are included.</p> <p><i>Exclusions:</i> Generic terms such as stuff, thing, something, etc. Modal verbs such as can, must, should, might, and auxiliaries such as be, have do, will and shall, when they accompany a main verb. Function words including proforms.”</p> <p>Definitions from POWERS (Herbert et al 2013: 12).</p>
2.	CP finishes the turn of PwPPA (B)	<p>This is where the CP begins to speak when the turn of a PWPPA is clearly not complete (grammar, pausing and word finding behaviours may signal it is incomplete), and what the CP says supplies the as yet unspoken end part of the PWPPA’s turn. This might be a single word or a phrase. For example: CP It seems like you get on quite well PwPPA well it’s much the the same as when eh when eh CP when John PwPPA yeah CP John came</p>
3.	PwPPA asks a question (F)	<p>A question is defined as any speaker talk that performs the action of questioning the other participant in a conversation, i.e. it elicits an answer or if not, then the lack of an answer is remarked on and dealt with (e.g. by repeating the question). It does NOT have to be accompanied by questioning intonation to be a question. It may NOT be delivered using a grammatical question format or contain a WH question word. It can be constructed as a single word, a phrase, a clause or a sentence.</p> <p>If a speaker produces a sequence of questions within a turn or across a sequence of turns, count each one separately.</p>

FIGURE 3 Snapshot of the refined BCPPA behaviour definitions developed for the purpose of rating enactment of the behaviours (see Appendix 1 in Appendix S1 for full version).

1	Participant ID:	1cm															
2	Label for recording:																
3	Date of transcription:	25/11/2019															
4	Transcriber and coder:	Chloe Rush															
5	Date of coding:	17/04/2020															
6																	
				5	6	7	8	9	10	11	12	13	14				
				asks an en question	CP asks a test question (B)	PwPPA gives information to continue le. pauses establish identity of a named person when trouble occurs around person’s	CP lets the conversati on continue le. pauses for further clues/so PWPPA can use strategies (F)	PWPPA uses prompt card (F)	PWPPA initiates (verbal) turn (F)	CP initiates turn (B)	PWPPA talks around a word or concept when encounte rs word finding difficultie s in a turn (F)	CP ask a question	CP asks a yes/no question (F)	CP asks a multiple choice question (B)			
7	Line Number	Participant	Content														
8		1															
9		2															
10		3															
11		4															
12		5															
13		6															
14		7															
15		8															
16		9															
17		10															
18																	
				Total:													

FIGURE 4 Blank copy of the BCPPA coding spreadsheet.

DISCUSSION

1. Outline an adapted methodological process to measure both fidelity of delivery and enactment that uses observation via video
2. Evaluate the extent to which the BCPPA pilot study was delivered as planned, and enacted.

This study provides a detailed overview of a novel methodological process, using observation via video, to measure fidelity of delivery and enactment in a complex speech and language therapy intervention. These methods were adapted from Walton, Spector, Roberts, et al., 2020; Walton, Spector,

TABLE 8 Enactment of barrier and facilitator behaviours before and after randomization to either the intervention or control group.

Participant no.	BCPPA intervention group				Control group				
	Pre-intervention behaviours		Post-intervention behaviours		Pre-randomization to no treatment		Post no-treatment		
	Total Facilitators	Total Barriers	Total Facilitator behaviours	Total Barrier behaviours	Total Facilitator behaviours	Total Barrier behaviours	Total Facilitator behaviours	Total Barrier behaviours	
3.03	15	2	15	2	20	4	19	4	
6.01	16	3	18	3	19	3	16	2	
6.03	15	2	17	2	20	3	16	3	
4.04	13	2	13	3	17	4	16	4	
4.02	10	2	13	3	12	2	9	1	
2.01	12	2	11	2	12	2	12	3	
3.01	14	4	15	3	9	3	12	2	
1.01	13	2	14	3	15	3	16	3	
8.01	14	3	12	3	16	2	14	3	
Total mean scores for group	13.5	2.4	14.2 (increase of 0.7)	2.7 (increase of 0.3)	Total mean scores for group	15.5	14.4 (decrease of 1.1)	2.9	2.8 (decrease of 0.1)

Williamson, et al., 2020 for fidelity of delivery and additionally Best et al., 2016 for enactment. The tools developed were used to analyse data collected during the BCPPA pilot study (Volkmer et al., 2018). This work has demonstrated that it is possible to combine and adapt the methods from different disciplines to successfully measure fidelity and enactment using video observation. Moreover, the rigorous methods produced checklists and guidance that achieved high IRR. The findings also demonstrate that the BCPPA intervention sessions were delivered by local speech and language therapy collaborators with a high level of fidelity. Whilst participants in the treatment group demonstrated a modest increase in enactment of facilitator behaviours in post-intervention conversations, the control group demonstrated a modest decrease. Participants in the treatment group demonstrated a small increase in use of barrier behaviours in post-intervention conversations whilst the control group demonstrated a negligible decrease.

The methodology described in this study uses analysis of video recordings to provide a rigorous and comprehensive approach for measuring both fidelity of delivery and enactment. This builds on previous fidelity methods to measure complex interventions (Walton, Spector, Roberts, et al., 2020), which have depended on live observation and self-reports from those delivering and receiving the intervention. Despite being considered a novel approach, video recording is a common sampling procedure within fields such as applied conversation analysis and speech and language therapy intervention development (Beeke et al., 2013; Beeke et al., 2021; Best et al., 2016; Beeke & Bloch, 2023). Having developed an objective method, this study proposes a possible 'gold standard' for measurement of enactment. Additionally, we provide a viable and feasible alternative to the more commonly used audio recording (Walton et al., 2017), for robustly measuring fidelity of delivery.

The findings of this study demonstrated a high level of adherence (Lombard et al., 2002) to the BCPPA intervention protocol. This indicates the current training of local speech and language therapy collaborators is adequate (Volkmer et al., 2018). The MRC guidelines for development of complex interventions recommend pilot studies examine fidelity of delivery to inform future full trials to ensure participants are all receiving the same intervention in a future full effectiveness study (Craig et al., 2008; Skivington et al., 2021). The overall fidelity results have thus been published in the main results paper (Volkmer et al., 2023). The more detailed analysis of which standardized and tailored components were consistently not delivered will inform the ongoing refinement of the BCPPA intervention protocol and collaborator training for a future full effectiveness study that is currently underway.

The findings of this study also demonstrated participants enacted the BCPPA intervention. The BCPPA trains participants to increase the number of facilitator behaviours and reduce the number of barrier behaviours used in conversation (Volkmer et al., 2021). Despite entering the study with more of the desired facilitator behaviours, the control group enacted fewer facilitators over time. Comparatively, the treatment group demonstrated a modest increase in enactment of facilitator behaviours in post-intervention conversations. The difference in frequency of behaviours between the control and the treatment group at the start of the study could represent a clinical mismatch in groups, thus, this methodology could be used to ensure groups are matched prior to randomization in a future full trial. Whilst the change across conversation behaviours is modest (a mean increase of 0.7 in the treatment group and a decrease of 1.1 in the no treatment group), this data was collected from only a 5-min conversation sample. If this were scaled up to reflect an entire day, these results would be more significant. Importantly, however, this data confirms there was no contamination to the control group; a reduction over time in facilitator behaviours shows the control group were unaware of the targets for change.

The results of this study demonstrate the treatment group use more barriers on average after the intervention. It could thus be that participants may not retain all aspects of the multicomponent BCPPA intervention, that they may first focus on the things they feel they need to work on most, and address barriers later, or that addressing barriers is simply more difficult. It is also possible that the increase in barriers in the treatment group could represent increased attempts at communication. Importantly, there is no indication that these barrier behaviours may reveal underlying frustration or lack of confidence, given measures of confidence and well-being improved post-intervention (Volkmer et al., 2023). It is perhaps ambitious to expect a 4-week intervention to result in immediate and widespread positive change in a behaviour as complex as conversation. There is some evidence from the chronic disease

literature that treatment effects following self-management interventions may be more observable in the period following an intervention, as participants establish proficiency of use in daily life of strategies they have learnt (Creer, 2008; Luszczynska & Schwarzer, 2005a, 2005b; Smalley et al., 2021). Future speech and language therapy research might need to revisit the schedule of expected change and when to measure it. Alternatively, future interventions might need to be delivered in phases, so that participants learn strategies gradually, over time.

Implications

This study proposes a clear and rigorous method for measuring enactment in future CPT intervention studies. Additionally, it is possible to use the checklists and guidance developed in this study to collect baseline data on conversation behaviours used by participant dyads in future CPT studies prior to randomization. This would ensure treatment and control groups are matched in terms of behaviour use. Given previous research studies have employed self-report tools to measure contamination (Walton et al., 2018) future CPT studies will also benefit from collecting additional data such as this alongside the video recordings to fully evaluate comparability across methodologies.

Qualitative interviews with participants in the BCPPA pilot-feasibility study demonstrated that video recording was not considered to be a burden or intrusive (Volkmer, 2020; Volkmer & Broomfield, 2022). In fact, participants valued the use of video recordings for feedback and reflection as part of the intervention itself, and many advocated the design of additional methods of making naturalistic video recordings. There may be settings where using video recording may be more challenging, for example, when somebody lacks decision-making capacity or when there is a risk of capturing people who have not consented to participating in the study, e.g., community based interventions. Video recording people discussing intimate or sensitive topics (such as end of life) may also not be appropriate. Researchers and ethics committees need to revisit concerns around video recording and embrace it as an appropriate method of gathering data for fidelity and enactment analysis. Future researchers should seek advice from people with lived experience (often described as Patient and Public Involvement) during the development of a research protocol and ethics application, on whether to use video recording for the measurement of fidelity and enactment is appropriate.

Strengths and limitations

Use of video recording is a major strength of this study, particularly given the permanent objective and detailed record it provided for analysis of fidelity and enactment. However, a limitation to analysing video recorded data is operationalizing the identification of behaviours. To negate this issue, it was particularly important for accompanying fidelity and enactment guidelines to include written examples from previously collected transcripts and contextual information. These examples were collated from previous participants with stroke aphasia or PPA. This was developed with expert input from trained speech and language therapists, with knowledge of communication behaviours, and members of the Better Conversations with Aphasia research team. It is possible that IRR could have been improved had the examples been video examples, perhaps from the dyad themselves being rated, rather than a different dyad or with stroke aphasia.

Making video recordings was considered achievable and essential by the PPI steering group on the BCPPA pilot study, meaning ethical approval was granted without concerns being raised. It is however possible that participants acted less naturally or performed differently during the recordings, resulting in a biased data set. To address this, with PPI feedback, the BCPPA study used small unintrusive tablet devices that participants would feel comfortable having in the environment. Participants were trained to make recordings and though four recordings were made before and four after the intervention, only the last 5 min of the final three recordings were used for analysis of enactment. This is consistent with practice in the applied Conversation Analysis field, where sampling in this way is considered to facilitate

the capture of naturalistic interaction (Best et al., 2016). Finally, on examining the demographic data for the treatment and control groups in the BCPPA study (published in Volkmer et al., 2023) it is evident that although groups were matched for gender, age and PPA variant the control group had a longer mean time since onset of symptoms, meaning they were further along their disease journey. Thus, we cannot assume that control participants were more skilled conversationally as an explanation for the higher number of pre-intervention facilitator behaviours than the intervention group. This suggests the potential value of considering the enactment measurement methodology as a tool for matching groups before randomization on conversation behaviours present.

CONCLUSION

This study proposes a novel and robust method, using observation of video-recorded data, to measure both fidelity of intervention delivery and enactment. The study demonstrates that the BCPPA pilot study was delivered as intended, with a high fidelity of treatment delivery, there was no contamination across treatment and no treatment groups, and participants enacted the intervention in practice. We propose the use of video recording to robustly and objectively measure fidelity of delivery and enactment in complex communication-based interventions in dementia and beyond.

AUTHOR CONTRIBUTIONS

Anna Volkmer: Conceptualization; data curation; formal analysis; funding acquisition; investigation; methodology; project administration; resources; software; supervision; validation; visualization; writing – original draft; writing – review and editing. **Beeke Suzanne:** Conceptualization; formal analysis; methodology; supervision; writing – review and editing. **Jason Warren:** Conceptualization; supervision; writing – review and editing. **Spector Aimee:** Conceptualization; supervision; writing – review and editing. **Walton Holly:** Conceptualization; formal analysis; investigation; methodology; supervision; writing – original draft; writing – review and editing.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interests to declare.

OPEN RESEARCH BADGES



This article has earned a Preregistered Research Designs badge for having a preregistered research design, available at [<https://pilotfeasibilitystudies.biomedcentral.com/articles/10.1186/s40814-018-0349-6>].

DATA AVAILABILITY STATEMENT

Data can be made available on contacting the author, and where the confidentiality and informed consent of participants are maintained.

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REFERENCES

- Azios, J. H., Archer, B., & Lee, J. B. (2021). Detecting behavioural change in conversation: Procedures and preliminary data. *Aphasiology*, *35*(7), 961–983.
- Baker, C., Worrall, L., Rose, M., Hudson, K., Ryan, B., & O'Byrne, L. (2018). A systematic review of rehabilitation interventions to prevent and treat depression in post-stroke aphasia. *Disability and Rehabilitation*, *40*(16), 1870–1892.
- Barnes, S., & Nickels, L. (2018). Interaction-focussed therapy for aphasia: Effects on communication and quality of life. *International Journal of Speech-Language Pathology*, *20*(5), 528–540.
- Beeke, S., & Bloch, S. (2023). *Better conversations with communication disabilities: A practical guide for clinicians*. J & R Press.
- Beeke, S., Sirman, N., Beckley, F., Maxim, J., Edwards, S., Swinburn, K., & Best, W. (2013). *Better conversations with aphasia: An e-learning resource*. University College London. <https://extend.ucl.ac.uk/>
- Beeke, S., Volkmer, A., & Farrington-Douglas, C. (2021). TeleCPT: Delivery of a better conversations approach to communication partner training during a global pandemic and beyond. *Perspectives of the ASHA Special Interest Groups*, *6*(6), 1776–1785.
- Bell, A. J., Borrelli, B., Resnick, B., Hecht, J., Minicucci, D. S., Ory, M., Ogedegbe, G., Orwig, D., Ernst, D., Czajkowski, S., & Treatment Fidelity Workgroup of the NIH Behavior Change Consortium. (2004). Enhancing treatment fidelity in health behavior change studies: Best practices and recommendations from the NIH behavior change consortium. *Health Psychology*, *23*(5), 443–451.
- Best, W., Maxim, J., Heilemann, C., Beckley, F., Johnson, F., Edwards, S. I., Howard, D., & Beeke, S. (2016). Conversation therapy with people with aphasia and conversation partners using video feedback: A group and case series investigation of changes in interaction. *Frontiers in Human Neuroscience*, *10*, 562. doi:10.3389/fnhum.2016.00562
- Borrelli, B. (2011). The assessment, monitoring, and enhancement of treatment fidelity in public health clinical trials. *Journal of Public Health Dentistry*, *71*, S52–S63.
- Borrelli, B., Sepinwall, D., Ernst, D., Bell, A. J., Czajkowski, S., Breger, R., DeFrancesco, C., Levesque, C., Sharp, D. L., Ogedegbe, G., Resnick, B., & Orwig, D. (2005). A new tool to assess treatment fidelity and evaluation of treatment fidelity across 10 years of health behavior research. *Journal of Consulting and Clinical Psychology*, *73*(5), 852–860.
- Brady, L., Padden, C., & McGill, P. (2019). Improving procedural fidelity of behavioural interventions for people with intellectual and developmental disabilities: A systematic review. *Journal of Applied Research in Intellectual Disabilities*, *32*(4), 762–778.
- Breitenstein, S. M., Gross, D., Garvey, C. A., Hill, C., Fogg, L., & Resnick, B. (2010). Implementation fidelity in community-based interventions. *Research in Nursing and Health*, *33*, 164–173. <https://doi.org/10.1002/nur.20373>
- Brogan, E., Ciccone, N., & Godecke, E. (2019). Treatment fidelity in aphasia randomised controlled trials. *Aphasiology*, *33*(7), 759–779.
- Carroll, C., Patterson, M., Wood, S., Booth, A., Rick, J., & Balain, S. (2007). A conceptual framework for implementation fidelity. *Implementation Science*, *2*(1), 40. <https://doi.org/10.1186/1748-5908-2-40>
- Century, J., Rudnick, M., & Freeman, C. (2010). A framework for measuring fidelity of implementation: A foundation for shared language and accumulation of knowledge. *American Journal of Evaluation*, *31*(2), 199–218. <https://doi.org/10.1177/1098214010366173>
- Chan, E. K., O'Neill, I., McKenzie, M., Love, A., & Kissane, D. W. (2004). What works for therapists conducting family meetings: treatment integrity in family-focused grief therapy during palliative care and bereavement. *Journal of Pain and Symptom Management*, *27*(6), 502–512.
- Craig, P., Dieppe, P., Macintyre, S., Michie, S., Nazareth, I., & Petticrew, M. (2008). Developing and evaluating complex interventions: New guidance. *Sciences*, *337*, a1655. <https://doi.org/10.1136/bmj.a1937>
- Creer, T. L. (2008). Behavioral and cognitive processes in the self-management of asthma. *Journal of Asthma*, *45*(2), 81–94.
- Croot, K. (2018). Treatment for lexical retrieval impairments in primary progressive aphasia: A research update with implications for clinical practice. *Seminars in speech and language*, *39*(3), 242–256. Thieme Medical Publishers.
- Dannhauser, T. M., Cleverley, M., Whitfield, T. J., Fletcher, B. C., Stevens, T., & Walker, Z. (2014). A complex multimodal activity intervention to reduce the risk of dementia in mild cognitive impairment—ThinkingFit: Pilot and feasibility study for a randomized controlled trial. *BMC Psychiatry*, *14*(1), 1–9.

- Gorno-Tempini, M. L., Hillis, A. E., Weintraub, S., Kertesz, A., Mendez, M., Cappa, S. F., Ogar, J. M., Rohrer, J. D., Black, S., Boeve, B. F., Manes, F., Dronkers, N. F., Vandenberghe, R., Rascovsky, K., Patterson, K., Miller, B. L., Knopman, D. S., Hodges, J. R., Mesulam, M. M., & Grossman, M. (2011). Classification of primary progressive aphasia and its variants. *Neurology*, 76(11), 1006–1014.
- Hankonen, N., Sutton, S., Prevost, A. T., Simmons, R. K., Griffin, S. J., Kinmonth, A. L., & Hardeman, W. (2015). Which behavior change techniques are associated with changes in physical activity, diet and body mass index in people with recently diagnosed diabetes? *Annals of Behavioral Medicine*, 49(1), 7–17.
- Harting, J., van Assema, P., van der Molen, H. T., Ambergen, T., & de Vries, N. K. (2004). Quality assessment of health counseling: Performance of health advisors in cardiovascular prevention. *Patient Education and Counseling*, 54(1), 107–118.
- Heilemann, C., Best, W., Johnson, F., Beckley, F., Edwards, S., Maxim, J., & Beeke, S. (2014). Investigating treatment fidelity in a conversation-based aphasia therapy. *Aphasie Und Verwandte Gebiete/Aphasie et Domaines associés*, 37(2), 14–26.
- Henry, M. L., Hubbard, H. I., Grasso, S. M., Mandelli, M. L., Wilson, S. M., Sathishkumar, M. T., Fridriksson, J., Daigle, W., Boxer, A. L., Miller, B. L., & Gorno-Tempini, M. L. (2018). Retraining speech production and fluency in non-fluent/agrammatic primary progressive aphasia. *Brain*, 141(6), 1799–1814.
- Herbert, R., & Webb, L. (2013). *Powers: Profile of word errors and retrieval in speech: An assessment tool for use with people with communication impairment*. J & R Press.
- Hinkley, J. J., & Douglas, N. F. (2013). Treatment fidelity: Its importance and reported frequency in aphasia treatment studies. *American Journal of Speech-Language Pathology*, 22, S279–S284. [https://doi.org/10.1044/1058-0360\(2012/12-0092\)](https://doi.org/10.1044/1058-0360(2012/12-0092))
- Kaderavek, J. N., & Justice, L. M. (2010). Fidelity: An essential component of evidence-based practice in speech-language pathology. *American Journal of Speech-Language Pathology*, 19, 369–379. [https://doi.org/10.1044/1058-0360\(2010/09-0097\)](https://doi.org/10.1044/1058-0360(2010/09-0097))
- Lock, S., Wilkinson, R., Bryan, K., Maxim, J., Edmundson, A., Bruce, C., & Moir, D. (2001). Supporting partners of people with aphasia in relationships and conversation (SPPARC). *International Journal of Language & Communication Disorders*, 36(suppl 1), 25–30.
- Loizidou, M., Brotherhood, E., Harding, E., Crutch, S., Warren, J., Hardy, C. J. D., & Volkmer, A. (2022). *Like going into a chocolate shop, blindfolded.: What do people with Primary Progressive Aphasia want from speech and language therapy?*
- Lombard, M., Snyder-Duch, J., & Bracken, C. C. (2002). Content analysis in mass communication: Assessment and reporting of intercoder reliability. *Human Communication Research*, 28(4), 587–604.
- Lorenatto, F., West, R., Christopherson, C., & Michie, S. (2013). Assessing fidelity of delivery of smoking cessation behavioural support in practice. *Implementation Science*, 8(1), 1–10.
- Luengo-Fernandez, R., & Landeiro, F. (n.d.). *The economic burden of dementia in the UK*. <https://dementiastatistics.org/statistics/the-economic-impact-of-dementia/>. Accessed September, 2022.
- Luszczynska, A., & Schwarzer, R. (2005a). Multidimensional health locus of control: Comments on the construct and its measurement. *Journal of Health Psychology*, 10(5), 633–642.
- Luszczynska, A., & Schwarzer, R. (2005b). Social cognitive theory. In *Predicting health behaviour* (2nd ed., pp. 127–169). Open University Press.
- Marshall, C. R., Hardy, C. J., Volkmer, A., Russell, L. L., Bond, R. L., Fletcher, P. D., Clark, C. N., Mummery, C. J., Schott, J. M., Rossor, M. N., Fox, N. C., Crutch, S. J., Rohrer, J. D., & Warren, J. D. (2018). Primary progressive aphasia: A clinical approach. *Journal of Neurology*, 265(6), 1474–1490.
- Moore, G. F., Audrey, S., Barker, M., Bond, L., Bonell, C., Hardeman, W., Moore, L., O’Cathain, A., Tinati, T., Wight, D., & Baird, J. (2015). Process evaluation of complex interventions: Medical research council guidance. *BMJ*, 350, h1258.
- Nichols, E., Steinmetz, J. D., Vollset, S. E., Fukutaki, K., Chalek, J., Abd-Allah, F., Abdoli, A., Abualhasan, A., Abu-Gharbieh, E., Akram, T. T., Al Hamad, H., Alahdab, F., Alanezi, F. M., Alipour, V., Almustanyir, S., Amu, H., Ansari, I., Arabloo, J., Ashraf, T., ... Liu, X. (2022). Estimation of the global prevalence of dementia in 2019 and forecasted prevalence in 2050: An analysis for the global burden of disease study 2019. *The Lancet Public Health*, 7(2), e105–e125.
- O’Connor, C., & Joffe, H. (2020). Intercoder reliability in qualitative research: Debates and practical guidelines. *International Journal of Qualitative Methods*, 19, 1–13.
- Resnick, B., Bellg, A. J., Borrelli, B., De Francesco, C., Bregar, R., Hecht, J., Sharp, D. L., Levesque, C., Orwig, D., Ernst, D., Ogedegbe, G., & Czajkowski, S. (2005). Examples of implementation and evaluation of treatment fidelity in the BCC studies: Where we are and where we need to go. *Annals of Behavioral Medicine*, 29(2), 46–54.
- Rixon, L., Baron, J., McGale, N., Lorenatto, F., Francis, J., & Davies, A. (2016). Methods used to address fidelity of receipt in health intervention research: A citation analysis and systematic review. *BMC Health Services Research*, 16(1), 1–24.
- Ruksenaite, J., Volkmer, A., Jiang, J., Johnson, J., Marshall, C. R., Warren, J. D., & Hardy, C. J. (2021). Primary progressive aphasia: Toward a pathophysiological synthesis. *Current Neurology and Neuroscience Reports*, 21(3), 1–12.
- Saldert, C., Jensen, L. R., Blom Johansson, M., & Simmons-Mackie, N. (2018). Complexity in measuring outcomes after communication partner training: Alignment between goals of intervention and methods of evaluation. *Aphasiology*, 32(10), 1167–1193.
- Schlosser, R. W. (2002). On the importance of being earnest about treatment integrity. *Augmentative and Alternative Communication*, 18, 36–44.
- Skidmore, E. R., Butters, M., Whyte, E., Grattan, E., Shen, J., & Terhorst, L. (2017). Guided training relative to direct skill training for individuals with cognitive impairments after stroke: A pilot randomized trial. *Archives of Physical Medicine and Rehabilitation*, 98(4), 673–680.

- Skivington, K., Matthews, L., Simpson, S. A., Craig, P., Baird, J., Blazeby, J. M., Boyd, K. A., Craig, N., French, D. P., McIntosh, E., Petticrew, M., Rycroft-Malone, J., White, M., & Moore, L. (2021). A new framework for developing and evaluating complex interventions: Update of Medical Research Council guidance. *BMJ*, *374*, n2061.
- Smalley, K. R., Aufegger, L., Flott, K., Mayer, E. K., & Darzi, A. (2021). Can self-management programmes change healthcare utilisation in COPD?: A systematic review and framework analysis. *Patient Education and Counseling*, *104*(1), 50–63.
- Toomey, E., Matthews, J., & Hurley, D. A. (2017). Using mixed methods to assess fidelity of delivery and its influencing factors in a complex self-management intervention for people with osteoarthritis and low back pain. *BMJ Open*, *7*(8), e015452.
- Tryfonidis, C. (2018). *No Better Conversations with Primary Progressive Aphasia (BCPPA): Evaluating conversation therapy outcomes for people with PPA and their conversation partners, using observational and self-reported measures*. (Unpublished MSc Dissertation, UCL).
- Volkmer, A. (2020). *Better conversations with primary progressive aphasia (BCPPA): Developing and piloting a communication partner training intervention for people with primary progressive aphasia and their significant others*. (Doctoral dissertation, UCL (University College London)).
- Volkmer, A., & Broomfield, K. (2022). *Seldom heard voices in service user involvement: The how and why of meaningful collaboration*. J&R Press.
- Volkmer, A., Spector, A., Meitanis, V., Warren, J. D., & Beeke, S. (2020). Effects of functional communication interventions for people with primary progressive aphasia and their caregivers: A systematic review. *Aging & Mental Health*, *24*(9), 1381–1393.
- Volkmer, A., Spector, A., Swinburn, K., Warren, J. D., & Beeke, S. (2021). Using the Medical Research Council framework and public involvement for the development of a communication partner training intervention for people with primary progressive aphasia (PPA): Better conversations with PPA. *BMC Geriatrics*, *21*, 642. <https://doi.org/10.1186/s12877-021-02561-8>
- Volkmer, A., Spector, A., Warren, J. D., & Beeke, S. (2018). The ‘better conversations with primary progressive aphasia (BCPPA)’ program for people with PPA (primary progressive aphasia): Protocol for a randomised controlled pilot study. *Pilot and Feasibility Studies*, *4*, 158. <https://doi.org/10.1186/s40814-018-0349-6>
- Volkmer, A., Spector, A., Warren, J. D., & Beeke, S. (2019). Speech and language therapy for primary progressive aphasia across the UK: A survey of current practice. *International Journal of Language & Communication Disorders*, *54*(6), 914–926.
- Walton, H. J. (2018). *Evaluating the implementation of interventions to improve independence in dementia*. (Doctoral dissertation, UCL (University College London)).
- Walton, H., Spector, A., Roberts, A., Williamson, M., Bhatt, J., Tombor, I., & Michie, S. (2020). Developing strategies to improve fidelity of delivery of, and engagement with, a complex intervention to improve independence in dementia: A mixed methods study. *BMC Medical Research Methodology*, *20*(1), 1–19.
- Volkmer, A., Walton, H., Swinburn, K., Spector, A., Warren, J. D., & Beeke, S. (2023). Results from a randomised controlled pilot study of the Better Conversations with Primary Progressive Aphasia (BCPPA) communication partner training program for people with PPA and their communication partners. *Pilot and feasibility studies*, *9*(1), 87. <https://doi.org/10.1186/s40814-023-01301-6>
- Walton, H., Spector, A., Tombor, I., & Michie, S. (2017). Measures of fidelity of delivery of, and engagement with, complex, face-to-face health behaviour change interventions: A systematic review of measure quality. *British Journal of Health Psychology*, *22*(4), 872–903.
- Walton, H., Spector, A., Williamson, M., Tombor, I., & Michie, S. (2020). Developing quality fidelity and engagement measures for complex health interventions. *British Journal of Health Psychology*, *25*(1), 39–60.

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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