Title: Collaborative turn construction practices of people Primary Progressive Aphasia and their family conversation partners

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Abstract

Background
Primary progressive aphasia describes a group of three rare language led dementias; semantic, logopenic and non-fluent. The small number of conversation analysis studies to date suggest that repair and turn construction practices in primary progressive aphasia are similar to those seen in post-stroke aphasia. This study investigates the collaborative aspect of these practices between people with primary progressive aphasia and their conversation partners.

Method
Conversation Analysis was used to investigate collaboration in repair and turn construction practices in 10-minute video recordings of natural conversation collected from two dyads, one with logopenic and one with mixed primary progressive aphasia.

Results
This study demonstrates that people with primary progressive aphasia have a range of practices available to construct their turns, and that their conversation partners collaborate to co-construct talk.

Discussion
Findings demonstrate that collaboration can support interaction or lead to further interactional trouble. Collaborative practices are important targets for speech and language therapy interventions.

Background

Dementia is a broad term describing progressive deterioration in cognitive function, most commonly due to a neurodegenerative brain disease. It is estimated there are 55 million people living with dementia worldwide, and of these around 944,000 in the UK (Alzheimer's Research UK, 2022). Alzheimer's Disease (AD) is considered to account for approximately 500,000 of UK dementia cases and is associated with an underlying amyloid protein. After Alzheimer's disease, vascular dementia and Lewy body dementia (LBD) are considered the most common types of dementias. Frontotemporal dementia is one of the most important dementias of middle life, presenting unique challenges because it usually presents with either changes in social and emotional behaviour (behavioural variant FTD) or selective impairment of speech and/or language use (primary progressive aphasia). Typically, people with AD present with memory difficulties as a leading symptom, people with FTD present with behaviour changes and those with vascular dementia and LBD present with a complex combination of cognitive changes including to memory and attention, hallucinations and other perceptual disturbances and parkinsonism. Increasing difficulty with language is a relatively common secondary symptom in many dementia types (Suarez-Gonzalez et al, 2021)

Primary Progressive Aphasia (PPA) describes a small group of language-led dementia syndromes associated with AD and FTD (Marshall et al, 2018; Rukesnaite et al, 2021). PPA is considered a rare phenotype within dementia, with conservative estimates suggesting around 3,000 people in the UK are living with the disease (these estimates exclude PPAs associated with AD; Coyle-Gilchrist et al, 2016). There are three internationally recognized PPA variants; semantic (svPPA), non-fluent (nfvPPA) and logopenic (lvPPA) each presenting with differing language profiles (Gorno-Tempini et al, 2011). SvPPA is described as a gradual dissolution of semantic knowledge, with associated difficulties in using and understanding words, particularly nouns. People with nfvPPA experience effortful, halting speech (speech apraxia) and/or difficulties in understanding and using grammar. Finally, lvPPA causes difficulties in word retrieval and verbal short term memory, meaning that people hesitate frequently, produce speech sound errors and present with difficulties in processing complex sentences (Rukesnaite et al, 2021).

Unsurprisingly, dementia can have a significant impact on conversation. Though Kindell et al's (2016) review of Conversation Analysis (CA) studies, found that people with dementia have many retained skills in conversation, the reviewed studies mainly focused on people with AD, vascular dementia and LBD in care home settings, and not on family interactions. Kitzinger and Jones (2007) and Jones (2015) used CA to examine how a woman with memory difficulties related to AD was able to participate in some interactions but not others. They found social interactions employing highly routinised sequences enabled participation, whilst those that required the recall of recent events were more challenging. Mikesell (2010) found that, while people with behavioural variant FTD were able to participate in turn taking using echolalic talk, they lacked an understanding of the over-arching aim of an entire sequence. The interactional practices of conversation partners (CPs) impact the interactions of people with dementia. For example, Lindholm (2014) found when a person with dementia produced confabulations this posed a challenge for interlocutors, with some encouraging him to rethink his contributions and others confirming his views.

There are only a small number of CA studies of PPA interactions. Taylor et al (2014) examined trouble and repair in three people with lvPPA or nfvPPA and their CPs. They uncovered a number of practices used to manage repair sequences. Taylor et al report how a person with nfvPPA attempted to self-repair a mispronounced word and the CP completed the repair by evaluating the pronunciation, thus also signalling their understanding. Another practice the authors reported was when the CP of a participant with lvPPA used 'test questions" or known answer questions to try to assist in a word search. This practice did not resolve the search, instead resulting in a sequence whereby the CP requested information already known to them, requiring a relevant answer, and evaluating it. These sequences were observed to cause significant frustration for the person with PPA. The authors remarked that these practices were similar to those in conversations between people with post-stroke aphasia and their CPs. Consequently, Taylor-Rubin et al (2017) identified that during word searches across seven people with svPPA and their CPs, repair happened over fewer turns when CPs provided the sought-after word. However, when CPs asked test questions this extended the repair sequence. The authors conclude that the contribution of the CP is crucial to successful versus problematic repair. Whether CP collaboration is important for turn construction and participation more broadly is not clear.

The applied CA literature on turn construction in post-stroke aphasia has revealed important insights about the ways in which collaborative practices can both support and problematise interactions. One example of a supportive collaborative practice is the 'hint and guess' sequence described by Laakso and Klippi (1999), whereby a person with aphasia provides hints to a sought-after word and the CP provides a series of candidate understandings. Laakso and Klippi (1999) uncovered four phases in these sequences: i) solitary search, ii) establishing a collaborative co-participation framework, iii) hint and guess, and iv) confirmation. Although there is a preference for self-repair, a hint and guess sequence instead establishes a collaborative repair framework, with both speakers working towards repair completion. In contrast the use of 'test' or known answer questions by CPs (such as a CP asking their spouse what the names of their children are) to construct sequences of talk can have negative social consequences, putting a person with aphasia at risk of losing face and leading to significant frustration (Lock et al., 2001; Schegloff, 2007; Beeke et al, 2013). Beeke et al (2013) describe how in two dyads where one person has aphasia, the CPs request information already known to them, and then evaluate the person's answer. Previous research by Lock et al (2001) uncovered the clear frustration that test questions can cause a person with aphasia, although this was not visible in Beeke et al's (2013) data. Beeke et al (2013) demonstrate that the test questions appear to be motivated by the aim of scaffolding a conversation in the presence of communication difficulties, though in discussion a CP acknowledges that test questions have a negative effect on the person with aphasia, in that they "drive him nuts". This highlights that whilst they may be positively intended, test questions can be problematic for the participation in interactions of a person with aphasia.

In post-stroke aphasia a range of resources are deployed in turn construction in addition to talk, including gesture, facial expression, body posture and gaze (Bloch and Beeke, 2008; Beeke et al, 2013; Beckley et al, 2013). However, the competence of people with aphasia when constructing multimodal turns is dependent on a CP's role in co-construction. Bloch and Beeke (2008) describe how a man with severe aphasia uses gaze, gesture and short phrases to talk about his garden with a visitor. This interaction is successful because a third interactant produces grammatically fleshed out redoings of these aphasic turns. In another example of co-construction Beeke, Wilkinson and Maxim (2007) discuss how a CP articulates a version of what a man with aphasia means to say, which receives a third turn confirmation and thereby

legitimately excuses him from completing the turn himself. These examples highlight how people with post-stroke aphasia and their CPs adapt to aphasia, using a range of practices to support turn construction.

Little is known about turn construction in PPA. Kindell et al (2013) identified enactment as a means of turn construction by a person with svPPA. They described enactment as the use of speech in collaboration with gestures, mime, changes in pitch and facial expression, whereby the person with svPPA constructed a turn. They argued that this practice of embodied interaction permitted a person with svPPA to construct turns that achieved intersubjectivity despite a loss of language. Given this was a single case study of svPPA it is unclear if people with other PPA variants would have the same range of resources available to them.

Wilkinson's (2019) review of CA studies in communication disorders highlights that people with post-stroke aphasia can be taught to use adaptive practices to support turn construction, such as gesture, writing or drawing (see for example Beeke et al, 2013; Beckley et al, 2013). This process of adaptation can be eased though collaboration with a CP (Perkins et al, 2010), highlighting the value of training both interactants. As a result, communication partner training (CPT) interventions have been developed such as Better Conversations with Aphasia (BCA; Beeke et al, 2013b). BCA aims to change the conversation practices of a person with post-stroke aphasia and their CP (Beckley et al, 2013; Best et al, 2016). CPT has a growing evidence base in post-stroke aphasia (see Simmons-Mackie et al, 2016) and is one intervention that can be protective of mental health in aphasia (Baker et al 2018).

Given the presence of similar language impairments to post-stroke aphasia, it can be argued that people with PPA and their CPs may adopt the same interactional practices as people with post-stroke aphasia and their CPs. This assumption has led speech and language therapists (SLTs) to train people with PPA and their CPs using CPT resources designed for post-stroke aphasia (Author et al, 2019, 2020). Yet people with PPA differ along many linguistic and pragmatic dimensions to stroke aphasia, not least because they present with a progressive disease rather than an improving or static condition. To better inform CPT intervention delivery for PPA and particularly to understand which practices to target for people with PPA and their CPs, further research examining conversational practices is required. The aim of this study is to investigate collaborative turn construction practices of people with PPA and their CPs and consider their similarity to collaborative interactional practices in stroke-aphasia.

Methods

Design:

This study describes two cases, selected from a larger data set collected as part of a randomised controlled CPT intervention study (author et al, 2018). CA was identified as a suitable method to explore collaborative turn construction practices because of the focus on turn-by-turn interactional phenomena. Antaki has described how in the analysis of conversations of people with disordered speech "CA applies its armoury of concepts from 'ordinary' conversation and offers new insights into the person's capabilities" (Antaki, 2011, pg 5). CA can illuminate the role of both interlocutors, with and without a communication difficulty, in the success of interaction.

The Better Conversations with PPA randomised controlled intervention study:

As part of a randomised controlled intervention study exploring the feasibility of a CPT intervention for PPA (Better Conversations with PPA, BCPPA; Author et al, 2018), conversation samples were recorded by 18 people with PPA and their CP; usually a spouse, family member or friend. Ethical approval was granted by London-Camden and Kings Cross Research Ethics Committee (reference: 17/LO/0357, received 26th April 2017).

Participants were recruited from 11 National Health Service sites across England and Wales. Participants were eligible if they had a diagnosis of PPA (in line with international consensus criteria, Gorno-Tempini et al., 2011), aged ≥ 18 years and had a CP who consented to participate in the study. Local collaborators (SLTs) at these sites recruited participants, obtained consent, completed pre-intervention measures (including collection of conversation video recordings) and delivered the BCPPA intervention. See Author et al, 2018 and Author 2021 for further details.

Each of the 18 dyads recorded four 10-minute baseline conversation samples prior to being randomised to either the BCPPA treatment arm or the no-treatment control arm. Following the four-week intervention period/no-treatment control, another four 10-minute conversation samples were recorded. Participants were trained to use an iPad to video record conversation samples independently at home. Participants were free to choose where to make these recordings and what topics to discuss. With guidance from the study's Patient and Public Involvement group a conversation topic list was provided to support this process, should a dyad require it (see appendix A). A schedule of recordings is shown in Table 1. Each dyad made eight 10-minute recordings. A total of 144 recordings (approx. 1440 minutes) of everyday conversations were collected.

Table 1: Schedule of conversation recordings

	Consent session			Pre-randomisation assessment (1 week)	Treatment/ Control (4 weeks)				Outcome assessment (1 week)	Final data collection		
sWeek	0			1	2	3	4	5	6	7		
Video recording of everyday conversation	1a	2i	3i	4a					5a	6i	7i	8i

Video recording of everyday conversation = a: assessor present but not in room; i: independent home recording, 1-7: represents number of recording.

Participants in this study:

In this study we present data from two dyads from the treatment arm of the BCPPA study. One participant had lvPPA and the other mixed PPA (NB: the diagnosis of mixed PPA is given when individuals present with symptoms aligning with multiple PPA variants and is thought to account for approximately 15% of people with PPA (Ruksenaite et al, 2018).

Jim (all names used are pseudonyms) is an 85-year-old English speaking retired maths teacher. Jim's CP is his 80-year-old English speaking spouse Fran, also a retired teacher. Jim was

diagnosed with lvPPA 4 months prior to participating in the study. His PPA diagnosis was confirmed via an analysis of his performance on a commonly used speech and language therapy assessment tool, the Comprehensive Aphasia Test (CAT) (Swinburn et al, 2004). Consistent with the criteria for lvPPA (Gorno-Tempini et al, 2011), Jim performed poorly on auditory digit span and sentence repetition compared to single word repetition. He experienced word retrieval difficulties despite performing relatively well on single word comprehension tasks. There was no information available on duration of symptoms prior to diagnosis.

Diane is a 71-year-old English speaking retired exam invigilator with mixed PPA. Her CP is her husband Pierre, also 71-years old, English speaking and a retired exam invigilator. Diane was diagnosed with PPA 11 months prior to participating in the study but reported symptom onset 35 months prior to participation. Diane's diagnosis was confirmed via analysis of her performance on the CAT (Swinburn et al, 2004), where she presented with both word retrieval difficulties (typical of lvPPA) yet relatively intact digit string and sentence repetition (which is typically impaired in lvPPA) and difficulties with complex sentence comprehension (more typical of nfvPPA).

Both dyads consented to participate in the randomised controlled BCPPA study and for their data to be used for secondary analysis in future research.

Analysis procedures:

Pre-intervention video recordings (2i) made by participants were viewed and two dyads were selected for analysis because of the presence of collaborative practices representative of the wider data set. Four pre-intervention video recordings made by these two dyads were viewed (1a, 2i, 3i and 4a), and a collection was made of collaborative practices. The pre-therapy samples were selected for analysis as they were considered most naturalistic in terms of the impact of PPA on everyday conversations, having been made prior to the dyads' awareness of conversations being raised by participating in therapy. As part of the process of making a collection, video file names and time stamps were noted alongside a basic orthographic transcription. Typical examples of practices were selected for transcription using the established conventions for CA (Atkinson & Heritage, 1984). Data were analysed alongside CA transcripts, examining collaboration in repair sequences and co-construction of turns in greater detail. Two extracts were presented at a data session with experienced analysts, to ensure reliability of transcripts and to inform analysis.

Results

Five extracts are presented demonstrating collaborative turn construction practices between participants with PPA and their CPs. Extracts 1 and 2 are examples of collaborative repair during word search sequences. Extracts 3 and 4 are co-constructed stories. In contrast extract 5 shows how collaborative practices can lead to interactional trouble.

Collaborative repair - word search sequences

In Extract 1 Jim and Fran have been reminiscing about past holidays together. Jim is trying to recall a specific place they visited but encounters word finding difficulties. This results in an extended hint and guess word search sequence as the dyad collaborate to identify the place name. Jim has several resources available to support his turn construction in this sequence,

such as gesture, gaze and speech, but is dependent on Fran's candidate understandings to complete the repair.

Extract 1. 3.01_2i_18.27-19.42_Italy

1	Fran	that was great fun wasn't it
2	Jim	yeah (.) and we (.) had (1.7) many k khhh
3		quite a few
4	Fran	oh so many lovely holidays
5	Jim	trips yeah yes but and we we
6	Fran	and uhh
7	Jim	k hmmmm (1.9) went to (1.6) ch-pi-ts-°hhhh
8		⌈ ts hhhhhhhh. ⌉
9		⌊ ((puts head back)) ⌋
10		⌈one line that sticks down out from ⌉
11		⌊ ((moves hands down in air and to right and shifts his gaze to Fran)) ⌋
12		ee ee
13	Fran	from Alaska?
14	Jim	(1.1) yes either ee ee
15	Fran	cos we went to Alaska and the bit
16		⌈that comes down the south ⌉
17	Jim	⌊no we're not going to ⌋we're not going
18		to there we're in Egypt⌈ (syllable)⌉
19	Fran	⌊oh ⌋
20	Jim	not Egypt
21	Fran	=oh we went down the Nile⌈ (yes ⌉
22	Jim	⌊ yep ⌋we yes we
23		went nown the Nile but as the (syllable) as
24		you go down Egypt
25		⌈there's a bit ehhhhh ⌉
26		⌊((moves hands down in air)) ⌋
27		(1.2) chi:n- chi:n- not °hhhh oh dear oh
28		dear oh dearest uh-
29	Fran	South Africa we did some game drives
30	Jim	huh=
31	Fran	=not in South Africa but in Niagra (1.2) at
32		Niragra Fall⌈ no not Niagra Falls ⌉
33	Jim	⌊no not we're not ah we're ⌋
34	Fran	⌈Victoria Falls ⌉
35	Jim	⌊WE ARE IN EUROPE ⌋
36	Fran	oh we're in Europe⌈ still ⌉
37	Jim	⌊we're⌋ in Europe and the
38		⌈big bit sticking down from the ⌉middle of
39		⌊((moves hand down and to right)) ⌋
40		ite ⌈what countries⌉

41	Fran	⌊Italy? ⌋
42	Jim	Italy? Italy (.)⌈that's it ⌉
43		⌊((taps CP's knee))⌋
44	Fran	⌊ yeah ⌋

This extract begins at line 1, with an assessment of the prior talk about holidays, "that was fun wasn't it", which Jim aligns with at line 2 as they continue to reminisce about 'lovely holidays' (Fran; line 4). Jim begins to talk about another holiday at line 5 "but and we we" but appears to run into difficulty completing his turn. Fran self-selects to add another point at line 6. Jim continues at line 7 but runs into trouble, evidenced by a long pause before multiple cut offs signal trouble with a place name. Jim's attempts at word retrieval continue and he puts his head back, looking away from Fran (lines8-9). This is characteristic of solitary word search (Laakso & Klippi, 1999) and marks the first of the four phases of hint and guess, the problem establishment phase. Jim attempts to verbally describe the location of the country he is thinking of, "one that sticks out from", while providing a gesture to indicate its shape (lines 10 and 11, see figure 1). This gesture constitutes an embodied enactment, a device previous observed by Kindell et al (2017) in the talk of a man with svPPA. Jim shifts his gaze to Fran and attempts the word, "ee ee'. These constitute the first hints and establish a framework for co-participation (phase two) by appealing to Fran to name the gesture. In response, Fran takes her first guess, "from Alaska?" (line 13) and the hint and guess phase begins (phase three). Jim accepts the guess at line 14, immediately after her turn. In response Fran provides an account for this candidate resolution by explaining how Alaska links to Jim's gestured country shape (lines 15-16). However, Jim subsequently rejects the guess in (line 17) and provides another hint "We're in Egypt" (line 18). Fran acknowledges this radical shift of country and continent with a change of state marker "oh" at line 19. Jim then rejects his own hint at line 20 stating "not Egypt". However, Fran nevertheless takes a second guess based on Egypt, "the Nile" (line 21). Jim aligns himself with this guess by acknowledging they have previously travelled the Nile, deploying "but" to return to the prior talk (Mazeland & Huiskes 2001). Jim displays a willingness to continue the word search as he returns to the hint and guess phase over lines 24 -28, repeating the same gesture to embody the shape of the target country whilst elaborating verbally, "you go down", "there's a bit". Fran offers a third guess in line 29 "South Africa we did some game drives". Jim's indicator of trouble "huh" at line 30 suggests this guess might be inaccurate, however Fran's self-repair from South Africa to Niagra Falls, and then to Victoria Falls over lines 31-34 indicates she is working hard to link her guesses to Jim's repeated gesture, which suggests something moving downwards. At line 35 Jim provides the fourth and most definitive hint at greater volume than surrounding talk, "WE ARE IN EUROPE". Fran acknowledges her change in knowledge state with "oh we're in Europe still" (line 36). At lines 37-40 Jim provides the fifth and final hint, as an embodied turn which elaborates the same gesture. He moves his hands down and to the right, using verbal resources to explain "big bit sticking down the middle of ite- what countries". Finally, Fran makes a guess at line 41 presumably triggered by the fragment 'ite', which turns out to be correct, "Italy". This is confirmed by Jim (phase four, confirmation) in lines 42 and 43, which he accompanies with a tap on Fran's knee. This touch appears to acknowledge they have reached the conclusion of a difficult word search.

Figure 1. Jim's use of gestures

In this extract Jim's turns are constructed using range of resources in the presence of a problematic word search sequence. As a result, Fran is able to make informed guesses. We see her incorporating the downwards movement that Jim gestures into her choice of places to guess at including the south of Alaska, the Nile (which they went down) and Niagra Falls. This collaborative hint and guess practice in PPA closely resembles the four phase sequence in post-stroke aphasia documented by Laakso and Klippi (1999).

The following extract also reveals collaborative word search practices in PPA. In Extract 2 Diane and Pierre are deciding what to watch on television that evening. Diane experiences word finding difficulties and provides hints to Pierre. However, unlike in Extract 1, this doesn't develop into a hint and guess sequence. Instead, Pierre poses guesses as a series of questions, using the answers to narrow down subsequent guesses until he identifies the target TV show.

Extract 2. 1.01_1a_06.02-07:00_nothing on TV

1	Pierre	so what we gonna watch on TV I know there's
2		nothing on
3	Diane	hahaha °hhhh no nothing nothing I've got the
4		ipad I've got ummm ah (2.4) °hhh ⌈one on television ⌉
5		⌊((shifts gaze to look at Pierre)) ⌋
6	Pierre	what tonight?
7	Diane	nod on tomight it was it was 'bout two days
8		ago (0.8) itch (1.9)
9	Pierre	⌈what⌉
10	Diane	⌊it ⌋(2 syllables) it's it's a um (1.0)
11		⌈ugh ⌉
12		⌊ ((jerks hands)) ⌋
13	Pierre	series?
14	Diane	no it's not a series it's just a (2.2)
15	Pierre	a one-off thing
16	Diane	yeah
17	Pierre	what⌈on ⌉
18	Diane	⌊well⌋
19	Pierre	not not that BBC no sorry the um=
20	Diane	=what
21	Pierre	the black and white ones you mean
22	Diane	no
23	Pierre	vera
24	Diane	⌈yeah that's it ⌉yeah yes that's
25		⌊ ((points finger at CP)) ⌋
26		alright

27	Pierre	yeah
28	Diane	at least it's something cos otherwise
29		there's nothing there
30	Pierre	no noth this summer

Extract 2 commences with a question from Pierre, who invites Diane to select a television program for them to watch on television that evening, despite acknowledging "there's nothing on" in lines 1-2. Diane aligns herself with his comment by saying "no nothing" but then remarks that she has her ipad (line 3). When she tries to name the show, she runs into trouble with fillers indicating a word search "ummm ah" (line 4). Having been unable to retrieve the name, Diane establishes a framework for collaboration by looking at Pierre and appealing to him with a description of the program "one on television" at line 5. In response Pierre asks "what tonight" perhaps because the ipad could be a reference to live TV or to a download, commencing a series of questions whereby he gathers further information. In line 7 Diane clarifies the show was on 2 days ago and tries to retrieve the word again, "itch" (line 8). After both speakers start up in overlap, Diane employs a series of recycled initiations 'it's it's a' as she resumes the word search (line 10), pauses for 1 second then says "ugh". This is accompanied by a jerking hand gesture (line 12), which appears to be an appeal to Pierre for help. Pierre asks another question at line 13, "series?", to which Diane responds, "no it's not a series it's just a (2.2)" (line 14). She is unable to complete the turn and Pierre offers a candidate response that acts as a completion, "a one-off thing", while also narrowing down the search category. He cuts off his suggestion of (presumably) a specific channel ("what on", line 17) which overlaps with Diane's "well" (line 18), and then self-repairs with "not that BBC" (line 19). Diane asks for clarification and in response Pierre continues to narrow the search by asking "the black and white ones you mean" at line 21. Diane responds 'no' at line 22 yet based on the prior context Pierre is able to provide a candidate resolution at line 23, guessing "Vera". Diane immediately confirms this is correct with a celebratory pointing of her finger (line 25). Consequently, talk resumes with an agreement that there really is nothing else to watch over lines 28-30.

In this extract Pierre is collaborates with Diane to successfully complete a word search. In contrast to Jim, Diane has fewer resources available with which to construct her turns, meaning Pierre must work to generate specific clues through his line of questioning in a type of "give us a clue" sequence. Goodwin (1995) describes this type of sequence in severe aphasia. In ascertaining what Chil wants for breakfast, Goodwin describes how his CPs offer options that Chil accepts, rejects or modifies. In a similar way, Pierre uses clarification questions to extract clues in order identify the target TV programme. Both Diane in this extract and Chil (Goodwin, 1995) have epistemic rights to knowledge in these sequences (Heritage, 2012) and their CPs acknowledge this through collaborative practices.

Co-constructed story telling

Extract 3 demonstrates how story telling can be collaborative, and how, through a process of co-construction, Jim recounts an experience from his childhood. In this anecdote he describes bagging up sugar for sale in a shop by decanting it from large bags into small ones. To convey this anecdote, he employs mime, facial expression and tone to 'enact' the story he is telling. This practice is identical to Kindell et al's (2017) description of turn construction by a man with svPPA. Jim is able to convey a complex anecdote through the construction of an extended turn using multimodal resources. Fran demonstrates her receipt of the story by putting words to the actions and in this way she co-constructs the story.

Extract 3. 3.01_4a_02.18-03.03_ sugar

1	Jim	as I grew up (2.1) I helped (3.3) qui-sometimes asked (0.9) and
2		sometimes I asked=
3	Fran	=uh huh
4	Jim	f- o- o- one of the thing I would do (0.6) was one o- one day (0.9) you
5		didn't used to get (2.3)⌈sugar in little things we get⌈now
6		⌊((gestures small shape and points at kitchen))
7	Fran	⌊no no=
8	Jim	=you'd get⌈big ones⌉⌈and
9		⌊((gestures larger shape))⌋
10	Fran	⌊big bags of it=
11	Jim	=(good) big yeah and er bags ba- (0.5) kuh⌈and uh you'd get them
12		⌊gestures scooping
13		⌈in (a) (1.6)⌉weigh them up⌈(0.5)=
14		⌊((gestures lifting scoops))⌋ ⌊((gestures tying))
15	Fran	=oh yeah=
16	Jim	----------s_____
17		=and I'd⌈(0.5)⌉⌈put the (1.3) s:⌈::
18		⌊((licks fingers))⌋⌊((moves hand side to side))
19	Fran	⌊seal them up
20	Jim	s__----------
21		s-n- uh: yeah⌈(0.5)⌉ s:⌈:
22		⌊((licks fingers))⌋
23	Fran	⌊heh heh heh moistened them⌉⌈and
24	Jim	⌊yeah
25	Fran	seal it over
26	Jim	an- and I did that as one that was one after nigh- after they closed aft-at
27		night

Jim provides a story beginning in line 1 with the statement "as I grew up". This is followed by a pause and despite what follows being a series of fragmented phrases, Fran indicates her attention with a minimal turn 'uh huh' (line 3). This acts an invitation to Jim to continue his story. Jim takes up this invite at line 4 and continues the story with "one of the thing I would do". The consequent statement "you didn't used to get sugar in these little things we get now" at line 5 sets up an expectation that he is going to make a comparison between the present time and the past. The first element of enactment occurs in line 5, where Jim adds to his description with a gesture that conveys a small shape (line 6) and a point towards the kitchen. Fran aligns herself with this with a minimal turn "no no" at line 7. Jim then contrasts his previous description with "you'd get big ones" (line 8) accompanied by a larger gesture (line 9) to emphasize the difference. Fran then combines his description with the specific term "bags", which Jim evaluates positively in the following turn "big yeah" (line 11). Jim follows this with an enactment of scooping (line 12) as he states he would "get them"; a non-specific statement referring to scooping sugar. As described in Kindell et al (2017), Jim employs mime to enact the activity he is trying to describe. The enactment of scooping is repeated as he says, "weigh them up" (line 13) and followed by enactment of tying a knot at the top (line 14), conveying the actions Jim undertook when scooping and bagging sugar. Fran demonstrates her understanding with 'oh yeah' (line 15), and Jim, in line 18, continues to enact the scenario by

licking his fingers and moving his hand side to side. At line 19 Fran again names the gesture of sealing bags, “seal them up”, as Jim continues to enact licking (line 22). Fran demonstrates her understanding by conveying the enjoyment enacted by Jim through laughter and in her repeated description of “moistening them and seal it off” in line 23 and 25. Jim’s acknowledgement overlaps Fran’s description (line 24) before he closes the story on line 26 and 27 by summarizing “and I did that as one that was after nigh- after they closed”.

In this extract, Jim and Fran collaborate to co-construct Jim’s story. Jim’s use of enactment (Kindell et al, 2017), employing gestures, mime and speech, allows him to convey a series of actions that make up a story about his childhood experiences. It might be assumed that given Jim’s considerable word search difficulties he would not be able to tell a story. However, Jim’s multimodal turn construction practices coupled with Fran’s collaboration in naming the actions he enacts serve to co-construct the narrative whilst respecting Jim’s epistemic right to tell the story. Fran’s actions also demonstrate receipt of the story, highlighting Jim’s competence as a storyteller.

Diane and Pierre also co-construct stories. In contrast to co-constructing a story where one interlocutor is in the K+ state, extract 4 illustrates a shared experience of their lives as grandparents. In this extract, Diane and Pierre discuss the sandwiches they will prepare for their grandchildren when they visit, and how this compares to what they were given to eat as children. Diane and Pierre care for their grandchildren together, and the joint activity and shared views are denoted throughout the extract by the use of “we”. As Diane attempts to express her views, Pierre paraphrases and extends her turns to co-construct their shared experience.

Extract 4. 1.01_2i_09:32-10:35_cheese sandwich

1	Pierre	and we’ll have to make sarnies for them cos
2		I don’t think we’ll be able to find anything
3	Diane	⌈oh god ⌉
4		⌊ ((shakes head)) ⌋
5		(2.3)
6	Pierre	well no one⌈ a-no one⌉ e-nobody⌈ does⌉ plain
7	Diane	⌊I know ⌋ ⌊no ⌋
8	Pierre	cheese sandwich
9	Diane	haha ⌈hahahahahahah⌉ hahaha
10	Pierre	⌊you know that⌋
11		and if it’s got anything ⌈else in ⌉ them
12	Diane	⌊yeah I know⌋
13	Pierre	other than cheese
14	Diane	yeah yeah hhhhhh why don’t they do something
15		different uhhhh
16	Pierre	who=
17	Diane	=well the children
18	Pierre	what eat something ⌈different ⌉
19	Diane	⌊yeah ⌋yeah
20	Pierre	hhhhh they’re children
21		(2.3)
22	Diane	°hhh we- (1.2) I didn’t didn’t well we

23		couldn't (have em) cos unfortunately we didn't
24		have much pfood t t ts (1.2)
25	Pierre	you didn't have much choice=
26	Diane	=no
27	Pierre	yeah what was put on the table you ate
28		other⌈ wise you went hungry ⌉
29	Diane	⌊that's right ⌋yeah
30	Pierre	yep
31		(1.1)
32	Pierre	well perhaps they perhaps we should do the
33		same hhhhhh⌈ we're ⌉having this if you don't
34	Diane	⌊yeah. ⌋
35	Pierre	⌈like it⌉
36	Diane	⌊ yeah ⌋
37	Pierre	no course you couldn't do that (0.7)
38	Pierre	⌈you'll be cooking ⌉
39	Diane	⌊ hhhhhhhhhh ⌋
40	Pierre	⌈or I'll be cooking rather ⌉
41	Diane	⌊ I know (.) yeah ⌋yeah
42	Pierre	to suit the children=
43	Diane	=yeah (1.3)⌈ (voicing) ⌉
44	Pierre	⌊okay? ⌋
45	Diane	yep

Pierre introduces the topic in lines 1-2 with a turn that denotes a joint activity from the very beginning "we'll have to make sarnies for them cos I don't think we'll be able to find anything". Diane's assessment of Pierre's statement at line 3 "oh god" alongside a head shake (line 4) suggests the activity of making sandwiches is problematic. After a pause at line 5, Pierre provides an account for why they will have to make sandwiches and Diane immediately aligns with this, overlapping with Pierre's talk. As Pierre continues his account (lines 6 and 8) "no one does a plain cheese sandwich", Diane produces overlapping laughter. This does not reflect Pierre's statement, instead it reinforces the suggestion of a problem that she conveyed previously. Pierre extends his account over lines 10-12 by describing the problem further, and Diane demonstrates her alignment with "yeah I know" (line 11). She then raises the question "why don't they do something different" (lines 14-15). Pierre clarifies who "they" are (line 16) and what "doing" refers to (line 18) before answering the question at line 20 by sighing and stating "they're children". The sigh aligns his stance with Diane's, this issue is problematic for them both. There follows a lengthy pause before Diane at lines 22-24 gives a comparative account of her own childhood "we- (1.2) I didn't didn't well we couldn't have em cos unfortunately we didn't have much pfood t t ts (1.2)". The account is punctuated with word search behaviours. Pierre recycles the same syntactic structure with an alternative candidate to food at line 25 stating "you didn't have much choice". This serves both to align with Diane's stance and flesh out her comment. Diane very promptly responds with "no" at line 26, indicating agreement. Beeke, Wilkinson and Maxim (2007) describe the same co-construction of turns in aphasia, where a turn that remains unfinished is followed by a CP articulating a version of what the person with aphasia means to say. Pierre continues co-construction of Diane's views by elaborating on the topic over lines 27-28, describing their personal experience from childhood to which Diane responds with a confirmatory "that's right" on line 32.

Following a brief pause, Pierre proposes a plan to address the issue at line 33-35 suggesting they should advise their grandchildren "we're having this". At line 37 however, Pierre rejects his own plan and describes what will happen "you'll be cooking" , then self-correcting it to "or I'll be cooking" (line 40) "to suit the children" (line 42), to which Diane agrees.

Despite not having the range of resources seen during enactment of a story by Jim, Diane is able to convey her opinion that the activity of making cheese sandwiches is problematic using practices such as laughing or sighing. Consequently, Pierre and Diane collaborate to co-construct an account for this problem. Pierre himself uses a range of practices to support this such as clarification and recycling the syntactic structure Diane has used, legitimising Diane's incomplete turns (Beeke, Wilkinson and Maxim, 2007). Pauses provide time for Diane to take a turn. These practices are not dissimilar to those noted by Taylor-Rubin et al (2017) who observed a CP using acknowledgement and clarification sequences as supportive practices in conversation with their relative with PPA.

Collaborative actions that lead to trouble: test question sequences

Unfortunately, collaboration doesn't always go smoothly. Extract 5 illustrates how Fran's attempts to support Jim in a conversation about a wedding they will attend can foreground word finding difficulties. Fran asks Jim to name the people who will be at the wedding, thus placing her in a K+ state in terms of the knowledge of names (note that they both presumably have shared knowledge of the upcoming event). Aaltonen and Laakso (2011) describe this phenomenon as 'exam halts', whilst Beeke et al (2013) refer to test questions, when a CP asks a question despite already knowing the answer. For Jim, this leads to interactional trouble because his PPA means that producing the target names to these test questions is difficult. As a result Jim's language difficulties become the focus of the conversation, rather than the wedding being the topic.

Extract 5. 3.01_1a_00:54-02:13_you're putting it out of my mind

1	Fran	and what are their names
2		(1.7)
3	Fran	do you ⌈remember ⌉
4	Jim	⌊she's ⌋ she's she's shhh (0.9) see y-
5		you're ⌈putting it out of my mind ⌉
6		⌊((taps hand on table)) ⌋
7	Fran	⌈yes ⌉
8	Jim	⌊ (2 syllables) thing ⌋
9	Fran	well what's his name you should remember
10		that
11	Jim	(4.0) Pete=
12	Fran	=yes
13	Jim	Pete
14	Fran	well why is that easier to remember than
15	Jim	cos our bo-⌈ ball Pete is Pete ⌉
16	Fran	⌊ hahah haha ⌋
17		cos we yes we've got more than Pete in
18		⌈Pete in the family⌉
19	Jim	⌊two our Petes ⌋yeah

20	Fran	yes
21	Jim	and um uhhh
22	Fran	and the bride is:
23	Jim	the bride is: (0.6) it'll ⌈ come ⌉ but not
24	Fran	⌊ ka- ⌋
25	Jim	⌈ huh ⌉
26	Fran	⌊ ka- ⌋ starts k-
27	Jim	(3.2) uhhh
28	Fran	she's the oldest then comes Christopher
29		and ⌈ then Lucy ⌉
30	Jim	⌊ Christopher ⌋
31	Fran	so she is?
32	Jim	um (1.9)
33	Fran	don't worry if you can't
34		⌈ remember I'll tell you ⌉
35	Jim	⌊ can't I can't ⌋ it'll come
36		⌈ (3 syllables) when she ⌉ comes in I'll
37	Fran	⌊ it will. it'll come to you ⌋
38	Jim	knew who ⌈ who she is ⌉
39	Fran	⌊ oh course you would ⌋
40	Jim	but uh no no I ⌈ can't ⌉
41	Fran	⌊ Katherine ⌋
42	Jim	and you know what I will I ⌈ don't ka- ⌉
43	Fran	⌊ Katherine ⌋
44	Jim	Katherine ⌈ Katherine that's right ⌉ Katherine
45	Fran	⌊ hahahahaha ⌋
46	Jim	nice little lovely (syllable) lovely ⌈ girl ⌉
47	Fran	⌊ yes ⌋
48		she is lovely
49	Jim	⌈ yeah ⌉
50	Fran	⌊ she ⌋ always has been
51	Jim	and uh very fond of her

Fran begins the test question sequence with "and what are their names" (line 1) followed by "do you remember" (line 3). This second question flags this sequence as a test or exam, indicating Fran knows the answer. In line 4 Jim attempts an answer beginning with the bride, but quickly runs into trouble, with multiple repetitions of "she's" and a pause indicative of word search. In line 5 Jim attributes this trouble to Fran, stating "you're putting it out of my mind" whilst simultaneously tapping the table. Fran acknowledges the trouble but does not provide the bride's name, instead shifting focus to the groom's name, advising Jim "you should remember that" (lines 9-10). After a lengthy pause Jim utters the target "Pete" (line 11). It is clear this is correct because Fran quickly evaluates it as such.

Fran then requests an account for why this name is easier to remember, which Jim promptly provides at line 15 "cos our bo- ball Pete is Pete". This appears to be a reference to their son ("bo-" is possibly an attempt at boy) also being called Pete, the reason why this name is easier to remember. Fran laughs in overlap, evaluates this as correct and fleshes out the account (lines

16-18), to which Jim adds an acknowledgement "two our Petes yeah" (line 19). At line 21, Jim returns to the prior word search for the bride's name, "and um uhhh". This is followed by another test question from Fran "and the bride is:", designed as an utterance completion (line 22). Although Jim attempts to answer this a pause indicates ongoing trouble, which Jim refers to directly "the bride is: (0.6) it'll come but not" (line 23). In overlap with his account, Fran provides the initial sounds of the sought-after name "ka-". However, Jim's "huh' at line 25 suggests he did not hear this cue. Fran repeats and then modifies the cue (line 26). A 3.2 second pause indicates this cue does not provide Jim with assistance, and a filled pause follows. Fran provides a fuller hint at line 28 "she's the oldest then comes Christopher and then Lucy". Jim repeats Christopher in overlap. After this, Fran restates the test question "so she is?" (line 31) but Jim continues to have word finding difficulties. In the face of this now extended word search sequence, Fran provides reassurance "don't worry if you can't remember I'll tell you" (lines 33-34) while in overlap Jim continues to account for his inability to retrieve the bride's name. Jim's account states that he knows who the bride is and will recognise her on the day, he just cannot remember her name "when she comes in I'll knew who who she is" (lines 36 and 38), which signals an attempt to save face. In overlap Fran provides mitigation for his failure to produce the name now "it'll come to you" (line 37), and strongly aligns with Jim's explanation that he will recognise the bride, "oh course you would" (line 39).

At line 40, Jim appears to give up his search for the name and Fran provides the answer, Katherine, in overlap. Initially, Jim doesn't acknowledge this, continuing to assert his knowledge at line 42 "you know what I will I". Fran repeats herself at line 43 "Katherine" and Jim evaluates this at line 44 "Katherine Katherine that's right Katherine". This extended acknowledgement sequence brings the test question sequence to an end. The imbalance of knowledge between the interactants is equalised (Heritage, 2012) and they go on to provide an assessment of the bride (lines 46-51). These final few lines contrast markedly to the previous talk, which has focused exclusively on naming two people that both Jim and Fran know, and which has thus served to expose Jim's language difficulties rather than extend the topic of a forthcoming family wedding. The impact of the test questions is a halt to progressivity. This results in an extended sequence, which contrasts with the orientation to intersubjectivity, and progressivity observed in extracts 1 to 4. Although on some level Fran's behaviour has collaborative elements, it exposes limitations to Jim's interactional competence and threatens his face.

Discussion

Analysis of extracts 1 to 4 demonstrates how Jim and Diane, two people with lvPPA and mixed PPA respectively, deploy a number of resources including gesture, speech, mime and facial expression when constructing turns to resolve a word search or to convey a story. These extracts also demonstrate how their CPs collaborate in this process of turn construction. Collaborative turn construction practices observed are not observably different to those reported in the post-stroke aphasia interaction literature (Goodwin, 1995; Laakso and Klippi, 1999; Beeke, Walkinson and Maxim, 2007; Aaltonen and Laakso, 2011; Beeke et al, 2013)
or to the findings of the few CA studies of PPA, which include other PPA variants with different clusters of language difficulties (Taylor et al, 2014; Kindell et al, 2015).

In contrast the final extract provides an example of resources deployed by a CP that have some collaborative elements but result in the exposure of interactional difficulties. Just as Beeke et al (2013) described, the motivation for the use of test questions in these data appears to be topic expansion. The CP appears to scaffold the person with PPA's participation in a discussion

about a forthcoming family event through a series of test questions. Aaltonen and Laakso (2010) proposed that 'exam halts' may be motivated by a CP wishing to promote talk in which a person with a communication difficulty appears competent based on a belief that, by narrowing the interaction to the production of one social action, an answer to a question, talk becomes easier. The CP's accounts of what the person with PPA might be expected to remember suggest a sensitivity to knowledge that might be important to him, and which he may wish to be able to express himself (with support) in order to maintain face. Given the structured sequence in which these questions are embedded, they appear to have a pedagogic purpose, possibly as a method of rehearsal in anticipation of talking to people at the forthcoming event whose names it will be important to remember. This appears to legitimise an overt focus on the task of naming as a "language exercise" as described by Bauer and Kulke (2004).

In these data the person with PPA displays the need to account for his inability to name people, suggesting the test question sequence threatens his language competence, or face. When asked why they use this test questioning approach, some CPs report having observed an SLT taking the same approach, which can be true, but crucially this occurs within the context of language exercises not everyday interaction. This perhaps embodies a broader challenge for SLTs – how do you teach CPs to employ techniques useful in everyday conversation when the SLT may be 'modelling' a different paradigm during the therapy session. CPs appear motivated to mimic what they observe to be a therapeutic interaction to promote language skills and communication. Unsurprisingly perhaps, a person with PPA might feel negatively towards this, as it might highlight an inequity or dependence in relational and interactional terms, as flagged by Jim when he states "you're putting it out of my mind". Negative feelings towards test questions have previously been described in CA studies in PPA (Taylor-Rubin et al, 2017) as well as in post-stroke aphasia (Lock et al, 2001; Beeke et al, 2013).

The findings of this study have important implications for CPT interventions for PPA such as BCPPA (Author et al, 2018). This intervention aims to support a person with PPA and their CPs to observe video recordings of their own conversations to identify behaviours that facilitate conversation, such as the collaborative turn construction practices described in these data. Additionally, behaviours that act as a barrier to conversation, such as test question sequences, may also be identified. Participants are then supported to set goals to practice doing more of the former and fewer of the latter, with the ultimate aim of reducing frustration in conversation and improving life participation. Understanding common practices observed in conversations between people with PPA and their CPs provides the SLT with an understanding of appropriate treatment targets for such as intervention that can be shared in an accessible way with their clients.

Given the increased recognition that progressive aphasia is a relatively common secondary symptom in other dementia types (Suarez-Gonzalez et al, 2021), a greater understanding of PPA conversations is likely to provide insights relevant to the wider dementia population. However, people with other dementia types will present with distinct profiles of cognitive difficulties, such as visual-perceptual difficulties in the case of Posterior Cortical Atrophy (PCA), and memory in the case of Alzheimer's. In the case of PCA, these additional visual-perceptual difficulties have been reported to impact in a distinctive way on conversation, specifically turn-taking (see Author et al, 2022). Future research should continue to develop our understanding of how interacting language, communication and wider cognitive difficulties in dementia impact conversation, to enhance our understanding of how interventions such as

communication partner training may be of benefit to a wider population of those living with dementia (Author et al, In Press).

One limitation of this study is that it presents data from only two dyads involving a person with PPA, limiting our ability to generalise to the wider PPA population. The extracts analysed here are representative of the wider dataset, and thus add to the small and growing body of CA studies in this field. According to Peräkylä (2004), in CA generalisation can also be considered in terms of possibility. While CA describes practices in particular contexts these practices, whether facilitative or not, are by their existence considered possible in other settings and for other speakers. Another limitation is the impact that filming can have on natural interactions. It cannot be ruled out that the presence of a camera and the instruction to sit and talk (as opposed to capturing talk during activities in the home) influenced these interactions. Test questions have a performative element, as does enactment, and being on camera may have encouraged this. However, in our experience, dyads who engage in test question sequences when video recorded commonly report also doing so when there is no camera present. In addition, dyads were aware that video recordings were a tool to inform a speech and language intervention, and this may have made them think more about how they were talking together. In consultation with people with PPA and their CPs who were part of the patient and public involvement component of the BCPPA study, the researchers elected to video record using a small tablet device, which was considered relatively unobtrusive. Additionally, multiple recordings provided a wide view of a dyad's interactions over time, based on the assumption that any practices due to performance for a camera were likely to be unsustainable over successive time points. It is possible that participants motivated to participate in an intervention study may not be representative of the wider population of people with PPA. Indeed, all participants in this study were native English speakers, this illustrates the need for larger and diverse samples of people living with PPA from different ethnic and socio-cultural backgrounds in future studies of this kind.

This study extends the current CA research exploring interactions between people with PPA and their CPs. The collaborative turn construction practices observed in this study appear identical to those observed between people living with post-stroke aphasia and their CPs. Importantly, turn construction is observed to be a collaborative practice involving the resources of both the person with PPA and their CP. Some practices such as test question sequences, highlight the language difficulties of the person with PPA in conversation, and risk threats to competence and face. This study adds to the small but growing body of CA studies in the field of PPA and provides SLTs delivering CPT with insights into targets for interaction-focused therapy. There is a need for further CA studies involving people from diverse linguistic and socio-cultural backgrounds who are living with a range of dementia types.

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Appendix 1: Conversation topic list co-produced with the PPI project group

Better Conversations
with primary progressive aphasia

Some helpful prompts for conversations

Future plans:

Future holiday

Future social events

Future gifts

Future family events

Christmas

What TV programmes are you planning to watch?

What are you doing after therapy today?