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Features of answers to questions about recent events by people with Mild Cognitive Impairment and Alzheimer's disease, and healthy controls

Keywords: MCI, dementia, conversation analysis, memory, responses

Gareth Walker, Traci Walker, Ronan O'Malley, Bahman Mirheidari, Heidi Christensen, Markus Reuber, Daniel Blackburn

Abstract
Background: Asking patients who have been referred to memory clinics open questions about recent events has been shown to have diagnostic relevance.
Method: We use Conversation Analysis to look at responses to questions about recent events. The interviewees are healthy controls, people with Mild Cognitive Impairment (MCI), and people with Alzheimer's Disease (AD).
Results: We show differences among the groups' use of claims of memory problems, self-directed questions, and well-prefacing. Healthy controls produce more talk in response to all of these, whilst people with MCI and AD either do not, or do so in demonstrably different ways from both healthy controls and each other.
Discussion/conclusion: Healthy controls are both willing and able to 'show off' their memory, whilst people with AD are willing but generally unable to do so. People with MCI, in contrast, display themselves as both unwilling and unable to engage with the agent's questions as tests of memory.

1 Introduction

Researchers have started collecting data from people with diagnosed memory problems by computerised means, using an intelligent virtual agent (IVA): a talking head on a computer which asks the respondent pre-recorded questions when prompted to do so (Mirheidari et al., 2017; Mirheidari, Blackburn, Walker, et al., 2019). This method has been used in studies comparing functional memory disorder (FMD) and neurodegenerative disease (ND; Al-Hameed et al., 2019; Mirheidari, Blackburn, Walker, et al., 2019; Walker et al., 2018), and in studies also including people with mild cognitive impairment (MCI) and healthy control participants (Mirheidari, Blackburn, O'Malley, et al., 2019; O'Malley et al., 2020). These studies have looked at a range of features, including sequential, lexical and acoustic features, alone or in combinations. Some of the studies have used statistical analysis to differentiate between groups and have done so with some accuracy (Al-Hameed et al., 2019; Mirheidari, Blackburn, O'Malley, et al., 2019; Mirheidari, Blackburn, Walker, et al., 2019; O'Malley et al., 2020). The studies typically look at many variables at a large scale, and may adopt an entirely automated approach to the analysis (e.g. O'Malley et al., 2020). Rather than taking a statistically-driven approach, in this study we engage in the fine-grained

analysis of certain aspects of responses to questions concerning recent memory, to see what light that approach may shed on a dataset constructed using an IVA.

Responses to questions concerning recent events are an auspicious environment for investigations into memory: Ribot's law states that recent memories are more sensitive to impairment than memories about remote events. This is supported by clinical observation and empirical research (see e.g. Müller et al., 2016 who found that people with memory problems were better able to remember remote autobiographical events than recent events). It also reflects the nature of the pathology of Alzheimer's Disease, the most common form of dementia (or reason for the diagnosis of Mild Cognitive Impairment): the degeneration of brain structures involved in acquiring new memories rather than networks involved in retrieving older memories.

By examining interactions in which one 'participant' is a talking head on a laptop computer screen, that asks pre-recorded questions in a predetermined order, we have controlled for some of the vagaries of real life interactions: the IVA is unable to respond in the course of the answer to its question, nor can it ask questions in a different order or alter the form of the questions. Barnes et al. (2018) show how doctors make changes to the questions they ask, and their ordering, when delivering a particular intervention that screens for psychosocial issues. These misplacements and deviations from the questions can lead to patients' misunderstandings and undermine the fidelity of the intervention; thus, a question-delivery system that cannot deviate has certain benefits if the aim of the research is to compare responses to certain questions. Jones et al., (2020) observed non-standardization during the implementation of standardised neuropsychological tests, with clinicians departing from standard procedures to offer help to some – but not all – patients with a high level of cognitive decline. Walker et al. (2018) compare responses to questions asked by an IVA to those asked by doctors, and showed that doctors did not use the same grammatical format to ask the set question "can you tell me the last time your memory let you down", instead using different modal verbs such as 'could', or indicating that the respondent should provide 'any examples', or even 'any significant examples', and sometimes changing or omitting the question completely (Walker et al., 2018: 1178). These differences, whilst explainable and understandable as the doctors' attempts to fit their questions to the interaction so far, and to make the questions easier for patients to answer, make comparing the responses more difficult. Controlling the format and delivery of the question by using an IVA ensures that all participants are answering exactly the same question as each other in the same sequential context. For our analysis this is a benefit as it allows us to focus on any differences in the responses, and removes the possibility that these differences are attributable to variation in the talk so far.

This study analyses data comprised of questions asked by an IVA and answered by three separate groups of participants: healthy, age-matched control participants (HC); people with a diagnosis of Alzheimer's disease (AD), and people with a diagnosis of Mild Cognitive Impairment (MCI). When comparing their responses to the IVA's recent memory questions, we discovered a recurrent use of three different practices: claims of memory problems, self-directed questions, and prefacing a turn with "well". In the analysis that follows, we show that these practices are distributed differently among the groups, and that the fine details of their use also differentiate among the groups.

2 Data and methods

Ethical approval was granted for the collection of the data analysed in this study by the NRES Committee South West-Central Bristol (REC number 16/LO/0737) in May 2016. Participants were recruited from two groups: patients attending memory or neuropsychology clinics in the Royal Hallamshire Hospital in Sheffield, United Kingdom, and members of the University of the Third Age (https://www.u3a.org.uk). All participants provided written informed consent prior to communicating with the IVA. The IVA was created using BotLibre (https://www.botlibre.com) and shown on a laptop computer screen in front of the participant. Participants were asked to respond to a set of 12 pre-recorded questions, most of which were developed based on the findings of Jones et al. (2016) and Elsey et al. (2015). Participants were instructed to answer each question by speaking to the IVA, and they controlled the move from one question to the next by pressing a button on the computer keyboard after they had finished speaking. Audio and video recordings of the participants responding to the questions were captured on the laptop computer, using both the built-in microphone and camera on the laptop, and an additional camera placed to the side of the participant. Participants could be recorded on their own or in the presence of an accompanying other, e.g. a partner or relative would be recorded if the participant was accompanied during the study.

We report on data from a total of 35 participants: 8 PwMCI (5 male, 3 female, median age 62, SD=7.8), 13 PwAD (6 male, 7 female, median age 68, SD=6.6), and 14 HC (6 male, 8 female, median age 74, SD=8.5). We employ the methodology of Conversation Analysis (CA; Sidnell and Stivers 2013) to analyse the sequential placement, grammatical form and lexico-semantic content of the responses.

The code at the start of transcribed data fragments identifies the participant by number; the number after the hyphen indicates whether the interviewee is responding to the first or second recent memory question; the following letters indicate which participant group the interviewee belongs to. Interviewees are referred to by pseudonym; the intelligent virtual agent is referred to as IVA; an accompanying other (e.g. partner or relative) is referred to as Oth. The IVA interactions occurred in the presence of a research assistant who was instructed to remain as passive during the recording as possible but who was at hand to support patients with the recording procedure if necessary; the researcher is referred to as Res. Transcriptions broadly follow conventions developed by Gail Jefferson (Jefferson, 2002). To enhance readability and in order to make the transcriptions more accessible to a wider audience, finer details of pronunciation are not represented. Identifying details, such as names of people and places, have been changed.

3 Analysis

In this section we present examples and analyses of three recurrent practices in response to questions concerning recent memory asked by an IVA: claims of memory problems, self-directed questions, and prefacing a turn with “well”. Not every response to the recent memory questions contains one of these practices; what our analysis reveals is that these practices are employed differently depending on the diagnostic category of the speaker. We have selected representative examples to illustrate how the fine details of these practices differentiate among the groups.

3.1 Claims of memory problems

Some responses to each of the two recent memory questions contain a claim that the participant cannot answer the question, either at all or in part, due to an inability to remember, for example “I can’t remember about Saturday at all”; “nowt springs to mind”. As noted by Drew (1989:106), a question that specifically asks about the question-recipient's memory sets up a 'test' situation that cannot be opted out of. In our data, participants orient to this obligation to respond to known-answer questions by claiming a failure or inability to remember (eg., "I can't remember"; "I can't think of anything") rather than a lack of knowledge (eg., "I don't know"). This finding contrasts with Hesson & Pichler (2016) who focus on the use of “I don’t know” by people with dementia in responses to questions in the Mini-Mental State Examination. They show that when used to claim a lack of knowledge, “I don’t know” use correlates with severity of dementia, but they also stress that “I don’t know” is employed for uses other than claiming lack of knowledge. Svennevig & Landmark (2019) also focus on how people with dementia respond to questions to which they are expected to know the answers. They describe how responses from people with dementia to such questions contain accounts that either normalise their inability to respond, or exceptionalise it, for example by reminding the questioner that they have Alzheimer’s disease. Some of the claims of memory problems used by people with dementia in our data follow this ‘exceptionalising’ pattern. Additionally, like Hesson & Pichler (2016), we find that claims of an inability to remember are put to different uses by participants with varying (and nonexistent, in the case of healthy controls) degrees of cognitive impairment.

A striking feature of the responses in our data was the way in which people with MCI use claims of memory problems in place of an answer and as a way to terminate the sequence. Examples of this are shown in fragments 1 and 2.

(1) [084-2 MCI]

1 IVA: what has been in the news recently
2 (12.0)
3 Joe: I'm sorry **I can't remember**
4 (2.4)
5 IVA: tell me about the school you went to and how old
6 you were when you left

Fragment 1 shows a person with MCI using a claimed inability to remember as the entire response to the question. The response is only produced after a long (12 second) silence, and the first bit of talk produced, “I'm sorry”, prefigures the following “I can't remember” and orients to the insufficiency of the response. During the 2.4 second silence shown in line 4, Joe presses the button to move on to the next question without offering any further account for his inability to respond, or making any further effort to expand on the response.

(2) [158-2 MCI]

1 IVA: what has been in the news recently

```
2           (10.3)
3  Pat: don't know
4           (4.7)
5  Res: tell him if you can't remember
6  Pat: can't I can't remember
7           (1.2)
8  Pat: right
9           (0.5)
10 IVA: tell me about the school you went to and how old
11      you were when you left
```

Fragment 2 shows an example in which a person with MCI attempts to use an “I don’t know” response, again after a lengthy pause. The researcher orients to the claim of 'not knowing' as being equivalent in this context to 'not remembering,' intervening with a directive to "tell him [the IVA] if you can't remember" (line 5). Pat complies with this directive, then moves on to the next question, shown in lines 6-10.

Fragments 1 and 2 show people with MCI make little or no attempt to produce any more talk, or to account for the difficulty with their memories after claiming an inability to respond. Healthy control participants, however, use claims of memory problems as prompts to say more; in other words, they may claim problems with recalling the answers but they follow such claims with details that *do* respond to the question. Fragment 3 shows a response from a healthy control participant which becomes lengthy despite starting with a rather extreme claim of a memory problem.

(3) [170-1 HC]

```
1  IVA: what did you do over last weekend giving as much
2       detail as you can
3           (1.0)
4  Ava: eh::: last weekend now my mind's just gone a
5       complete blank of course .hhh (.) e::m (0.5) let
6       me think last weekend I know on Sunda:y u:m: !t
7       .hh (0.2) my husband and I took our little do for
8       a walk in Fidlington Woods in Shoreton so we walked
9       round the woods .hhhh (.) and then we went there's
10      uhm: !t a center in the woods where you can get uh:
11      tea and uh flapjack so we sat there and that was
12      very nice looking over the pond .hhh and then we
13      went to my mother's house which is in Shoreton and we
14      had lunch there .hhhh (0.2) um and spent some time
15      with her and then we came home again .hhh (0.3)
16      I'm desperately trying to think what we did on the
17      Saturday we can't have done very much I think we
18      just went shopping yeah we did we went to
19      Sainsbury's went shopping .hhhh (0.2) u:m did some
20      housework nothing very exciting
```

After a 1.0 second pause, Ava, a healthy control participant, claims not to be able to respond at all (“my mind's just gone a complete blank”, line 4-5) then provides a public

display of thinking (“let me think”, line 5-6). She then produces “I know”, followed by the remainder of her response. Through this series of prefaces, Ava portrays herself as moving from a state of being unable to answer the question through to remembering what she did, and providing rather a lot of the requested detail (lines 6-15).

Ava makes another claim of difficulty with her memory in line 16, “I'm desperately trying to think what we did on the Saturday”. Again this claim functions as a self-prompt and preface to providing additional detail about what she did on Saturday, having already given a detailed account of Sunday. Initially she produces a vague assessment that accounts for her memory problems, “we can't have done very much”, then hazards a guess at what she might have done prefaced by “I think” (lines 17-18). However, she then claims to have solved her memory problem and dispenses with any hedges, producing the details in a declaratively formatted utterance: “yeah we did we went to Sainsbury's, went shopping, .hhhh (0.2) um did some housework” (lines 18-20).

Rather than ending her response after indicating that she was having trouble with her memory in line 4, Ava proceeds to make three separate claims of difficulty with her memory of the weekend’s events. However, she successfully ‘solves’ each of the three claimed problems and produces the requested details.

Fragment 4 provides another example of a healthy control participant, Bob, using a claimed memory problem to preface the provision of additional detail in a response.

(4) [161-2 HC]

```
1  IVA: what has been in the news recently
2          (0.4)
3  Bob: .thhh oh brexit brexit brexit (0.2) .hhhh uh
4       awful things (.) um do you know I don't know
5       (.) particularly anything .hhhh that's caught my
6       fancy (.) um (0.8) over the past few days (0.7)
7       let me think has there been anything (.) no just
8       the cricket well: (0.2) .hhh yes (.) England (.)
9       Pakistan being (0.2) .hhhh (0.3) er being beaten
10      by thrashed by India (0.2) um (0.2) .hhh no I
11      haven't really I haven't really (0.2) er
12      remembered very much more that's happened
13      there's nothing nothing untoward that's happened
14      in my little world
```

Bob starts his response by mentioning only one specific thing that’s been in the news (Brexit, line 3). His following talk orients to the potential inadequacy of this as a response: “I don’t know (.) particularly anything .hhhh that’s caught my fancy (.) um (0.8) over the past few days.” This use of “I don’t know” does not stand on its own, but rather is designed as the beginning of an account for why he doesn’t remember enough – at first – to respond adequately to the question. It prefaces the explanation that he hasn’t been interested enough in anything that’s been in the news to have recalled it. After this account, he pauses for 0.7 seconds, then claims to be ‘doing recalling’ with “let me think” (line 7). This claim of thinking is then followed by a recap of the cricket match that’s been in the news.

Juxtaposing the latter two fragments with the former two shows that rather than use claims of memory problems as ways to respond to the question and quickly move on, as people with MCI do, healthy control participants use these claims as prompts or prefaces to more detailed answers. When people with Alzheimer's disease claim a memory problem, on the other hand, they use these claims to initiate talk about their memory and how problems with it are affecting their everyday life. One example is shown in fragment 5.

(5) [111-2 AD]

1 IVA: what has been in the news recently
2 (0.5)
3 Sue: o(h)h g:o:dh huh huh huh huh .mhh.thh (.) uh::-
4 **I don't know I never- I never remember what's in**
5 **the news** .hhh (0.9) ada- **I can remember it: for:-**
6 **a while and then it's forgotten (0.2) basically**

In line 3, Sue, a person with Alzheimer's disease, exclaims "o(h)h g:o:dh" and laughs. She then claims an inability to respond to the question with "I don't know", which is immediately followed by an account that orients to memory: "I never- I never remember what's in the news" (lines 4-5). This is followed by further details of problems she is having with her memory ("I can remember it: for:- a while and then it's forgotten (0.2) basically").

This section has highlighted the differences among the ways that the different groups in our data (healthy controls, people with MCI, and people with AD) use claims of memory problems. Although all three groups make such claims, the talk or activities that follow them are not the same. People with MCI terminate the sequence after responding with a claim of a memory problem, whereas people with Alzheimer's disease use them as a way to initiate talk about the severity of their memory problems. Healthy controls, on the other hand, follow claims of difficulty remembering with extended responses that contradict such claims.

3.2 Self-directed questions

Self-directed questions were shown by Goodwin & Goodwin (1986) as one way (among several others) in which interlocutors indicate that they are performing a word or name search - in other words, a way of claiming a difficulty in accessing information. Additionally, Schrauf (2020) shows that during a neurocognitive clinical examination, people with Alzheimer's disease exhibit many of the behaviours noted by Goodwin & Goodwin, including the use of self-directed questions, in instances where they are experiencing memory troubles, not just word-finding problems. We discuss the use of self-directed questions as a category separate from claims of memory problems to highlight the differences in the way the participant groups use these devices in their responses.

We counted a turn-constructional unit as a self-directed question if it contained a first person pronoun (e.g. "what did **I** do Saturday", "what else did **I** do?"), and as self-directed even if a third party was present as long as they did not treat the question as directed at them.

Self-directed questions rarely occur as the first element in a response; they are instead usually found within an extended response. Fragments 6 and 7 show the typical placement

of a self-directed question. Both fragments also show healthy control participants using self-directed questions in a similar way to claims of memory problems: they answer them, and thereby provide more detail in response to the question from the IVA. In fragment (6), Bob, a healthy control participant, produces a self-directed question after beginning his answer with an account of how he broke his normal weekend routine.

(6) [161-1 HC]

IVA: what did you do over last weekend giving as much
detail as you can
(0.3)
Bob: oh:: deary me hhuh huh huh .hhhh uh had a nice lie
in hh uh: didn't feel up to going to do my normal
(.) uh five kay .hhhh run in the morning .hhhh er
what did I do in the afternoon I think I did a
little bit of study (.) then I went out and did
some shopping (.) and then went for a long walk
.hhhhh uh: and then came back (.) made the meal and
we settled down to just an evening chatting and
watching tee vee

After specifying that he hadn't done his "normal" run in the morning, Bob uses a self-directed question as a preface to describing what he did the rest of the day: "what did I do in the afternoon?" (line 7). This allows him to display how he is moving chronologically through his memory of the day to provide the requested detail.

Fragment 7 involves another healthy control participant, Dan, who first describes Sunday in some detail, then uses a self-directed question before describing what he did on Saturday.

(7) [089-1 HC]

IVA: what did you do over last weekend giving as much
detail as you can
(1.0)
Dan: oh crikey (1.9) uh::: ooh (0.4) !t (0.8) well
Sunday was spent in:: (.) CITYNAME in Marringley
.hhhh (0.2) out for a walk (.) uh:: (0.5)
Hebbeston Rock .hhhhh with some friends (0.2)
walking the dogs .hhhh and then over to see: brother
(0.5) an:d sister in law (.) for a catch up (0.3)
.hhh (0.3) a:::nd a bit of dinner (.) .hhhhhh uh::
Saturday (0.3) I'm trying remember **what did I do**
Saturday litter picked Saturday morning .hhhhhhhhhh
(0.6) uh:::: (0.9) pf::: (0.6) not a great deal (.)
uh probably watched a bit of sport I think (1.7)
uh:: (1.0) caught up with the missus (0.6) .mhhhhhh
(0.7) yeah (0.6) not a great deal (.) quiet day
Saturday

Dan first describes his activities on Sunday and then admits to running into difficulty in recalling Saturday. "I'm trying to remember" (line 7) could project the production of a subordinate clause with declarative syntax (“I'm trying to remember what I did Saturday”), which would be a claim of an inability to respond. However, Dan goes on to produce an interrogatively formatted clause, "what did I do Saturday" – a self-directed question. Dan then proceeds to provide examples of what he did on Saturday, albeit with several pauses and some hedges (eg., "probably," "I think"), and ending with the account that it was a “quiet day Saturday.”

In fragments 6 and 7, healthy control participants respond to their own self-directed questions by providing a list of what they did, for example, litter-picked, watched a bit of sport and spent time with "the missus", did a bit of study, did some shopping and went for a long walk. This sequential organisation provides a neat display of their success in accessing the memories: they query themselves, then give the answer.

The following examples show how the responses of people with Alzheimer’s disease to self-directed questions are structured differently from the responses produced by healthy controls. Fragment 8 shows an example of an answered self-directed question from Tim, a person with Alzheimer’s disease.

(8) [104-1 AD]

```
1  IVA: what did you do over last weekend giving as much
2       detail as you can
3          (1.3)
4  Tim: .hhhhhhh (0.7) (same as your) .hhhh.mhh (0.2) um::
5       (0.5) went shopping (3.6) uh::hh (0.4) °what else
6       did we do?° (8.7) no (0.4) ung can't (3.0) watched
7       tee vee (13.4) went for a walk (6.0) bout it I
8       think isn't it (0.9) I can't (1.1) think of anything
```

After silence of 1.3 seconds following the end of the IVA’s question, Tim produces an inbreath. It takes a further 1.5 seconds before he produces the first recognisable verbal response to the question: “went shopping”, line 5. The self-directed question he produces (“what else did we do?”, line 5-6) is very quiet and followed by a 8.7 second pause, then “no (0.4) can’t (3.0)” before he manages a few more statements of possible activities, “watched tee vee (13.4) went for a walk”. Unlike the talk produced by healthy controls after both claims of memory problems and self-directed questions, the talk produced here is not linked together with any indication of chronological order; there are no linking conjunctions or adverbs, or any sense of unfolding time. Tim ends his response with several claims of not being able to recall anything further: “bout it I think isn’t it (0.9) I can’t (1.1) think of anything”.

In fragment 9 Colin, another person with Alzheimer’s disease, produces a lengthy response containing more than one self-directed question.

(9) [113-1 AD]

```
1  IVA: what did you do over last weekend giving as much
2       detail as you can
```

```
3          (1.0)
4  Col: °ooh: last weekend° which d one was last weekend
5       (4.0) well uh huh huh .hh a safe bet was that I'd
6       went to thee .hhhhhh (0.9) pub on: uh (.) Sunday
7       night (0.3) that's probably: yes .hhhhh ah:::
8       (0.4) on: thee::hhhhhhhhh (.) °uh what else did I
9       do° (1.9) it was coldhhh (1.5) there was a lot of
10      ice around (1.1) .hh on the Friday I remember I
11      got °I° hijacked by .hhhh a load of kids coming out
12      of school .hh they were all playing on the ice
13      .hhhhh and they started to slip and (0.2) they
14      slipped into me (.) and then .hhhhh (0.3) there
15      was a- (0.6) bundle of about (0.3) eight of us
16      sliding down (0.5) the ice .thhhh that was quite
17      notable huh huh huh huh huh huh .hhhhh (.) .h
18      everybody survived (0.2) it was okay it was quite
19      funny .hhhh (0.2) uh::m: (1.0) that was an event
20      where else did I gohhhhh (0.3) .hhhhh trying to
21      think what the last film I went to see the sih
22      film was .hhhh I went to si- I- (.) recently na-
23      that's not this weekend though I think that was the
24      weekend before I went to see:: uh:m (1.1) .mhhhhhhh
25     (0.4) queen (1.0) the queen film out (.) it was
26      excellent (.) thoroughly enjoyed it
```

In this response, Colin answers his self-directed questions with descriptions of what he would typically do, rather than providing evidence of genuine recollections about last weekend. Colin answers his own question "which d one was last weekend" (line 4), with a description of something he is likely to have done: gone to the pub on Sunday night. No evidence is offered, however, that they did go to the pub on this particular weekend; rather, going to the pub is offered as “a safe bet,” a typical activity, but with no guarantees that it represents an actual memory of what Colin did on this particular Sunday night.

The next self-directed question ("what else did I do", lines 8-9), is at first answered with a description of the weather, not a description of what he did. This is followed by a declaration that "on the Friday I remember…" but this recollection does not prompt an expansion of what he did on the weekend itself, but rather prefaces a description of an event that he witnessed on Friday afternoon. Yet another self-directed question is employed in line 20, "where else did I go", but again, rather than being followed by details about his weekend activities, this self-directed question instead prefaces a change of topic to films. He then mentions a film he saw, but "not this weekend though I think it was the weekend before" (lines 23-24).

Thus we can see that self-directed questions used by people with Alzheimer's disease do not lead on to an extended response to the IVA’s question. Although people with Alzheimer's disease may produce talk after self-directed questions that, sequentially, can be seen as responses or answers to them, this talk is not organised or structured in the same way as that produced by healthy controls. The talk is instead about general, or typical events, or as shown in fragment 9, about events that happened on some weekend, but not the weekend in question.

Self-directed questions are not used by any of the people with MCI in our data; however, people with Alzheimer's disease produce self-directed questions at a rate of 1 in 4.3 responses, and healthy controls at a rate of 1 in 5.6 responses. Therefore, if people with MCI used self-directed questions in a similar proportion, we would expect to have found 3 or more. This suggests that people with MCI may be avoiding the use of self-directed questions, not simply not using them.

In summary, we find that self-directed questions are used by healthy controls as a way to foreground and direct attention to the claimed action of accessing specific memories to complete their response. After producing the self-directed question, healthy controls provide details and more complete responses than have been provided so far. People with AD do not answer their self-directed questions in the same way as HC; their responses are vague, generic and go off on tangents. People with MCI avoid using self-directed questions, and thereby neither highlight an ability to access specific memories, nor end up unable to provide detailed responses.

3.3 Well-prefacing

The use and meaning of 'well' in conversation has long been the topic of linguistic investigation (eg., Svartik 1980; Jucker 1993; Schourup 2001). Schegloff and Lerner (2009) present a conversation analytic investigation of well-prefacing after wh-questions. They show that well-prefacing sometimes indicates a 'non-straightforward response', and describe the use of well-prefaces as forward looking (in contrast to turn-initial 'oh', which is backward looking). Heritage (2015) builds on this work, and shows that in the context of responses to questions, well-prefaces reliably project expanded responses (as shown also by Heritage & Clayman 2010 in the context of responses to doctors' history-taking questions).

Both the recent memory questions we examine here are wh-questions. We argue that participants' use of well-prefacing in the responses projects an extended answer providing a detailed account of relevant events either from last weekend, or from current events. Even when participants cannot entirely fulfil all the expectations projected by a well-preface, they still display an orientation to the relevance of an extended response (sometimes with the help of an accompanying other).

Some examples of the use of well-prefacing in our data are "well we've just had the hoo hah about Brexit" and "well Theresa May's having a bad time". In our data "well" is used to preface responses that vary in the amount of talk, and in the detail conveyed in that talk. Healthy control participants use well-prefacing as previously described in the literature (Heritage 2015; Schegloff & Lerner 2009): to embark on an extended response to the IVA's question. Our dataset contains eight examples of healthy control participants using well-prefacing, in response to both recent memory questions, whereas people with MCI and people with Alzheimer's disease taken together only produce a total of four well-prefaces, all in response to the question "what has been in the news recently."

Fragment 10 (shown previously as fragment 7) shows a response from Dan, a healthy control participant.

(10) [089-1 HC]

```
1  IVA: what did you do over last weekend giving as much
2       detail as you can
3          (1.0)
4  Dan: oh crikey (1.9) uh::: ooh (0.4) !t (0.8) well
5       Sunday was spent in:: (.) CITYNAME in Marringley
6       .hhhh (0.2) out for a walk (.) uh:: (0.5)
7       Hebbeston Rock .hhhhh with some friends (0.2)
8       walking the dogs .hhhh and then over to see: brother
9       (0.5) an:d sister in law (.) for a catch up (0.3)
10      .hhh (0.3) a:::nd a bit of dinner (.) .hhhhhh uh::
11     Saturday (0.3) I'm trying remember what did I do
12     Saturday litter picked Saturday morning .hhhhhhhhhh
13     (0.6) uh:::: (0.9) pf::: (0.6) not a great deal (.)
14     uh probably watched a bit of sport I think (1.7)
15     uh:: (1.0) caught up with the missus (0.6) .mhhhhhh
16     (0.7) yeah (0.6) not a great deal (.) quiet day
17     Saturday
```

This extended response is prefaced with “well”, and contains details about exactly where he went, who with, and what activities he took part in.

Fragment 11 shows another healthy control participant, May, using “well” to preface a lengthy and detailed description of her weekend.

(11) [094-1 HC]

```
1  IVA: what did you do over last weekend giving as much
2       detail as you can
3          (0.7)
4  May: !t.hhhhh well I had ehm::: (0.3) I do l::ook on
5       Facebook a lo(h)t huh huh hu(h)m .hhh go on my
6       phone .hhhh an::: I had a message uh:: on Saturday
7       nigh::t from a friend (0.2) .hh that (.) I used to
8       do (0.6) sorry hih huh .hhhhh I: used to:: sort
9       of wuh we worked on ehm: (.) a Wishold project
10      som:e uh fifteen twenty years ago .hhhhhhhh eh:
11      setting up workshops an and various things and
12      that was funded by the European trust .hhhh so we
13      worked together and known each other for quite
14      some time .hhh and she asked me if I fancied going
15      to: uh::m(0.3) .hhhhh a life drawing session we
16      both: attended Bingham (0.3) university and got
17      (0.4) our degrees: (.) fine art degrees from
18      there:: .hhhhhh and she continued with her: uh
19      (0.4) !pt .hhhhhhhhhh artistic career whilst I
20      took further s::ort of: studies and I ended up I
21      was a probation worker (0.5) .hhhhhh so::: getting
22      back to what we were s(h)a(h)ying .hhhh on Sunda:y
23      .hh uh she asked me if I would go with he::r life
```

```
24      drawing which I really an we- we did go: (.)
25      together: (.) uh::: Greenhill (.) community
26      centre (0.4) and we had a really lovely time and
27      spend a whole morning till one o'clock live
28      drawing .hhhh and then went back to her place
29      .hhh for a spot of lunch and uh some really lovely
30      coffee because she's got a new percolator .hhhh
31      after that I went home cooked for my husband .hhhh
32      and just had a lazy afternoon
```

May's response, prefaced by "well", contains extensive background information provided to explain her relationship to the friend she spent time with over the weekend, followed by a positively assessed description of the activities they did together.

As noted above, people with MCI rarely use well-prefacing in our data. Fragment 12 shows one of our two examples, in which Dave, a person with MCI, struggles to produce much talk at all after employing a well-preface, contrary to findings reported in the literature for people without memory problems.

(12) [121-2 MCI]

```
1  IVA: what has been in the news recently
2          (1.5)
3  Dav: !t u::m: (1.2) well Theresa May's having a bad
4       time (1.1) u:m: (1.0) that's about as much av
5       I've (.) I've read (1.2) at this moment in time
```

Dave only produces one vaguely described example of something that has been in the news recently ("Theresa May's having a bad time"). Theresa May was the prime minister of Great Britain at the time, and to describe a world leader as 'having a bad time' leaves a lot of room for expansion. However, Dave offers no details explaining what kind of 'bad time' she was having. Next, a 1.1 second silence elapses, followed by an "u:m:" and another 1.0 second silence before Dave produces any more talk. This, we argue, shows his orientation to the structure projected by the use of the well-preface: more talk should be forthcoming, but he does not produce any. Instead, he now ends his response with a claim of inability to recall anything else, lines 4-5.

People with Alzheimer's disease also rarely employ well-prefacing; again, we have only two examples in our data, one of which is shown in Fragment 13, featuring Bea and an accompanying other.

(13) [028-2 AD]

```
1  IVA: what has been in the news recently
2          (1.0)
3  Bea: uhm: (1.3) well things in Europe and um (2.4) u-
4       (6.3) [uh:   ]
5  Oth:       [a bomb]
6          (0.6)
7  Bea: oh a bomb yes
8  Oth: where (0.8) tell him about the bomb
```

```
9           (1.4)
10 Bea: where was it I've forg(h)o(h)tt(h)en .hhh
11          (1.4)
12 Bea: in America weren't it
13          (0.4)
14 Oth: aye
15          (5.7)
16 Oth: general election
17          (1.0)
18 Bea: yes the general election's coming up later this
19       week .mhhhhhh (1.7) um (3.3) and that's about it
20           (2.5)
21 Oth:  next one
21 Bea:  yeah
```

After an “uhm” and a 1.3 second pause, Bea begins her response with “well” (line 3). Similarly to the person with MCI in Fragment 12, however, Bea only produces one vaguely described item of news (“things in Europe”). The use of “and um” could project more to come, and display an orientation to the structure projected by the well-preface; however, she produces only pauses and indistinct vowel sounds (“u- uh:”). The accompanying other overlaps the latter of these with the prompt “a bomb” (line 5). After a 0.6 second pause, Bea repeats this (line 7), but following yet another prompt from the accompanying other, she requests additional help with “where was it I’ve forgotten” (line 10). Although Bea posits a response to where the bomb was (“in America weren’t it”, line 12), the accompanying other continues providing prompts. Bea again repeats what the accompanying other says, “yes general election”, and follows this with additional information “later this week”, but this is again followed by lengthy pauses and (see line 19). She then moves to close the response to this question with “and that’s about it.”

This section explicates the difference in the ways that the groups produce talk after well-prefaces: healthy controls provide the extended responses that are projected by the well-preface, whereas people with MCI and people with AD show an orientation to the extended response projected by the well-preface, but also display an inability to complete the response.

4 Discussion

Some of our observations have been made before in contexts focussing on only one group of people. For example, Hamilton (2005) shows that people with Alzheimer’s disease tend to have preserved abilities to maintain conversational structure but those conversations have a notable lack of content; people without diagnosed memory problems use well-prefaces before giving extended responses to wh-questions (Heritage 2015). The contribution of this work lies in comparing the use of similarly-structured responses from three different diagnostic groups: healthy control participants, people with MCI and people with Alzheimer’s disease. This comparison is facilitated by the use of an IVA to collect the responses, as the IVA cannot vary the timing, composition, or delivery of the questions. In other words, our comparisons are truly like with like: differences in the responses cannot be linked to differences in the initiating action.

Our analysis shows the following differences among the groups' use of similar response types: Claims of memory problems were used by healthy control participants as prompts to say more in response to the question; by people with MCI in place of an answer, and as a way to terminate the sequence; and by people with Alzheimer's disease as a way to talk about their memory problems rather than answer the question. Self-directed questions were used by healthy control participants to prompt the provision of additional detail in the question responses, but people with Alzheimer's disease did not produce additional detail in response, and we found no instances of people with MCI using self-directed questions. Well-prefaces were used to project extended answers by healthy control participants, whilst people with MCI and people with Alzheimer's disease showed some orientation to their normative use, but did not provide expanded responses.

Our analysis also reveals distributional differences in the use of the practices among the groups. None of the responses from healthy controls in our data consist of claims of memory problems such as "I can't remember," followed by sequence termination. However, this way of responding is used by people with MCI, as well as people with Alzheimer's disease – but people with Alzheimer's disease, unlike people with MCI, sometimes follow up these claims of memory problems with additional talk about memory. Self-directed questions are never used by people with MCI, only by healthy control participants and people with Alzheimer's disease. Finally, well-prefacing is used twice as often by healthy control participants as by people with MCI and people with Alzheimer's disease put together.

Based on these findings, we propose that healthy control participants use these conversational practices in such a way as to 'show off' their recall and demonstrate their cognitive abilities. They use claims of an inability to recall and self-directed questions as ways to produce more talk that displays their intact, and retrievable on command, memories. On the other hand, people with Alzheimer's disease try to use these structures but they do not achieve the same results as healthy control participants. People with Alzheimer's disease use claims of an inability to recall to preface complaints about their memory failures, and when they employ self-directed questions and well-prefaces, their following talk lacks detail and sequential coherence: they can produce the bones of the responses, but cannot put flesh on those bones. And for their part, people with MCI avoid the use of these conversational features, as in the case of self-directed questions, and do not continue the sequences begun by either claims of an inability to recall or well-prefaces in the ways that healthy control participants or people with Alzheimer's disease do. Rather, people with MCI could be said to respond in ways that minimise their engagement with the questions, thus reducing the opportunities for cognitive impairment to surface.

5 Conclusions

In this paper we have examined interview data collected using an intelligent virtual agent rather than a human conversational partner. Walker et al. (2018) has shown that people treat an IVA similarly to a human doctor; therefore, whilst we cannot be certain that our data mimic naturally occurring interactions perfectly, we believe that our approach allows us to make some headway in understanding the lived experiences of people with memory deficits arising from certain neurological conditions. We also trust that the features we set out here

as characterising those responses will be recognisable by anyone who interacts with people living with those deficits in their everyday lives.

We have presented a fine-grained analysis of the recurrent use of certain linguistic features (claims of memory problems, self-directed questions, well-prefacing) in the responses to recent memory questions. We have shown differences in both the distribution of these features, and in the way that they engender (or curtail) additional talk, when employed by healthy controls, people with MCI, and people with Alzheimer's disease. We suggest that our data shows that healthy controls are both willing and able to 'show off' their memory, whilst people with Alzheimer's diseases are willing but generally unable to do so. People with MCI, in contrast to both of these groups, display themselves as both unwilling and sometimes unable to display their memories of recent events.

One limitation of the work presented here is that it is a small-scale study of a modest dataset. It is not balanced in terms of numbers of participants in each group (partly because changes to the questions asked by the IVA as the method for data collection was refined confounded some comparisons). Additionally, we only looked at two recent memory questions. Other questions might shed more light on these features, and may reveal further relevant features.

If these results are replicated in a larger dataset, a CA-based training package for clinicians could be constructed using these recognisable conversational features. Rather than requiring the use of automatic speech recognition programmes and/or statistical classification algorithms, the use or absence of claims of memory problems, self-directed questions, and well-prefacing could be recognised by an interactant (e.g. a doctor) and provide evidence-based input into diagnoses.

Contributors

Traci Walker is a Senior Lecturer in the Department of Human Communication Sciences, University of Sheffield. Her research uses the methodology of Conversation Analysis (CA) to investigate the function and use of linguistic structures in both typical and atypical communication.

Gareth Walker is a Senior Lecturer in the School of English, University of Sheffield. His research tries to reach a more complete understanding of how people use linguistic resources in conversation. He has published on topics including turn-taking, laughter, communication impairment, and the coordination of vocal and visible resources (gaze, posture, gesture).

Ronan O'Malley is a consultant neurologist with a specialist interest in cognitive disorders. He works at Sheffield Teaching Hospitals foundation trust. He is also a Biomedical Research Council Doctoral Fellow. His research interests include non-invasive diagnostic tests for cognitive disorders with a focus on language and imaging.

Heidi Christensen is a professor of spoken language technology in the department of computer science at the University of Sheffield, United Kingdom. Her research interests are

in the use of speech and language processing in the healthcare domain. Her core expertise is in the automatic detection and tracking of people's physical and mental health including verbal and non-verbal expressions of emotion, anxiety, depression and neurodegenerative conditions.

Bahman Mirheidari is a Research Associate in the Computer Science department at the University of Sheffield. His main research interests are in the areas of medical applications of speech technology, automatic speech recognition of conversations, and emotion detection in conversations.

Markus Reuber is a Professor of Clinical Neurology at the University of Sheffield and Honorary Consultant at the Sheffield Teaching Hospitals NHS Foundation Trust in Sheffield, United Kingdom. He is particularly interested in the phenomenology and treatment of seizure and cognitive disorders. He has used the methodology of Conversation Analysis to address a number of diagnostic and communicative challenges in clinical neurology.

Daniel Blackburn is a Senior Lecturer and Honorary Consultant neurologist working at the University of Sheffield. His research interests are non-invasive diagnostic tests for early dementia or cognitive impairment using automated analysis of language and electroencephalography (EEG). He is the lead for young onset dementia in Sheffield.

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