

Research Report

Semantic trouble sources and their repair in conversations affected by Parkinson's disease

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Abstract

Background: It is known that dysarthria arising from Parkinson's disease may affect intelligibility in conversational interaction. Research has also shown that Parkinson's disease may affect cognition and cause word-retrieval difficulties and pragmatic problems in the use of language. However, it is not known whether or how these problems become manifest in everyday conversations or how conversation partners handle such problems.

Aims: To describe the pragmatic problems related to the use of words that occur in everyday conversational interaction in dyads including an individual with Parkinson's disease, and to explore how interactants in conversation handle the problems to re-establish mutual understanding.

Methods & Procedures: Twelve video-recorded everyday conversations involving three couples where one of the individuals had Parkinson's disease were included in the study. All instances of other-initiated repair following a contribution from the people with Parkinson's disease were analysed. Those instances involving a trouble source relating to the use of words were analysed with a qualitative interaction analysis based on the principles of conversation analysis.

Outcomes & Results: In 70% of the instances of other-initiated repair the trouble source could be related to the semantic content produced by the individual with Parkinson's disease. The problematic contributions were typically characterized by more or less explicit symptoms of word search or use of atypical wording. The conversation partners completed the repair work collaboratively, but typically the non-impaired individual made a rephrasing or provided a suggestion for what the intended meaning had been.

Conclusions & Implications: In clinical work with people with Parkinson's disease and their conversation partners it is important to establish what type of trouble sources occur in conversations in a specific dyad. It may often be necessary to look beyond intelligibility and into aspects of pragmatics to understand more fully the impact of Parkinson's disease on everyday conversational interaction.

Keywords: conversational interaction, Parkinson's disease, communication partners, anomia, repair, pragmatics.

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What this paper adds?*What is already known on the subject?*

The speech of people with Parkinson's disease is often affected by dysarthria. Qualitative studies of conversational interaction with dyads including an individual with Parkinson's disease have shown how the speech disorder may affect everyday conversations. Previous experimental research as well as questionnaires and interview studies have also reported that pragmatic problems are common in Parkinson's disease.

What this study adds?

This study shows how conversational interaction in relation to Parkinson's disease may be affected by pragmatic problems. It also brings into light how people with Parkinson's disease and their spouses cooperate to (re-)establishing mutual understanding in cases of trouble sources related to the use and meaning of language in interaction.

Introduction

The presence of a communication disorder usually places high demands on the participants in conversation. The communication disorder associated with Parkinson's disease (PD) is primarily dysarthria characterized by quiet, breathy voice and imprecise articulation (Hartelius and Svensson 1994). However, research on impaired language production at a sentence and discourse level suggests that PD also may affect all stages of language production. This may cause reduced information content, disrupted fluency and reduced syntactic complexity (Altmann and Troche 2011). Based on data in their review Altmann and Troche (2011) also describe how cognitive decline affecting executive function and working memory as well as concept formation may contribute to the impaired language production abilities seen in PD. It is also known that PD may affect comprehension of non-verbal communication like facial expressions and prosody as well as implied, non-verbal, meaning. This too has been related to alterations in cognition, for example, executive function and working memory (Pell and Monetta 2008).

There are only a few studies of the effects of PD on conversational interaction, but they have often reported problems with initiation and turn-taking, often due to difficulties initiating speech (see Griffiths *et al.* 2011, for a review).

Word-retrieval difficulties have also been reported affecting conversational interaction in people with PD (Berg *et al.* 2003, Hartelius *et al.* 2011, Miller *et al.* 2006). Besides being a frequent symptom in aphasia, word-retrieval difficulties are also an early symptom in dementia with behaviours like overuse of empty vocabulary, for example, words like 'thing' or 'such', and of increasingly less comprehensible paraphasias and circumlocutions (Goodglass and Wingfield 1997, Guendouzi and Müller 2006).

Pragmatic ability has been described as compromised in PD (Holtgraves *et al.* 2013, McNamara and Durso 2003, Pell and Monetta 2008). Pragmatics may be described as the study of use of linguistic (e.g. phono-

logical, semantic and syntactical) and non-linguistic means for communication (Perkins 2007). This includes use of verbal and non-verbal means to express meaning and personal attitude and for comprehension. The most natural form of language use is in different forms of conversational interaction and pragmatic ability is also displayed in the handling of, for example, turn-taking and topic management. In Perkins's (2007) view of pragmatic ability, it is seen as emerging from the interaction of fundamental entities such as language, social cognition, memory, attention, executive functions and inferential reasoning. Furthermore, sensorimotor systems are also fundamental entities involved in pragmatic ability. This view of pragmatics focuses on the processes within the individual as well as between individuals in interaction. The emergent perspective also claims that the link between an underlying deficit and a resulting pragmatic impairment is not always obvious and direct. The symptom may very well be the consequence of compensatory adaptations.

The pragmatic ability of people with PD in conversational interaction has been explored by using different rating scales. McNamara and Durso (2003) used a checklist of different aspects in conversational interaction assessing causal interaction elicited by open-ended questions in conversations between 22 individuals with PD and an examiner. When comparing the ratings with those of a control group they found what they called *inappropriateness* in several aspects related to turn-taking. Most affected in the area of turn-taking were initiation, pause time between phrases, quantity and feedback to the listener. Other behaviours that were reported as inappropriate were prosody, gestures and facial expressions. Degree of inappropriateness was significantly related to measures of frontal lobe dysfunction. Holtgraves *et al.* (2013) assessed degree of informativeness in responses from people with PD on questions in a semi-structured interview. People with PD were rated as less informative than non-PD controls and the results were related to executive functions. However, the authors state that the gold standard for an

assessment of utterances' informativeness would be the perception of people participating in the interaction, not the assessment made by an observer.

In a descriptive study Kegl and Poizner (1998) explored how PD affects turn-taking in deaf-signers with PD and how their conversation partners may compensate for those problems by, for example, being more attentive. Griffiths *et al.* (2012) used conversation analysis to explore everyday communication in relation to PD. They reported two prominent phenomena. First a tendency for overlap due to the speech disorder related to PD, which led to repair. Second the opportunities to repair the disordered talk are often not followed up, which may lead to a deletion of PD turns and talk and thus reduced participation in conversation. These findings were related to dysarthria but there are no studies of how pragmatic trouble sources may affect natural everyday conversational interaction between spouses, when each utterance and response is analysed in relation to the other, that is, on a sequential level.

Trouble sources and repair sequences occur in all types of conversation, but in communication disorders, interaction is often characterized by intermittent repair work due to frequently occurring problems with mutual understanding between participants. Mutual understanding has been described as something that is achieved in cooperation in the interaction between participants (Heritage 1984). Repair sequences are, according to Schegloff *et al.* (1977), organized in a system for the recognition and management of issues that need repair: the repair is preceded by a trouble source that someone apprehends as a problem. When a person highlights the problem repair is initiated. An initiation of repair is usually followed by an attempt to solve the problem. Repairs may be initiated and performed either by the person whose contribution contained the problem, in that case termed self-initiated self-repair, or by the conversation partner, in that case termed other-initiated other-repair. Repair initiated by one of the participants may also be completed by the other, that is, both other-initiated self-repair and self-initiated other-repair may occur. From analysis of interactions not affected by communication disorders, Schegloff *et al.* (1977) have described different construction types for other-initiated repair which have a relative strength of capacity to indicate the specific trouble source and thus make it easier to repair. The strongest repair initiator is to more or less explicitly invite confirmation of a guess or a suggestion for a possible understanding of the prior turn: 'You mean you went to the market?'. This is a very precise way to pin point the trouble source and the prior speaker only needs to confirm or reject. Initiators like 'huh?' or 'what?' are far less precise in indicating the location or nature of the trouble source (see Drew 1997, on 'open-class' initiators). In natural interactions self-initiated self-repairs are more frequent than other-

initiated other-repairs (Schegloff *et al.* 1977). Griffiths (2013) described other-initiated repair in couples where one individual had dysarthria due to PD and the types of other-initiations that were used were in accordance with the patterns described by Schegloff *et al.* (1977).

As discussed by Milroy and Perkins (1992), the efficient self-initiated self-repair is often difficult to achieve in interaction affected by a communication disorder. Collaborative hint and guess or completion strategies where spouses provide the missing information in relation to word-retrieval difficulties in aphasia have been described by, for example, Lubinski *et al.* (1980), Laakso and Klippi (1999), Ferguson (1993) and Oelshlaeger and Damico (2000). Other strategies for re-establishing mutual understanding described both in interactions involving people without communication disorders and in relation to dementia are to watch and wait, that is, to pass own turn hoping that more information will resolve the problem or to shift topic when the talk has become too problematic for repair (Guendouzi and Müller 2006).

The effects of a communicative disability on interaction and the phenomenon of co-construction of meaning has been described in both aphasia (see, for example, Goodwin 2003) and in dysarthria related to motor neuron disease (MND) and multiple sclerosis (Bloch 2005, Bloch and Wilkinson 2004, 2009, 2011). Bloch and Wilkinson have studied the nature of dysarthric talk trouble sources and how participants resolve these problems. Their results show the importance of cooperation where the repair may be more efficient when the recipient can display what was not understood. The person with dysarthria may also monitor the conversation partner's understanding to be able to initiate self-repair when needed. However, Bloch and Wilkinson have demonstrated that in relation to dysarthria there is more to disordered speech in interaction than intelligibility. Sometimes the repair is more complex, particularly when the trouble source is more global. This may happen when the problem is the understanding of the meaning of an utterance in a particular context, although each word is understood semantically. Drew (1997) argues that comprehension in conversational interaction involves more than the recognition of the literal sense of a contribution. When trying to understand a contribution the recipient may lean on a possible relation between that contribution and the preceding contributions. Wilkinson (1999) describes the relationship between repair, sequentiality and mutual understanding in aphasia and shows how the sequential context may be part of the trouble source as well as a resource in re-establishing mutual understanding.

Intelligibility is often described as a measure of speech signal effectiveness and the term *comprehensibility* as how a listener understands the semantic content of an utterance produced in a communicative context (Barefoot *et al.* 1993). Yorkston *et al.* (1996) have

described comprehensibility in terms of intelligibility when context in terms of, for example, syntactic and semantic cues are added. Barefoot *et al.* (1993) and Hustad (2008) on the other hand describe comprehensibility as the degree to which listeners can interpret the meaning of messages disregarding the accuracy of phonetic and lexical parsing. The latter definition thus describes the comprehension of a higher level meaning, and may be measured by listeners' ability to answer questions about the content of a narrative passage. Bloch and Wilkinson (2004, 2009, 2011) propose the concept of *understandability*, which is defined as how a turn is understood by a recipient in relation to prior turns, as a complement to intelligibility and comprehensibility. That is, understandability describes how the function of an utterance is understood in a sequential context. It is thus related to the definition of comprehensibility defined by Barefoot *et al.* and Hustad but differentiated in that it may only be assessed by sequential analysis of natural conversational interaction.

Bloch and Beeke (2008) described and compared the co-construction in conversations in two dyads where one of the conversation partners in one dyad had aphasia, and one in the other dyad had dysarthria due to MND. They found several similarities in the practise and proposed further research across disorder specific boundaries. Carlsson *et al.* (2014) also described many similarities in strategies used by spouses when people with aphasia after stroke or PD were having problems expressing themselves. Differences in strategies used seemed to be related to individual characteristics in the participating dyads more than to the underlying disease aetiology.

The purpose of the present study was to explore pragmatic problems related to the use of semantics in everyday conversational interaction between spouses in three dyads including an individual with later stage PD. The specific aims were (1) to describe the type of semantic-related pragmatic problems that occur; and (2) to explore how the individuals with PD and their spouses re-establish mutual understanding.

Method

Participants

The participants were recruited in relation to a study of conversation partner training, through the local PD association and include three dyads featuring three men diagnosed with PD and their spouses. All were native Swedish speakers. Demographic data for the participating dyads is presented in table 1.

The focus of the wider partner training study was the conversational interaction and cooperation between the two participants in each dyad. Formal testing of cognitive and motor abilities of the people with PD was kept to a minimum. All the participants with PD had

Table 1. Age of participants as well as years since diagnosis, stage of the disease, degree of comprehensibility, word fluency and comprehension for the participants with PD

Dyad	1	2	3
Age (PPD/CP)	76/73	79/73	72/72
Years since diagnosis	13	18	19
Stage of PD ^a	IV	IV	III
Comprehensibility in contextual speech	75%	37%	87%
Word fluency (Phon/Sem) ^b	28/9	26/19	31/26
Token test (cut-off point: 253/261)	175	249	237

Notes: ^aAccording to the Hoehn and Yahr (1967) five-graded scale.

^bAll three participants perform below the norms presented in Tallberg *et al.* (2008): phonological: 42.3 ± 10.6 ; semantic (results joint in the table): animals: 20.9 ± 7.1 ; activities: 18.1 ± 6.0 .

dysarthria. Degree of comprehensibility was measured by the calculation of percent correctly perceived words by a naive rater of 100 words uttered by the people with PD (PPD) in the context of a video-recorded conversation, a method recommended by Schiavetti (1992). In this way the measure was related both to the Yorkston *et al.* (1996) definition of comprehensibility and to the concept of understandability as described by Bloch and Wilkinson (2004). Phonological aspects of word fluency were measured with a request for verbal production of words beginning with the letters F, A and S during one minute for each letter (Tallberg *et al.* 2008). Semantic aspects of word fluency were explored in the same way with the categories *animals* and *activities*. Comprehension was measured with the Token Test (De Renzi and Vignolo 1962).

Dyad 1 features Robert, a former medical doctor, and his wife, Sonja, a former audiologist. Robert's voice is soft and breathy and his articulation is sometimes imprecise. Dyad 2 features Sten, who is 79 years old and his wife Ingrid. Sten had worked as an economist and Ingrid as an office assistant, before retirement. Sten's speech is severely affected by hypokinetic dysarthria, characterized by soft and breathy voice and instances of very rapid speech with imprecise articulation. Dyad 3 features Carl and Mary. Carl is a retired journalist and Mary had worked as a nurse but is now also retired. Carl's speech is characterized by a soft breathy voice and his articulation is sometimes imprecise.

None of the participants with PD had been diagnosed with dementia but the measures of comprehension and word fluency indicate that they have impaired language abilities as all three of the participants perform below the norms presented in Tallberg *et al.* (2008). Sten, who is the oldest one of the three PPD, has the lowest results on the FAS-test and comprehensibility, but the highest score on comprehension. Carl, who is the youngest PPD, has the highest results on word fluency as a whole and the best comprehensibility and is also assessed as being in an earlier stage of PD than the other two PPD, despite being the one who has

had the diagnosis for longest time. Besides this there are no obvious relations between the measures of word fluency, comprehension and comprehensibility and phase of disease or age and the difference in age and in results on the FAS-test between the three of them are not large.

The study was approved by the local research ethics committee and all names are changed and occupations have been exchanged to equivalents to protect the participants' anonymity.

Data collection

The material consists of video-recorded conversational interactions between the husband and wife in the three different dyads. The recordings were obtained before the start of the intervention phase and all of the available pre-intervention data for each of the dyads were used in the analysis. Three video-recordings each were obtained for dyads 1 and 2 and six video-recordings for dyad 3. The video-recordings are about 15 min long. The interaction was filmed once a week in the participants' homes. Two video cameras were set up by a research assistant, placed to ensure that both participants' gestures and facial expressions were captured. The participants were instructed to speak with each other as they would usually do, and to talk about anything they wanted, preferably something they needed to talk about anyway. They were also told that they were welcome to be silent for periods during the recording if they wished. The couples were then left alone during the recording.

Procedure of analysis

From each recording the middle 10 min was transcribed in ELAN, 4.5.1 for Windows. The transcription included non-vocal features as gestures and other body movements, as well as talk. The middle section was chosen as it was felt the couple would be less self-conscious of being video recorded after being recorded a few minutes. This procedure resulted in a material comprising 30 min each of transcribed natural interaction with dyad 1 and 2, and 60 min with dyad 3. In a first analysis all instances of other-initiated repair and other-repair by the spouses of the PPD were identified. Other-initiated repair was defined as an occurrence where the spouse requested a repetition or clarification of a contribution produced by the PPD. The spouse producing a repetition that resulted in a verification or rejection of the interpretation the spouse had made was also defined as a repair initiator. An action where the spouse produced a guess, or rephrased a contribution produced by the PPD may function as a repair initiator but it may also result in the completion of the repair, and may in those cases also be defined as other-repair. This resulted in a collection of 48 repair sequences. In a further analysis the instances were classified according to the nature

of the trouble source. Eleven of the 48 instances of other-initiated repair were found in the 30 min of data from dyad 1 (mean of 3.7 instances/recording), nine instances were found in the 30 min of data from dyad 2 (mean of 3.0 instances/recording) and 28 instances were found in the 60 min of data from dyad 3 (mean of 4.7 instances/recording). Thirty percent of the trouble sources could be related to quiet speech or imprecise articulation in the contributions of the PPD. In those cases repair initiated by the spouse was often in the form of an open class repair, like 'what did you say?' or a wh-question and the repair was typically completed by the PPD. The fact that the repair completion was performed by the PPD repeating what he had said sometimes with a stronger voice or clearer articulation, and this was followed by the proceeding of the interaction indicated that the problem the spouses had experienced was related to the dysarthria.

The remaining 70% of other-initiated repair sequences was characterized by trouble sources related to the meaning of words rather than just difficulties with dysarthria. It is acknowledged that quiet speech or imprecise articulation was sometimes also present in this collection of repairs, but the repair work in these instances was preceded by symptoms of word search or use of wording that was followed by the spouses either exchanging the expressions given for other candidate expressions or requesting more information. A more exhaustive interaction analysis, influenced by the principles of conversation analysis (Sidnell 2010), was performed on those occurrences that were related to semantics. Below five extracts taken as a representative sample of the occurrences are presented and used here as an illustration of the phenomenon under consideration.

To ensure the reliability of the findings, procedures established and reported within the field of conversation analytic research were undertaken (Silverman 2001, Ten-Have 2007). The first author conducted an initial data review before transcribing and analysing repair sequences featuring semantic trouble sources. During this process, the collection of occurrences and the analyses were reviewed and discussed in several data sessions with the co-authors. Transcriptions were also developed and regularly reviewed by the research team using Jefferson (1984) conventions (see the appendix).

Results

The interaction in dyad 1 was often dominated by the spouse, Sonja, but there were several instances of more balanced activity where both Sonja and Robert acted as listeners and speakers in the interaction. The speech of Sten, the PPD in dyad 2, was severely affected by dysarthria and in this dyad the spouse, Ingrid, dominated in the conversations. This may explain that the dyad, despite Sten's severe dysarthria, only had a

Extract 1

12		(1.4)
13	Robert:	(and then it was) (0.6) it was some priest who (2.5) read a chapter from
14		(1.2) eh the bible (1.6) and well (x) there were no (1.0) purposes or influ-
15 →		or something that should be influenced fluenced or so but it was like
16 →		what was part of their work (xxx) (0.8) help and encourage (1.4) be
17 →		considerate to (0.9) elderly persons and such who are living on those
18 →		pension schemes
19		(1.1)
20	Sonja:	((<i>subtle nod</i>)) mm
21	Robert:	but it was a moment of =
22	Sonja:	= an ho- an hour or what?
23	Robert:	yes
24	Sonja:	yes
25	Robert:	it is a moment of (different) (1.8)
26 →	Sonja:	no but you are participating in the singing of <u>hymns</u>
27	Robert:	yes

mean of 3 occurrences of Ingrid initiating other-repair in their recordings. Sten's participation in the interaction was typically restricted to feedback and short responses to questions from his spouse. In dyad 3 the amount of introduction of topics and length of contributions were consistently more balanced between the spouses, Carl and Mary, than in the other two dyads. This may also have resulted in more occurrences of other-repair initiated by Mary (mean of 4.7 occurrences/recording) compared with the other two dyads.

Transcripts demonstrating other-initiated repair in relation to word search and atypical wording as well as procedures for re-establishing mutual understanding are presented below. The transcripts presented here have been translated into English. The original Swedish transcripts are available from the first author. A key to the transcription symbols is presented in appendix 1.

Extracts 1 and 2 come from dyad 1 and show how word searches result in pauses, circumlocutions, use of non-specific vocabulary and atypical wording, making the message unclear. The couple is sitting in their living room, side-by-side in their television-chairs, oriented towards each other. Sonja has asked her husband Robert to tell her about a visit to a church he had made to-

gether with others at the day care centre. Sonja has asked whether there was any singing during the church visit and after the couple has established that there had been two girls singing and a man playing the organ, Robert, after a 1.4-s pause, continues to tell Sonja about the events at the church.

In lines 13–18 Robert is saying that a priest had read something from the bible. In lines 13–17 his contribution is characterized by non-specific vocabulary, for example, 'some priest'; 'something that should be influenced fluenced *or so*'; and 'elderly persons *and such*', which makes the information in his contribution imprecise. Robert also uses what may be described as atypical wording in this context, in lines 17–18 Robert seems to be referring to pensioners with the circumlocution 'elderly persons *and such who is living on those pension schemes*'. Robert also fails to provide clear reference to the possessive pronoun *their* in the phrase '*part of their work*' in line 16. It is not clear to what he is referring here, that is, what it was that was not supposed to have an influence on what.

As Sonja does not explicitly treat Robert's utterance in lines 13–18 as problematic at this stage and no repair is initiated, we may only speculate as to what

Extract 2

30 →	Robert:	and then what you feel about that (1.6) that you don't know (2.6)
31 →		but eh (2.9) yes it is (1.0) it is (x) it is good for such (it is) that
32		you shouldn't (1.1) understand or (x) be able to (0.8) ehm (1.1)
33		refer to certain (1.0) things in (2.1) (and) (2.1) but you eh (0.6)
34 →		may speak quite (0.9) freely on such things
35 →	Sonja:	I see so you had some discussions after or?
36	Robert:	no it is not much it is just a little
37	Sonja:	so there are questions put to you by the priest or?
38	Robert:	yes it is it is not so much but eh (there is) a lit- a little
39	Sonja:	I see
40	Robert:	to make the time pass
41	Sonja:	ok yes

Extract 3

01	Mary:	and the thinking
02	Carl:	(xx)
03	Mary:	yes
04 →	Carl:	[the thinking (1.7) and ha- hardiness]
05	Mary:	[((smiles))]
06		[(1.4)]
07 →	Mary:	[((stops smiling))] [the <u>hardiness</u>] [((puzzled expression on face))]
08	Carl:	(1.4) yes
09	Mary:	how do you mean now? (1.0) that
10	Carl:	(1.8) I don't want to are not doing (0.5) that often doing (0.8) one thing
11	Mary:	no
12	Carl:	but have several things going (0.4) so it becomes petty and (1.8)
13 →	Mary:	you jump from one activity to another
15	Carl:	yes

the intended meaning of Robert's utterance was. Sonja seems to be practicing the watch and wait strategy (Guendouzi and Müller 2006) and is maintaining her gaze at Robert while he is speaking. After a 1.1-s pause she produces a subtle nod in line 20, followed by a verbal response token ('*mm*'). Sonja restricts her response to minimal acknowledgement here and does not elaborate on the topic. Instead she interrupts Robert in line 22 and suggests a concrete time indication '*one hour*' for what she may have perceived as an attempt by Robert to report how long the event was. However, Robert's utterance in line 25 suggests that he was about to tell her more about how he experienced the event. Again he is not able to finish the sentence and after a 1.8 s-long pause Sonja in line 26 orients the topic back to her initial question about whether there had been any singing during the church visit. She does this by asserting that they had been singing hymns, with a stress on hymns. Sonja's utterance is initiated with a prefacing '*no but*', signalling that she is not aligning with Robert and his project describing his experience during the church visit. Instead she invalidates Robert's contribution and redirects the topic to safer grounds in terms of mutual understanding. Sonja is avoiding explicitly addressing the problem by restricting her responses to minimal acknowledgments and by attempting to redirect the course of action to the sequential context prior to the problems. These types of strategies have been described as actions used by conversation partners, as means of avoiding repair, in relation to aphasia (Barnes and Ferguson 2013) as well as in dementia (Guendouzi and Müller 2006). The Extract shows the occurrence of imprecise vocabulary and atypical wording that indicates semantic-related pragmatic problems. However, the spouse in this case is not cooperating in repair of the affected contribution but attempts to re-establish the mutual understanding on a more global level.

Although Robert agrees that they were singing hymns, he returns to the project of telling about his reflections on what had happened during the church

visit. In Extract 2 Robert's utterance is again characterized by pauses. The syntactically incoherent phrases indicate that he changes his speech plan and is searching for words.

During his first utterance Robert produces mainly circumlocutions and non-specific vocabulary, for example, words like '*such*' (line 31) and '*certain things*' (line 33) as well as the pronoun '*that*' with unclear reference (line 30). In line 34 Robert uses the preposition '*on*' (Swedish: '*på*') instead of '*about*' in an atypical way that would not typically occur in Swedish. This may be considered a paraphasia but it may also be a trace of a changed speech plan as it is preceded by several hesitations. In this case Sonja, in line 35, initiates repair by inviting Robert to confirm her understanding of his prior utterance. She does not attend to the atypical proposition and seems to sum up what Robert has expressed, stating it as a question about whether he means that they had some discussions afterwards. Robert in line 36 rejects her suggestion and Sonja in line 37 rephrases and provides another suggestion, that the priest had asked them questions. In line 38, Robert agrees that there had been some questions and in line 40 he states that it was enough to pass the time. Thus, following Robert's use of imprecise vocabulary and atypical wording Sonja and Robert, after some negations of suggestions from Sonja, finally come to what seems to be a common ground for what had happened during the church visit.

Extract 3 displays another example of atypical wording where the spouse is completing the repair by providing a suggestion for the intended meaning. Carl, the PPD in dyad 3, uses an unusual wording when describing his perception of the symptoms of his disease. The couple is sitting in front of each other in the living room. They are talking about the effects of the intermittent phases of dyskinesia, that is, the involuntary movements that are an effect of the PD medication. Mary, the spouse, has just mentioned that it affects the voice. She goes on to mention that it also affects cognitive aspects like 'the thinking'.

Extract 4

01	Ingrid:	is that alright?
02	Sten:	mm
03		(3.4)
04 →	Sten:	°I want (xxx) [yes°] raspberry jelly
05	Ingrid:	[what?]
06	Ingrid:	what did you say that?
07	Sten:	so there will be raspberry jelly
08	Ingrid:	raspberry jelly yes we have that
09 →		lingon berry jam we have
10	Sten:	but that is not the same
11	Ingrid:	ras- raspberry? (0.2) is that what you want?
12	Sten:	mm
13 →	Ingrid:	to the meatballs? (0.7) h.hehheh (0.8) raspberry jam and meatballs yes
14		what was it they always said at home one good thing does not
15		spoil the other
16	Sten:	no that's right

In line 4 Carl uses the word ‘*hardiness*’ (Swedish: ‘*tålighet*’). Although the Swedish word for ‘*hardiness*’ in some contexts may refer to patience or ability to stay focused, it is in those cases more often used in the negative form: as ‘*otålighet*’ (English: ‘*impatience*’) when referring to those traits of a character. In the positive form it nowadays usually refers to the hardiness of an object or of a person in a more metaphoric way, referring to a person who puts up with a lot (i.e. stoical). Mary, who has been smiling during Carl’s speech in line 4, stops smiling in line 7 during a 1.4-s gap and initiates repair by a partial repeat of his utterance highlighting the problematic word with stress on the first syllable. She has a puzzled expression on her face. When Carl in line 8 confirms she goes on to request clarification with an infinitive mark in line 9. The infinitive mark may function as a prompt to help Carl get started, but it may also signal that Mary requests a full phrase to understand what Carl means. In lines 10–12 Carl uses circumlocutions to describe how he feels and what this results in. His articulation is imprecise and sometimes incomprehensible and the utterance is full of pauses, indicating word search or other speech management processes. In line 13 Mary rephrases and presents her understanding of what Carl has expressed and her interpretation is verified by Carl in his next turn response. Thus, although the other initiation of repair in this Extract is made with a repetition of the semantic trouble source, the repair is again completed through a rephrasing and a confirmed suggestion for interpretation.

In Extract 4 the negotiation of the meaning of an atypical wording is handled in a more implicit way by the spouse. Ingrid and her husband Sten (dyad 2) are sitting by the kitchen table, facing each other. Sten has involuntary movements, dyskinesia, and is moving his head from side to side and touching the table and the objects on it. Ingrid has just told her husband that they

will have meatballs for dinner and asks Sten if that is alright with him.

Sten’s response to Ingrid’s question in line 2 is followed by a 3.4-s pause. In line 4 Sten produces an utterance that is characterized by imprecise articulation and soft, breathy voice. The first syllables in the utterance are almost incomprehensible and Ingrid initiates an open class repair in overlap with parts of Sten’s completion of the phrase. In line 6 she repeats her repair and Sten now, in line 7, modifies his request for raspberry jelly to a stronger assertion that there will be raspberry jelly. Although his production is much clearer this time, Ingrid seeks verification for her interpretation by repeating the word ‘raspberry jelly’ in line 8, but she then immediately goes on to say that yes, they do have it. However, she clarifies that what she means is they do have lingonberry jam and she puts a stress on the word jam. The problem with Sten’s request for raspberry jelly to the meatballs is that in Sweden meatballs are usually served with lingonberry jam, not raspberry jam, and certainly not raspberry jelly. Thus, Ingrid treats Sten’s utterance as a paraphasia and completes repair in the form of an embedded correction (Jefferson 1987), changing the word used by Sten to a word that is more coherent within this specific context. However, Sten in line 10, explicitly rejects the correction and declares that he does not consider raspberry jelly and lingonberry jam to be the same. Ingrid in line 11 again requests confirmation for her interpretation by repeating raspberry with a questioning intonation. She goes on to ask if he really wants that. Her displays of surprise and request for several verifications that the intended word really is raspberry (lines 8, 11 and 13), indicate that she finds Sten’s request problematic. It is tempting to infer that this is not what he usually has with his meatballs. In line 13 Ingrid is again treating Sten’s utterance as a paraphasia, again producing an embedded correction, but this time it is the ‘jelly’ part that she paraphrases as

Extract 5

01	Mary:	but I don't remember one year to another what they cost
02	Carl:	mm
03		(1.8)
04	Mary:	huh
05 →	Carl:	but then I think that in general (0.4) this thing with (1.5) m- b- getting
06 →		presents and (0.4) Santa Claus has come (0.5) a very sensible (0.9) period
07 →	Mary:	as we had this this year?
08	Carl:	yes
09	Mary:	yes I think so too

'jam'. We cannot be sure whether Sten actually means jelly, or if it was raspberry jam he meant, but he does not object to Ingrid's somewhat amused comment about the combination of meatballs and raspberry jam and again a common ground is established through a rephrasing by the spouse, which is accepted by the PPD, although this time the rephrasing was not presented as a suggestion. Ingrid's reference to what was said in her home when she grew up in lines 14–15, lends support to Sten's claim of having a different type of jam with his meatballs than what is common, and may function as a way to save face as well as to establish agreement and mutual understanding (Goffman 1955).

Extract 5 is an example of problems arising in relation to atypical wording, which is quickly resolved by a request for clarification including a suggestion for interpretation. Mary and Carl are again sitting in their living room and have been talking about the price of the Christmas tree this year. In a side sequence they have talked about the family owned business selling Christmas trees in their neighbourhood but in line 1 Mary has returned to the topic of the price of Christmas trees this season.

The topic of Christmas trees seems to be exhausted with the minimal response from Carl in line 2 and the closing comment ('*huh*') from Ingrid in line 4 after a 1.8-s long pause. In line 5 Carl elaborates on the Christmas theme, and marks that it is an elaboration of the topic with the initial phrase *but then I think that in general . . .*. Several gaps and false starts signal that he is having word finding problems in lines 5–6, and he describes the phenomenon he wants to say something about by mentioning the key activities involved: '*getting presents*' and '*Santa Claus has come*' as a circumlocution for the concept of Christmas. Carl's contribution seems to involve an assessment of Christmas and he describes that he experiences this as a '*very sensible period*' in line 6. Now, the word '*period*' is a less common word used to refer to this space of time, although it may be used in the context of Christmas as a sales period. Otherwise the word 'time' is more commonly used in relation to Christmas (that is: *Christmas time*). To make sense of the intended meaning of this utterance Mary has to infer that despite using the phrase '*in general*' Carl is not referring to Christmas in general. The statement is

ambiguous and it would have been surprising if that was what he meant as Christmas time in general is considered to be one of the most hectic holidays there is in Western Christian culture. Mary had mentioned that the grandchildren of the people selling Christmas trees had been helping with the sales, and this may have evoked the associations Carl seems to form with their own family and their Christmas holiday. In line 7, Mary checks her understanding that Carl is referring to the Christmas they have had within their family this particular year and when Carl verifies she agrees in line 9. Thus, Carl's use of the phrases '*in general*' and '*period*' here do not really fit with the context of the intended meaning of his utterance. Another factor that may contribute to the compromised mutual understanding is the fact that Carl's contribution involves a topic shift. This may have interacted with the atypical wording and resulted in the need for repair as mutual understanding is vulnerable in topic shifts (Bloch *et al.* 2014). However, Mary is able to infer what Carl meant and the mutual understanding is re-established within three turns.

Discussion

The findings of this study show that conversational interaction in later stages of PD may be influenced by semantic-related pragmatic problems as well as dysarthria. Other-initiated repair and negotiation of meaning in the instances studied here typically followed a contribution that involved hesitation sounds and pauses as well as circumlocutions with non-specific vocabulary or use of atypical wording. The use of atypical wording in these cases might be perceived as a type of semantic-paraphasia associated with cognitive decline in PD, or it may be related to cognitive change associated with aging. The frequency of the word-finding difficulties found in this study is quite large, with a mean of 2.6 occurrences in each 10-min recording, which is much more than what has been reported in normal aging (Huppert *et al.* 1994). This may indicate that the phenomenon should be related to the disease, but further experimental work will be required to substantiate this observation.

The spouses in all three dyads treated the problematic sequences in the same way as have been described

above in relation to aphasia (Ferguson 1993, Laakso and Klippi 1999, Lubinski *et al.* 1980, Oelshlaeger and Damico 2000), dementia (Guendouzi and Müller 2006) as well as in interactions involving people with no communication disorder (Schegloff *et al.* 1977). The repair work may be initiated in a more unspecific way, e.g. by an open-class repair, but typically included a completion in the form of a rephrasing or elaboration, usually presented as a suggestion for interpretation and an invitation for confirmation. Those suggestions for interpretation of meaning were typically confirmed by the PPD, although further negotiation was sometimes needed to re-establish mutual understanding and proceed with the conversation.

The results in this study also correspond to problems with sequentiality as described by Wilkinson (1999) in relation to aphasia. The way the PPD constructed their turns resulted in the recipients having trouble in inferring to what was referred and thus what the implications were for the following turn. Although Bloch and Wilkinson (2004, 2009, 2011) focus on trouble sources and repair related to speech affected by dysarthria when discussing the concept of understandability, it may also involve trouble sources caused by cognitive impairments as in aphasia or dementia. The non-specific vocabulary or atypical wording or paraphasia produced may be perfectly intelligible and comprehensible, but the conversation partners nevertheless had difficulties understanding the contributions in relation to the sequential context. One important difference between the earlier cases discussed by Bloch and Wilkinson and the data in this study is that the people with dysarthria in the former studies were able to perform self-repair to a higher extent than the PPD in this study, who seemed to be more dependent on the repair work performed by their conversation partners.

In two of the dyads (1 and 3) there were numerous occurrences of pauses, false starts and circumlocutions, as well as use of non-specific vocabulary, unspecified pronouns and atypical wording in relation to specific contexts. In dyad 2 the PPD had severe dysarthria. In this dyad the spouse dominated the conversation and her husband's speech was produced rapidly in short phrases usually involving brief responses to questions. Compared with the other two participants with PD there were less occurrences of explicit word search displayed in hesitations and pauses or obvious circumlocutions. However, in the analysis, the understandability of the speech was often perceived by the authors as compromised in the longer contributions due to imprecise articulation. Despite that the spouse initiated repair to a lesser extent than the two other spouses. As discussed by Guendouzi and Müller (2006) intelligibility is a complex matter in relation to conversation. Guendouzi and Müller especially highlight the methodological issues in

relation to analysis of conversations affected by dementia and define intelligibility as *a potential for mutual understanding* present in the conversation and its participants (p. 202). This potential is never the same for a transcriber or analyst and this must be acknowledged when making inferences of the state of mutual understanding or actions in the interaction. However, just as in severe aphasia, the resources available for self-repair by a PPD in later stages are limited and the conversation partner needs to take on the main responsibility to establish mutual understanding. This may be achieved through several different means. Other-repair in the form of rephrasing and provision of alternatives for the intended meaning of contributions that has compromised the mutual understanding is one way. Avoidance or abandoning of repair of a trouble source is another. The avoidance of repair was the behaviour that was most commonly seen in interaction in dyads including an individual with aphasia after stroke or an individual with a communication disorder related to PD (Carlsson *et al.* 2014). This means that fewer occurrences of other-initiated repair may not reflect the degree of mutual understanding. A conversation partner may choose to align, or to not initiate repair and instead contribute with a comment or shift the topic in a way that makes it possible for the interaction to proceed in order to avoid face-threatening repair work (Goffman 1955, Wilkinson *et al.* 2003). The choice to initiate repair or not may be related to the perception of the dyad's inherent resources to complete the repair in a successful way. The avoidance of repair or commenting on the problematic sequence may be a way of curtailing further problems with mutual understanding (Guendouzi and Müller 2006, Barnes and Ferguson 2013).

Implications of the results in this study are the importance of looking beyond intelligibility and also to cross-reference with aphasia research in the exploring of conversational interaction in PD (also Bloch and Beeke 2008). Although it is known that both dysarthria and word-retrieval difficulties may occur in relation to PD, this paper contributes by showing how pragmatic problems related to the use of words affect the conversational interaction in a way distinct from problems described as related to dysarthria (Griffiths *et al.* 2011, 2012). From the emergentist perspective (Perkins 2007), what may be described as pragmatic problems, for example, difficulties adapting to social rules about how to produce coherent narratives, introduce a new topic, or refer to a person may be viewed as consequences of a semantic impairment which may interact with restrained speech production caused by the dysarthria. However, this study also shows that the repair work performed by the participants in cooperation is crucial for the pragmatic quality of the conversational interaction.

There are important limitations of the study which make it difficult to generalize to the population of

people with PD as a whole. The study only includes three elderly men with PD. The amount of data are limited, and we do not know whether similar issues may be seen in conversational interactions including women with PD. The analysis performed does not control for possible impact on the conversational interaction from other variables than pragmatic ability. Further, we cannot be sure whether the pragmatic issues displayed may be related to processes of normal aging rather than PD. Although there were no obvious relationships between age and occurrences of pragmatic trouble sources related to the use of words in this study, this needs to be further explored. Nevertheless, this is a first attempt to examine semantic-related pragmatic difficulties in natural interaction in relation to PD, and as such the method of analysis used is important in identifying participant centred practices.

Clinical implications

The findings in this paper have implications for the clinical management of at least elderly people with PD. When trouble sources affecting the understandability in a conversation are related to dysarthria they may be handled differently than if they are related to semantic or other cognitive aspects of pragmatic ability in interaction. Although strategies used for repair may be common irrespective of whether an individual has no disability, or is diagnosed with aphasia or dysarthria the same specific strategy may not work in all cases. A voice amplifier or a voice output communication aid may be a resource when problems are mainly related to breathy voice or imprecise articulation, but it does not solve problems that are related to semantics or other cognitive impairments. The clinician needs to analyse natural conversational interaction thoroughly to get a clear picture of what causes the need for repair work and what resources are available to complete, or prevent, repair. People affected, including significant others and professional care providers, need to be informed about the effects of the combination of dysarthria and word-retrieval difficulties on the conversational interaction.

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Appendix: Transcription key

- [] large brackets link an ongoing utterance with an overlapping
- [] utterance or non-verbal action
- = marks where there is no interval between adjacent utterances
- ? rising inflection, not necessarily a question
- but- single dash indicates a halting, abrupt cut off to a word or part of a word
- stress emphasis
- h.heh discernible aspiration or laughter
- ((nods)) text in double parenthesis represents a gloss or description of some non-verbal aspect of the talk
- °no° degree signs indicate a passage of talk which is *quieter* than surrounding talk
- (0.6) pauses or gaps in tenths of a second within parenthesis.
- (xx) single parenthesis containing either a word, phrase or syllable count in the form of x:es (if utterance is very unclear) mark where target items are in doubt