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Citation: Marshall, J. (2017). Therapy for people with jargon aphasia. In: Coppens, P. & Patterson, J.C. (Eds.), *Aphasia Rehabilitation: Clinical Challenges*. . USA: Jones and Bartlett Learning. ISBN 9781284042719

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Chapter 3

Therapy for People with Jargon Aphasia

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To appear in: Aphasia Rehabilitation: Clinical Challenges. P. Coppens & J. Patterson (eds), Burlington MA: Jones and Bartlett Learning,

Introduction (H1)

Jargon aphasia describes an acquired language impairment in which speech is fluent and easily articulated, but largely unintelligible. It is associated with Wernicke's and transcortical sensory aphasia and usually follows left hemisphere posterior brain lesions, for example in the region of the supramarginal gyrus, the inferior parietal lobe and the posterior portion of the first temporal gyrus (Kertesz, 1981). The motor cortex is often spared, leaving the person without physical impairments.

Manifestations of jargon aphasia vary. A defining characteristic is the production of jargon, or largely meaningless speech, which can take different forms (see definitions and examples in Table 3.1). Semantic jargon is composed mainly from real words, albeit in very anomalous combinations. Neologistic jargon contains frequent neologisms, or non word errors, which are typically embedded in empty, but syntactically structured phrases. Phonemic, or undifferentiated jargon is composed almost entirely from non words. These different manifestations, in part, reflect the severity of the condition, with semantic jargon being the least and phonemic jargon the most impaired. Evidence for this view comes from longitudinal studies showing that non word errors typically reduce as speech recovery occurs (Simmons & Buckingham 1992; Eaton, Marshall & Pring, 2011).

Table 3.1: Definition of terms and Examples

Term	Definition	Example
Semantic jargon	Fluent but unintelligible speech that is constructed mainly from real words, but with frequent semantic errors and verbal paraphasias (real word errors that are unrelated to the target)	"foot, nose, feets, shoe feets, shoe, the shoe itself, but the knife seems more strenuous than anything else" (RG naming a picture of a foot; from Marshall, Chiat, Robson, & Pring, 1996)
Neologistic jargon	Fluent but unintelligible speech that contains frequent non word errors	"and looks like the luggyburgers. It says oh we're gonna to pick a ligyburger that we want to get our liggiburgers. And so they,

		the ... the king say or the so the men the uh the pigyburger say ah well here's the bigyburger and bloblah and all the rest of it" (FF retelling the Cinderella narrative; from Bose & Buchanan, 2007)
Phonemic/ Undifferentiated jargon	Fluent but unintelligible speech, containing very few recognisable real words	'he /spɪt æl 'dʒɒlɪtə/ erm his erm /'vɛdɪʃən 'hɑɪf wɪz ʃɜm/ it er /raɪtʃ/ with /'aɪdrɒtɪn 'tɛɪ tɛɪ'rɑdədʒɪn/' (LT responding to a question about his son in America; from Robson, Pring, Marshall & Chiat, 2003)

Errors in jargon aphasia are profuse and diverse, even within the same speaker. They may bear a semantic or phonological relationship to the target or be entirely unrelated. Neologisms or non word errors are present in almost all speakers. These are varyingly defined. Some researchers classify all non word errors as neologisms (e.g., Bose & Buchanan, 2007), while others reserve the term for abstruse errors containing less than 50% of the target phonology (e.g., Kohn, Smith, & Alexander, 1996; Moses, Nickels, & Sheard, 2004).

Another common symptom in jargon aphasia is perseveration. This may involve the repetition of whole words, or word fragments (Bose & Buchanan, 2007; Eaton, Marshall & Pring, 2010; Moses et al., 2004; Pitts, Bhatnagar, Buckingham, Hacein-Bey, & Bhatnagar, 2010). FF's sample in Table 3.1 above is illustrative, with neologisms constructed around a repeated and minimally changing phonological form. There is some evidence that perseveration is a marker of severity in jargon aphasia. For example, it is associated with poor recovery over time (Kohn et al., 1996) and with the overall number of speech errors produced by individuals (Goldman, Schwartz, & Wilshire, 2001).

Logorrhea is a further possible symptom (Caspari, 2005). Also referred to as a 'press of speech', this involves the use of incessant talking that is difficult to inhibit. The rate of speech may also seem abnormally fast, although this may be an impression arising from the lack of intelligibility.

In the face of so many speech impairments it is worth reflecting on what is intact in jargon aphasia. A speaker of jargon can usually signal whether s/he is asking a question or making a statement. It will also be clear whether the speaker is pleased, puzzled, sad, or annoyed. We might even know if s/he is telling us a joke or recounting something serious. These elements can be conveyed largely because the paralinguistic properties of speech, such as intonation and stress, are typically intact. Indeed, one jargon speaker known to me was able to mimic the accents of her care staff (in jargon) for the guilty amusement of her visitors.

Most people with jargon aphasia also obey the phonological constraints and phonotactic rules of their language, even if they produce virtually no real words. So, they only use their native speech sounds and combine these into legal syllables (Hanlon & Edmondson, 1996; Robson et al., 2003). Many speakers also display elements of preserved syntax (although see Butterworth & Howard 1987 for evidence of syntactic impairments). Perhaps most striking is the finding that even abstruse neologisms may be correctly inflected, again pointing to a degree of syntactic preservation (Macoir & Beland, 2004; Miller & Ellis, 1987).

This brief introduction shows that speech in jargon aphasia is highly varied, particularly in terms of the errors that are produced. The common features are fluency and a lack of intelligibility, coupled with a retained melodic line, and aspects of phonology and syntax. Thus, in severe cases, speech can be almost entirely unintelligible but sound deceptively 'normal', particularly if heard from a distance.

The disorder of speech may be accompanied by a number of additional impairments. Many (but not all) speakers of jargon show signs of anosognosia. This is a lack of awareness of neurological deficit, in this case related to speech (Butterworth, 1979; Cappa, Miozzo, & Frugoni, 1994; Cohen, Verstichel, & Dehaene, 1997; Hanlon & Edmondson, 1996; Hillis, Boatman, Hart, & Gordon, 1999; Marshall et al., 1996; Marshall, Robson, Pring, & Chiat, 1998; Panzeri, Semenza, & Butterworth, 1987; Robson, Pring, Marshall, Morrison & Chiat, 1998;

Robson et al., 2003; Sampson & Faroqi-Shah, 2011; Simmons & Buckingham, 1992; Weinstein, 1981). For example, they do not attempt to correct their speech or show dissatisfaction with it. They may become annoyed or mystified when others fail to understand. These speakers may be equally unaware when they have said something correctly. So, when tested, they may persist with a response even when they have already produced the correct word (see the example from RG in Table 3.1). It seems, therefore, that the mechanisms that monitor speech have broken down in at least some individuals with jargon aphasia.

Many speakers also have impaired auditory comprehension (e.g., Robson, Keidel, Lambon Ralph, & Sage, 2012). Indeed, this problem can be profound, and may manifest as word deafness (Maneta, Marshall, & Lindsay, 2001). Writing problems are also common, and can include jargonagraphia with fluent but meaningless writing (Cappa, Cavalloti & Vignolo, 1987; Schonauer & Denes, 1994).

Wernicke's Aphasia, the syndrome most associated with jargon, may recover over time (Laska, Hellbolm, Murray, Kahan, & von Arbin, 2001). However, there is evidence that the prognosis is worse than for other types of aphasia (Bakheit, Shaw, Carrington, & Griffiths, 2007; Nicholas, Helm-Estabrooks, Ward-Lonergan, & Morgan, 1993). In line with this, it is often argued that jargon is particularly difficult to treat (e.g., Marshall, 2006). A number of factors contribute to this view. First of all, as we have seen, jargon aphasia is not simply an absence of speech. Rather there is a profusion of overt symptoms, such as semantic errors, neologisms, and perseverations. Many speech production tasks will elicit these errors, and so run the risk of reinforcing the very symptoms that we would hope to suppress. The frequent co-existence of impaired auditory comprehension is a further challenge. This generates an additional goal for intervention, and may affect treatment compliance because therapy tasks cannot be understood. Above all, the seeming lack of awareness can inhibit attempts to remediate speech and even lead to the rejection of therapy.

This chapter will review some of the treatment approaches that have been attempted with people who jargon. These have been directed at several levels of the International Classification of Functioning Disability and Health model (WHO ICF, 2001). Communication activities have been addressed by attempting to remediate the language impairment and by promoting the use of compensations. Participation has also been addressed, either by promoting the transfer of therapy skills to everyday contexts, or through environmental modifications.

The chapter will first consider attempts to remediate the comprehension and monitoring impairments that typically occur in jargon aphasia. It will then turn to production and describe both direct and compensatory attempts to address the impairment. Finally it will consider the importance of working with those who are in the environment of the jargon speaker.

Treatments of Auditory Comprehension (H1)

When auditory comprehension is impaired this may be an initial focus of therapy because of the likely effects on everyday communication. Disordered comprehension may also impair understanding of the rehabilitation processes, again making it a priority for intervention.

Accounts of comprehension therapy in the literature are often underpinned by cognitive neuropsychological models of word processing (Morris & Franklin, 2013; Whitworth, Webster & Howard, 2014). The impairment is initially diagnosed by identifying the level of breakdown in the auditory processing system; and this diagnosis motivates the content of therapy. For example, tasks may attempt to remediate the impaired level of processing, or engage intact skills to compensate for the problem.

This approach was taken in three single case accounts of comprehension therapy with jargon speakers. LR (Grayson, Hilton & Franklin, 1997) had unintelligible speech which combined 'English jargon' (p 259), that is semantic jargon, and neologisms. Understanding of speech was also severely impaired. For example, LR was unable to respond accurately to simple yes/no questions. Assessment revealed difficulties with all auditory input tasks, but judgements of meaning were particularly impaired, regardless of modality. For example, LR could not match spoken or written words to pictures, and was impaired on the all-picture version of the Pyramids and Palm Trees Test (Howard & Patterson, 1992), where pictures have to be associated on the basis of their meaning. The authors therefore concluded that a central semantic deficit was core to LR's problems.

LR was given 3 programmes of comprehension therapy delivered over a period of 24 weeks (with breaks for assessment). The regime involved daily sessions, at least initially. The first programme entailed semantic therapy, and included spoken word to picture matching, picture categorisation and written word association tasks. In the second programme these tasks were augmented by auditory therapy, in which LR had to match words to pictures with rhyming foils. In the final programme the stimuli were extended to include sentences. Although the study did not employ an experimental design, each programme of therapy was evaluated with relevant assessment tasks. Crucially, gains on these were consistent with the content of therapy. So, after the first programme semantic tasks like word to picture matching improved, whereas minimal pair tasks did not. The latter, however, did improve after the second programme which involved the discrimination of very similar sounding words.

PK, the individual in the second single case study, also produced neologistic jargon, and had very impaired understanding of speech (Maneta et al., 2001). In his case the comprehension deficit seemed due to word sound deafness, or an inability to discriminate

between speech sounds. In line with this, he was poor on all auditory input tasks including minimal pair judgements; whereas written input tasks were largely intact. The first programme of therapy with PK worked directly on his auditory discrimination. He was given a series of tasks in which he had to match spoken stimuli to written words and pictures, with very similar sounding distractors. For example the word 'man' had to be matched to one of three written words: 'man', 'tan', and 'can'. He was supported in these tasks with lip reading information. For example, he was encouraged to watch the therapist's face and was given diagrams illustrating lip to sound correspondences. The therapist also used cued articulation (Passy 1990), which is a series of hand signals indicating phonemic features, such as the presence or absence of voicing. After 12 sessions of this therapy, delivered twice a week, PK was reassessed on a number of auditory tasks. Sadly, there were no significant gains.

The lack of progress encouraged the authors to change tack. Rather than attempting to remediate PK's impairment, they decided to employ an indirect, compensatory approach. The second programme, again comprising 12 sessions, trained PK's wife to use a number of strategies to assist his understanding. In particular, she was encouraged to use single word writing alongside speech, to simplify messages, and to check that PK had understood after each exchange. This programme of therapy was evaluated through an interactive task, in which PK was asked a number of yes/no biographical questions by his wife. Before therapy he scored virtually at chance, and the task resulted in frequent and extended breakdowns in communication. After therapy he scored 28/30, and there were only four communication breakdowns, which were quickly resolved.

KW, the individual treated in the final case study (Francis, Riddoch, & Humphreys, 2001) had very impaired auditory comprehension alongside phonemic jargon speech. A series of investigations indicated that his difficulties were due to word meaning deafness. Individuals with this impairment can discriminate speech sounds and recognise spoken words. They

cannot, however, derive any meaning from the language they hear. Accordingly, KW succeeded on minimal pair and lexical decision tasks, but failed on tasks that required comprehension, such as synonym judgement and word to picture matching. His problems were specific to speech; thus he had no difficulties when the equivalent tasks used written words.

KW was given two programmes of therapy, each lasting three weeks and each targeting 26 different words. The treatment was largely self-administered via work sheets that KW practised intensively at home. The first programme was called 'Implicit Access Therapy' and involved two written tasks. In one task KW had to read definitions of the target words and attempt to fix the meaning in his mind. For example the definition for 'Annual' was: 'Annual refers to something that occurs every year'. After reading the definition, he had to write the target word down several times while thinking about its meaning. In the other task he was given triads of written words, and had to identify the two that were most related in meaning (e.g., 'annual', 'yearly', and 'monthly'). The second therapy programme was called 'Explicit Access Therapy'. This involved very similar tasks. However, now the stimuli were also recorded on a tape and KW had to listen to the tape while completing the tasks. He was also required to repeat the target words after the definition task, rather than writing them down. The authors argued that auditory processing might be engaged implicitly in the first therapy programme during silent reading; whereas this was an explicit feature of the second programme. Both treatments exploited KW's strengths in reading comprehension.

Therapy outcomes were assessed by asking KW to define spoken words. Both programmes of therapy improved KW's performance on this task, but only with the treated words. The immediate gain was similar after each therapy. However, follow up assessment showed that the benefits of Explicit Access Therapy were more durable.

It is clear that the therapy practised with KW improved his understanding of speech. The authors discuss two ways that this may have been achieved. One mechanism was compensatory, which involved KW visualising the spelling of words so that he could effectively read and understand them. The other mechanism entailed direct remediation of his impairment, or the re-connection of spoken words with their semantic representations. Interestingly, both mechanisms seemed specific to treated words.

The studies reviewed in this section all describe attempts to tackle comprehension failure in jargon aphasia. Change was achieved either by remediating the impairment or by using compensations. For example, Francis et al. (2001) encouraged their participant to make compensatory use of his spelling and reading skills in order to 'bootstrap' his understanding of speech. In Maneta et al. (2001) compensation was achieved by changing the behaviours of the client's main communication partner.

Studies of comprehension therapy for people with aphasia are few in number (see review in Morris & Franklin, 2013) and are often limited to single case or small group designs. Clinicians, therefore, are not provided with a strong evidence base to inform their clinical decisions. Findings from the existing studies are also equivocal, in that not all participants responded positively (e.g., Woolf, Panton, Rosen, Best, & Marshall, 2014) or achieved generalised gains (Francis et al., 2001). If comprehension skills are difficult to restore, working through those who interact with the person with aphasia will be an important aspect of intervention, as was the case in Maneta et al. (2001). We need to make communication partners aware of the comprehension difficulties that typically accompany jargon, and give them strategies for coping with them. Such indirect work is further discussed in the final section of this chapter.

Treatments for Monitoring of Speech (H1)

The seeming lack of awareness (anosognosia) that often accompanies jargon speech is one of the most striking and puzzling features of the condition. It also poses a clinical challenge. If the person believes their speech is intact, they will not see the need for therapy, or for alternative channels of communication. Clinicians may also worry that confronting a client with their difficulties will cause psychological distress or even a catastrophic reaction (Chriki, Bullain & Stern, 2006).

Comment [J&J1]: I have added anosognosia here in parenthesis to indicate that this is synonymous with 'lack of awareness'. I hope this deals with the concerns about terminology

Identifying the nature and origin of the awareness deficit in jargon aphasia is challenging. Anosognosia is known to be complex and multidimensional (Prigatano, 2010). For example it may encompass an inability to detect neurological symptoms, a misattribution of their cause, or an underestimation of their functional consequences. There may also be a discrepancy between explicit and implicit signs of awareness; for example, a patient may assert that he or she can walk, but still refuse to leave their wheelchair.

Anosognosia is typically probed by self reporting measures that are highly dependent on language, such as structured interviews and questionnaires (Jehkonen, Laihosalo, & Kettunen, 2006). Of course such measures are difficult to use with people who have aphasia, and particularly jargon aphasia. For this reason, anosognosic impairments may be under detected in this group (Cocchini, Beschin, Cameron, Fotopoulou, & Della Sala, 2009; Orfei, Caltagirone, & Spalletta, 2009).

Determining the cause of anosognosia in jargon aphasia is a further challenge. An early view attributed the problem to the psychological denial of deficits, stemming from a need to maintain emotional equilibrium and preserve a sense of self (Weinstein, 1981; Weinstein & Lyerly, 1976). While this may be true for some individuals, it cannot explain all cases, or account for the diverse manifestations of the condition. It is also challenged by evidence that awareness and mood may not correlate (Cocchini, Crosta, Allen, Zaro, & Beschin, 2013). An alternative proposal argues that impairments in cognitive skills, such as

attention, memory, and executive function, prevent the person from absorbing new information about their current state. However, this struggles to explain modality specific anosognosias, for example where hemiplegia is recognised but aphasia is not (Cocchini et al., 2013). Dissociations within language are even more challenging, for instance where there is differential awareness of speech and writing errors (Marshall et al., 1998).

The final proposal argues that anosognosia can arise from monitoring failures for specific cognitive functions. Thus, in the context of jargon aphasia, there seems to be a breakdown in the system that monitors speech. This in turn, suggests that treatment needs to address monitoring skills.

Treating the monitoring failure in jargon aphasia requires an understanding of how monitoring of speech is normally accomplished. Here there are differing views (Postma, 2000). According to one account, monitoring involves feedback through the auditory comprehension system, in effect enabling a person to listen to their own speech (Hartsuiker & Kolk, 2001; Levelt, 1989; Oomen & Postma, 2002; Oomen, Postma, & Kolk, 2001). Feedback can be pre and post-articulatory. The pre-articulatory feedback route monitors speech before it is produced, so preventing speech errors from occurring. The post-articulatory route monitors speech after it is produced. This route cannot inhibit errors; but it generates awareness of them, and initiates post production repairs.

Failure of the feedback monitor is a likely explanation for some jargon speakers, particularly when there are co-existent deficits in auditory comprehension (e.g., Ellis, Miller, & Sin, 1983; Maneta et al., 2001). However, the view is also challenged by evidence of dissociations between comprehension and monitoring (e.g., Maher, Gonzalez-Rothi, & Heilman, 1994). Take RMM as an example (Marshall et al., 1998). She was a speaker of fluent neologistic jargon with no apparent awareness of her speech deficit. She made no overt attempts to self repair, and her speech lacked the hesitations that might signal covert error

detection. Yet her auditory comprehension was surprisingly intact. For example, she scored over 90% correct on tests of minimal pair judgement, auditory lexical decision, and spoken word to picture matching. Thus she could analyse speech sounds, judge the lexical status of words and comprehend speech; yet failed to recruit these skills in order to monitor her own output. A more recent investigation of five jargon speakers similarly found that comprehension scores were not predictive of monitoring behaviours (Sampson & Faroqi-Shah, 2011).

It seems that for some jargon speakers a viable auditory system is unavailable for error detection. This could be due to a disconnection in the feedback pathways or could reflect a limitation in processing resources. Employing the feedback monitor requires a speaker to carry out two tasks at once, namely produce speech and scrutinise that speech for errors. Some individuals may lack the capacity for such dual processing.

A number of studies have explored these proposals by asking participants to carry out tasks in which they had to judge the integrity of their own production, while varying the conditions in which the judgements were made (Maher et al., 1994; Marshall et al., 1998; Sampson & Faroqi-Shah, 2011; Shuren, Smith-Hammond, Maher, Rothi, & Heilman, 1995). So, in one task, the person might be asked to name a picture and then immediately judge whether their attempt was correct or not. This condition might be compared to judgements of their tape recorded responses, judgements made in the context of masking noise, or judgements of responses on different production tasks. A number of findings emerged from these studies. Firstly, some individuals were impaired when making immediate judgements of their speech, but less so when they listened to themselves on tape (Maher et al., 1994; Shuren et al., 1995). It seemed that these individuals lacked the processing resources to carry out a dual task. In other words, monitoring could only be accomplished when it was disconnected from speaking. Sampson and Faroqi-Shah (2011) showed that all but one of their participants

were less able to monitor when subjected to masking noise. This showed that these individuals *were* making use of post-articulatory feedback, as when they could no longer hear their own speech, their judgements were impaired. However, this monitoring mechanism was far from perfect, given that many errors were undetected even in normal listening conditions. Finally, there is evidence that, at least for some individuals, monitoring depends on the nature of the production task (Marshall et al., 1998; Sampson & Faroqi-Shah, 2011). So, more errors were detected in a repetition task than in picture naming.

Taken together, these studies suggest that for many jargon speakers feedback monitoring is imperfect, and varyingly applied. Its concurrent use with speaking, in particular, cannot be assumed. The finding that error detection depends on the nature of the production task is consistent with the existence of a secondary monitor, which is intrinsic to the output rather than the input system (Postma, 2000). This monitor might employ editors that are attached to each level of the production system or may arise from feedback connections that 'detect' mismatches between the target and a pending error (see arguments in Marshall et al., 1998). It is assumed that this monitor can only operate when the production system is functioning, at least to some degree. In line with this proposal, there is evidence that rates of error detection correlate with production success (Eaton, Marshall, & Pring, 2011; Sampson & Faroqi-Shah, 2011).

What are the implications for therapy? It seems that treatment might aim to improve the functioning of two monitoring mechanisms; one of these employs feedback through the auditory comprehension system, while the other is intrinsic to production. An obvious target for the former is to work on auditory input, particularly when there is a co-existent deficit in speech comprehension. So therapy might target phoneme discrimination, word recognition or access to semantics, depending on the level of impairment. If successful, this should bring about gains in auditory comprehension coupled with improved self-monitoring. However,

there are a number of caveats. As we have seen, although there are reports of successful comprehension therapy with jargon speakers (Francis et al., 2001; Grayson et al., 1997), there are also negative accounts (Maneta et al., 2001). It may be, therefore, that achieving change in comprehension skills is challenging. The findings from self-judgement experiments also show that even if auditory input skills recover, these may not be employed successfully for monitoring. In such instances, tasks that promote 'dual attention' might be attempted. For example, the person may be asked to judge the quality of their own speech under increasingly demanding conditions. So they might first hear the therapist repeat back their responses, but later make unaided and immediate judgements. To my knowledge, such a treatment has not been reported.

One study reports a direct attempt to remediate the production monitor (Marshall et al., 1998). CM produced fluent neologistic jargon. Although he did not deny his aphasia, he seemed unable to judge the quality of his speech. For example he did not try to self-correct and he relied on feedback from his conversation partner to determine whether or not he was making sense. On all spoken input tasks, such as minimal pair judgements, lexical decision, and word to picture matching, CM scored well above chance. Yet he was clearly failing to use these input skills for the purposes of self-monitoring. CM's monitoring skills were investigated through a series of judgement tasks. For example, he had to name a picture and then indicate whether or not his attempt was correct. These showed that he was largely oblivious to his errors in naming, but much more aware of his errors in repetition. The authors concluded that CM's capacity to monitor depended on the nature of the production task. When this required him to access phonology from semantics, as is the case in naming, monitoring broke down. When he could by-pass semantics, as is the case in repetition, monitoring was achieved.

This hypothesis was the springboard for therapy. CM was given 6 hours of treatment aiming to improve his production of 40 words. The tasks required him to carry out semantic judgements with the target words; for example, he had to select written words that were related to the target in the presence of distractors. Thus treatment aimed to facilitate the impaired connection between semantics and phonology; if successful, naming should increase coupled with improved monitoring of naming errors.

Treatment was evaluated by asking CM to name the 40 treated words and 40 control items that had not featured in therapy (items were presented in one block in random order). After each naming attempt CM was asked to signal whether or not he had produced the word correctly. Thus the task yielded a naming and a monitoring score. Results for the former were disappointing. CM produced marginally fewer correct words after therapy than before, with no specific benefit for treated words. Monitoring, however, did improve. CM's judgements of his naming attempts after therapy were significantly better than before, including his detection of neologisms. However, this gain was almost entirely confined to treated words. Neologisms produced for untreated words still passed below his radar. Interpreting this result, the authors concluded that therapy improved semantic processing for treated items only. The gain was insufficient to benefit production, possibly because therapy had required very little spoken output. Treatment did however, enable the production monitor to kick in, making CM aware of his errors.

The results achieved with CM were theoretically interesting, but clinically disappointing. Treatment had not improved CM's speech, but had made him more aware of its failings. Indeed, such an outcome might even have adverse psychological consequences (although, fortunately, this did not seem to be the case for CM). More positively, improved awareness might stimulate correction attempts, or encourage the person to convey their message by alternative means.

Unfortunately, there are few studies of self monitoring in jargon aphasia, particularly with respect to therapy. It is not clear, therefore, whether the feedback or production monitors can be rehabilitated and therapists are left with little guidance about how to address the communicative consequences of monitoring failure. In the absence of an evidence base, therapists are likely to make individual decisions, probably following careful consultation with family members and friends. A number of clinical papers allude to 'stop' strategies (e.g., making a 'sh' gesture), whereby the therapist attempts to inhibit unmonitored and unintelligible speech (Marshall, 2008; Martin, 1981; Strauss Hough, 1993). It is argued that these strategies can help individuals who have logorrhea or press of speech and do not pause to listen. However, some individuals may respond negatively to such inhibitory techniques, or fail to see the rationale for them. As an alternative, individuals with relatively intact comprehension might respond to explicit discussion about the failings in their speech, possibly reinforced by video playback, so that they can observe themselves talking. Others might benefit from consistent feedback during communication exchanges, such as that provided by family members and all rehabilitation staff. For example, this feedback might indicate when speech is not comprehensible and offer suggestions about alternative strategies that might be attempted. Finally, Marshall (2008) stresses that if the person does attempt to correct his or her speech, this should be explicitly reinforced.

Whatever the technique, therapy aiming to improve awareness of jargon should additionally give the person resources for dealing with the problem. In other words, parallel treatments of production should be attempted.

Treatments of Production (H1)

Output therapies in jargon aphasia can attempt to remediate the speech production impairment or compensate for it. Remediation therapies aim to boost the functioning of the

speech production system. Compensations include the use of alternative language modalities, such as writing, or non verbal techniques, such as gesture and drawing.

Treatment aimed at remediation (H2)

There is good evidence that the errors in jargon aphasia reflect an underlying impairment in word retrieval (e.g., Bose & Buchanan, 2007; Olson, Romani, & Halloran, 2007; Robson et al., 2003). For example, many studies have demonstrated that neologisms occupy content word positions in connected speech, encouraging the view that they are substituting for words that cannot be accessed (e.g., Buckingham, 1990; Stenneken, Hoffmann, & Jacobs, 2008). Butterworth (1979, 1985) additionally showed that they follow pauses, suggesting that an unsuccessful word search has taken place. Longitudinal studies provide further evidence, showing that when the florid symptoms of jargon subside the residual anomia is typically revealed (e.g., Eaton et al., 2011; Panzeri et al.; 1987 Simmons & Buckingham, 1992). Finally, simulation studies have shown that jargon errors can be elicited by lesioning an interactive lexical network (Dell, Schwartz, Martin, Saffran, & Gagnon, 1997).

If a failure in word production underpins jargon, therapy could address that failure. Successful outcomes should be marked by improved word retrieval, coupled with a reduction in the symptoms of jargon. This is a promising avenue, given that a number of word finding therapies have been developed for people with aphasia, several of which have a good evidence base (e.g., see Carragher, Conroy, Sage, & Wilkinson, 2012; Nickels, 2002). However, evaluations of these treatments with jargon speakers are rare.

Boyle (2004) conducted Semantic Feature Analysis with two participants who had fluent aphasia. One had a diagnosis of Wernicke's aphasia and produced neologisms in naming tasks. This participant worked on 80 words over two phases of therapy. Treatment required him to attempt naming of each word and then access a range of semantic features associated

with it, such as its category, use, physical properties, and location. Naming of treated nouns improved as a result of this therapy, with some generalisation to untreated probes. There was also improved word retrieval in discourse. The author hypothesised that the treated individual had an impaired semantic system, and that therapy improved his ability to access the semantic features of words, with subsequent benefits for naming.

A different semantic therapy was tested with another individual who had Wernicke's aphasia (Davis, Harrington, & Baynes, 2006). Treatment was highly intensive and involved semantic decision tasks, mainly delivered on a computer. For example, the participant had to answer questions (such as 'which one grows on a tree?') by selecting a target pictures from a choice of four. None of the tasks involved any production. Despite this, naming both of treated and untreated words improved, and there were gains on noun production in narrative speech. Pre and post therapy functional imaging showed that the behavioural gains were accompanied by increased left hemisphere brain activation, particularly in the peri-lesional and inferior frontal gyrus areas.

These studies suggest that individuals with fluent, Wernicke's aphasia may benefit from semantic naming treatments. However, the degree to which jargon was a feature of their presentation is unclear. This was not the case for two investigations of phonological treatment. GF (Robson, Marshall, Pring, & Chiat, 1999) produced unintelligible neologistic jargon, with picture naming scores that were virtually at floor. Despite her severe production impairment, GF's auditory input skills were surprisingly intact. For example she could distinguish minimal pairs and scored 97% correct on spoken word to picture matching. She also demonstrated awareness of her jargon, with frequent comments about her production failures. Further testing confirmed that GF retained semantic knowledge about words, but could not access their phonologies. Therapy therefore adopted a phonological approach. It required GF to make phonological judgements about target words, focussing on their syllabic

structure and first phoneme. Stimuli were initially spoken by the therapist, but then only represented with pictures. Once GF had identified the number of syllables and the first phoneme of a word she was asked to produce it. The programme was delivered over 6 months, and comprised 40 sessions each lasting 20 minutes. Fifty words were included in therapy, and GF made significant gains in naming these words as a result of therapy. Encouragingly, untreated words also improved, suggesting that she had recovered general, rather than item specific access to the phonological lexicon.

The second phonological treatment study adopted a similar approach (Bose, 2013). FF had neologistic jargon aphasia (see example in Table 3.1) and achieved approximately 40% accuracy in tests of picture naming. Like GF, he seemed to have impaired access to the phonological representations of words. Therapy involved Phonological Component Analysis (Leonard, Rochon, & Laird, 2008). First FF was asked to produce each word in response to a picture. Regardless of his success, he was then required to identify five phonological features related to that target: a rhyming word, the first sound, a first sound associate (i.e., another word with the same first sound), the final sound, and the number of syllables. The word was then re-presented for naming. Therapy improved FF's naming of 30 treated words. Generalisation to a large set of untreated items was not observed in terms of naming accuracy. However, his errors became more target related and less likely to be non words.

The above studies show that word retrieval in jargon aphasia may respond to phonological treatment. However, the approach has only been tested with two individuals, and aspects of their presentation might be regarded as atypical. For example they retained the auditory input and self monitoring skills required by the therapy tasks. Further evaluations of anomia therapy in jargon aphasia are needed, including explorations of factors that make individuals good (or poor) candidates for therapy. More diverse techniques also need to be tested. One could be errorless learning. This approach does not outperform other treatments

of aphasic naming (Filingham, Sage, & Lambon Ralph, 2006); however, it may particularly benefit speakers of jargon, as it would minimise the production of jargon errors during treatment tasks.

The semantic and phonological treatments described above involved single word tasks. Some discourse therapies have also been attempted with people who have Wernicke's aphasia. Attentive Reading and Constrained Summarisation (ARCS) therapy involves reading passages aloud sentence by sentence, and attempting to summarise the content (Rogalski & Edmonds, 2008). Participants are constrained in that they are not permitted to use pronouns or non specific language (such as 'thing' or 'stuff'). Thus the retrieval of meaningful content words is emphasised. ARCS was attempted with two individuals who had chronic Wernicke's aphasia (Rogalski, Edmonds, Daly, & Gardner, 2013). Both had 'empty' discourse, featuring frequent speech errors and non specific language. They received eighteen treatment sessions over 10 weeks, each session lasting 50 minutes. As a result one showed marked gains on the Boston Naming Test (Kaplan, Goodglass, & Weintraub, 2001) and on the number of information units produced in discourse production tasks. The other, however, did not improve on these outcome measures, possibly because her aphasia was more severe and of longer duration.

An alternative discourse therapy is AphasiaScripts™ (Lee, Kaye, & Cherney, 2009). This is a computerised treatment in which the person with aphasia practises a scripted discourse with an avatar therapist acting as their conversation partner. Each discourse is personally developed. For example, it may consist of a conversation about a recent holiday, or a graduation speech for a son. The script is programmed into the computer, so that it can be practised independently at home. Different levels of cue can be provided. In the most cued condition, the person with aphasia sees the written text and the avatar speaking each section of the discourse. These cues can be faded out, so that by the end of therapy the person with

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aphasia is producing his or her side of the discourse without any assistance from the computer. One small group trial (N = 3) of Aphasiascripts involved a participant with Wernicke's aphasia (Cherney, Halper, Holland, & Cole, 2008). This person made no changes on standard aphasia tests as a result of 9 weeks practice with the programme. However, his production of the scripted dialogues did improve, most notably in the percentage of script-related words. The authors comment that this was due to a reduction in empty speech and circumlocutions.

These preliminary findings suggest that working at the level of discourse may be productive for some people with Wernicke's aphasia. It is also encouraging that one individual benefited from a self administered computerised treatment. However, the studies did not employ controlled experimental designs, and data are available from very few participants. It is also unclear whether these therapies would be suitable for individuals with florid and highly aberrant jargon, or for individuals who have poor self monitoring. Indeed the results from Rogalski et al. (2013) suggest that the severity of impairment may be a negative prognosticator.

Treatment aimed at compensation (H2)

Rather than attempting to remediate the speech impairment, therapy might aim to exploit an alternative output modality. This option may be taken if speech proves resistant to intervention or if there is a severe monitoring deficit, making it impossible for the person to detect or correct their speech errors.

For some individuals, writing may be a potential target for treatment. Although jargon can manifest in writing as well as speech (e.g., Schonauer & Denes, 1994), this is not always the case (Hillis et al., 1999). When writing is relatively preserved, it may offer a means by which communication can be established.

Two single case studies demonstrate the potential of writing for people with jargon aphasia (Beeson, 1999; Robson et al., 1998). Both participants mastered a written vocabulary through therapy and learnt to write words to support communication. One study involved a participant whose jargon had evolved to empty stereotypical speech (Beeson, 1999). This section will focus on the other paper describing RMM. RMM (Robson et al., 1998) produced highly unintelligible phonemic jargon, with virtually no real words. As described above (Marshall et al., 1998), she seemed unaware of her speech deficit, and often became irate when others failed to understand her. This caused profound difficulties with her care staff and had led her to reject previous speech and language therapy.

RMM's writing was also impaired, with virtually no correct responses on written picture naming tasks. However, the writing impairment was different from the speech impairment. First of all writing was very effortful and non fluent. Secondly it was clearly monitored. RMM was acutely aware of her writing errors. She voiced concern about them and would often strike them out and attempt a correction.

One task particularly revealed the potential of writing. This was delayed copying of words and non words. Here, each item was shown to RMM then removed. A 10 second delay was imposed after which RMM was asked to write down the target. Her responses showed a clear effect of lexicality, with words written more successfully than non words. It seemed that the orthographic representations of words were still available to RMM, and were supporting her performance on this task.

Thus a number of factors encouraged the decision to focus on writing in therapy. Speech was profoundly impaired, unmonitored and difficult to treat. In contrast, RMM was aware of her writing problems and motivated to work on them. She also retained some 'latent' knowledge of written forms that might be promoted in therapy.

Three stages of writing therapy were provided for RMM, comprising a total of 59 sessions. All stages involved practising word sets, with targets represented by a picture. Tasks on each word included: identifying the first letter, anagram sorting, immediate copying, delayed copying, writing the picture name with a first letter cue, and writing the picture name without a cue. The therapy targets were chosen on the basis of their relevance to RMM. In the second and third stages of therapy the single word practice was supplemented with tasks that aimed to promote the communicative use of writing. For example, RMM was required to use her practised words in order to answer a question ('where did you go this weekend?'), label local landmarks on a map, or using Message Therapy, convey parts of a message (see examples in Table 2).

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Table 3.2: **Examples of Message Therapy used with RMM (Robson et al., 1998)**

Message examples:	My blouse needs ironing
	The laundry is late this week
The written messages were shown to RMM. She had to complete the following tasks	
i)	Relate the messages to one of two given words (shirt and <i>vicar</i>)
ii)	Relate to messages to one of two given pictures (a picture of a shirt and a picture of hair); write the picture name
iii)	Write a target word that was related to the given messages.

Therapy outcomes were evaluated by asking RMM to write the names of pictures. After the second and third stages she was also tested on her ability to respond to questions with written words, or to write words in order to convey a message. RMM showed consistent and highly significant gains in written picture naming following each stage of therapy, and

these were maintained at follow up assessments. However, gains were item specific. Unpractised words did not improve. The question and message tasks also improved, but again only when RMM could use her practised words. Encouragingly, by the end of therapy RMM started to use writing to resolve some of the communication difficulties that occurred in her everyday life. For example she wrote 'hair' (one of her practised words) to indicate that a hairdressers appointment clashed with a proposed therapy session.

A follow up small group study explored whether the therapy approaches used with RMM might benefit others with jargon aphasia (Robson, Marshall, Chiat, & Pring, 2001). The ten participants in the study all had fluent but unintelligible speech, largely composed of neologisms. They also had impaired writing, with poor written naming scores. However, as with RMM, there were some positive prognosticators for writing therapy. All bar one were able to monitor their writing errors, and most had at least some skills in delayed copying and anagram sorting.

In this study, six participants progressed to therapy. Twelve sessions were delivered in which they practised personally chosen sets of words. Tasks were similar to those used with RMM and included: writing the first letter of words, completing words with missing letters, anagram sorting, copying written words, and cued written picture naming. Four of the participants made significant gains on a written picture naming assessment as a result of this therapy. The other two also improved, but only marginally. As with RMM, gains were specific to treated words; so words that had not featured in therapy did not improve. The participants were also tested on a message assessment. This required them to write a single word that might convey a given message. For example, the message for 'newspaper' was 'I want a copy of the Telegraph'. This task did not improve as a result of the first programme of therapy, despite the fact that half the messages targeted treated words. Three participants were given a second programme of therapy, this time targeting communicative writing. The programme

consisted of 6 sessions, and involved a communication partner, typically a friend or family member. The tasks required participants to use their practised words in order to convey information to their partner. For example, one participant had to convey the information that his son had phoned (his son's name was a therapy target). This therapy brought about further gains on the picture naming task. All participants also improved on the message task, although the gain was significant for only one.

An interesting adaptation of writing therapy was conducted with one other individual (Jackson-Waite, Robson, & Pring, 2003). MA produced undifferentiated jargon that was poorly monitored. Previous therapy had attempted to remediate speech and promote alternative communication strategies, such as gesture, but with minimal success. MA also seemed a poor candidate for writing therapy, as she was totally unable to write or even copy words. Her errors included letter reversals, repetitions of letter strokes, and switches between upper and lower case. These pointed to a peripheral dysgraphia, affecting the selection and realisation of letter forms. As a result, writing therapy was administered on a Lightwriter, a portable keyboard communication aid. Three stages of therapy practised different sets of words, using anagram, copying, and picture naming tasks (all on the Lightwriter). After the first two stages, naming of each word set improved very significantly, but with no carry over to communicative tasks. The third stage therefore included tasks in which MA had to use her vocabulary to convey information. This produced gains on a questionnaire measure, but not in an assessment of conversation.

The studies reviewed above show that writing therapy may be useful for a number of people with jargon aphasia. It is striking that only practised words seem to improve, suggesting that these need to be carefully chosen. It also seems that the use of writing for communication may not occur unless it is specifically promoted in the therapy. The group study showed that gains varied across individuals, with not everyone improving. Therefore

further research would be beneficial to explore factors that predict treatment outcomes. Finally, the work with MA showed that therapy might be enhanced with technology. Although this study employed a Lightwriter, many of the mainstream technologies that have since become available offer exciting opportunities here. For example, words might be practised on tablets and then converted into speech, using speech synthesis software.

Writing is not the only compensatory modality that has been promoted in aphasia therapy. A number of studies have also explored the use of non-language techniques such as drawing (Sacchett, Byng, Marshall, & Pound, 1999) and gesture (Rose, Raymer, Lanyon, & Attard, 2013). For example, it has been shown that people with severe aphasia can learn a 'vocabulary' of gestures (Marshall et al., 2012), and improve their interactive communication as a result of gesture and naming therapy (Caute et al., 2013). Most studies of gestural therapy have involved people with non fluent or global aphasia (see Rose, 2006). An exception is the study by Carlomagno and colleagues (Carlomagno, Zulian, Razzano, De Mercurio, & Marini, 2013), who treated two individuals with chronic Wernicke's aphasia using a functional therapy programme that incorporated gesture. Tasks were interactive and involved sending and receiving information, for example to describe pictures or tell a story. When speech failed, participants were encouraged to employ supplementary gestures and thus integrate the modalities to convey information. After 6 weeks of this therapy (approximately 25 hours) one participant demonstrated improved functional communication on the Communicative Abilities in Daily Life test (CADL-2, Holland, Frattali, & Fromm, 1999). Analysis also showed that his gestures were less copious but more informative than prior to therapy, mainly because they combined more meaningfully with his speech. The other participant sadly showed no change.

Although the use of compensatory strategies is an obvious solution to some of the problems of jargon aphasia, uptake may be affected by monitoring impairments. In other

words, individuals with poor awareness of their jargon may not see the need for such strategies and may resist their adoption. Here interactive therapy approaches, such as PACE (Promoting Aphasic Communicative Effectiveness, Davis, 2005) may help. PACE has four main principles: therapy tasks should involve the communication of novel information to another person; the therapist and client should participate equally as both the sender and receiver of information; the communication channel is unconstrained, so may involve speech, writing, gesture, or drawing; and feedback reflects communicative success rather than accuracy. PACE offers an ideal medium in which to model and practice communication strategies, and, in the context of jargon aphasia, may demonstrate that a gesture or drawing is effective when speech is not.

This section outlined treatments that address the production problems of jargon aphasia. One approach aims to remediate the word production impairment, with the hypothesis that this will improve speech accuracy and reduce florid jargon errors. There is some evidence to support this view, particularly from studies that have used semantic and phonological naming therapies. However, these are mainly single cases, making it difficult to draw generalised conclusions. A more indirect approach aims to compensate for the impairment, but promoting alternative communication strategies. Here writing has been employed with some success, although again the evidence base is weak. Finally non verbal media were considered, such as drawing and gesture.

Working with and through Others (H1)

It is well recognised that the consequences of aphasia are not confined to the individual with the condition, but also extend to individuals in his or her immediate environment (e.g., Michallet, Le Dorze, & Tetreault, 2001; Michallet, Tetreault, & Le Dorze, 2003). When asked about the support that they need, family members typically stress the importance of information, for example about the nature of stroke and aphasia and the

prognosis for recovery (Avent et al., 2005; Hilton, Leenhouts, Webster, & Morris, 2014). This need is likely to be particularly acute for the relatives of people with jargon aphasia, given the very puzzling symptomatology. The presence of fluent but meaningless speech, coupled with a seeming lack of awareness, is very difficult to understand and may even generate false beliefs. For example, family members may worry that their relative is confused or mentally ill. Some may think that the person has reverted to a previously known foreign language. One relative known to me was convinced that his partner was speaking 'in code', and that he needed to crack this in order for communication to be restored. Even when such beliefs are not present, family members will need clear and accessible information about the nature of jargon aphasia, and why the symptoms are occurring.

In addition to information, family members and friends will need new skills. In terms of the ICF Model (WHO, 2001) this will help to modify the environment of the person with aphasia and hence promote social participation. As we have seen already (Maneta et al., 2001), relatives may need to adapt their language to make it comprehensible to their partner. They will also need guidance about how to respond to the jargon speech, particularly if it is unmonitored, and strategies for dealing with repair. It is hoped that changes in their behaviour will ease everyday interactions and, perhaps more optimistically, help the person with jargon aphasia to modify their output.

There is considerable evidence that the conversation partners of people with aphasia respond positively to training, and that this improves the quality of communication that takes place with the aphasic person (Simmons-Mackie, Raymer, Armstrong, Holland, & Cherney, 2010; Turner & Whitworth, 2006). Training can take a variety of forms. It may be administered in groups, and cover general themes about the nature of aphasia and how to adapt communication when speaking with a person with aphasia (Cunningham & Ward, 2003; Kagan, Black, Duchan, Simmons-Mackie, & Square 2001; Rayner & Marshall, 2003).

Alternatively, training may be individual and focus on the specific needs of one pair. Such training may draw on the insights of conversation analysis, for example to tease out the repair behaviours that are being used, and which may be usefully adapted (Beeke, Maxim, & Wilkinson, 2007). Alternatively, it might employ Conversation Coaching (Hopper, Holland, & Rewega, 2002) or Solution Focused Therapy (Boles & Lewis, 2003). These techniques also scrutinise the conversational behaviours that take place between an aphasic person and their partner, typically by using video. The therapist and the couple identify behaviours that facilitate or hinder the conversation, and then attempt to promote the former and reduce the latter, for example by using communication exercises.

Studies of conversation partner training have involved a wide range of participants, leading Simmons-Mackie et al. (2010) to conclude that the effects can be generalised across aphasia types. However, their review identifies no individuals specifically with jargon aphasia and few with a diagnosis of Wernicke's aphasia. They also acknowledge that issues of candidacy need to be further explored. Applications with people who have jargon aphasia may be particularly challenging, because of the multiple communication impairments, and because of reduced insight on the part of the person with aphasia. Nevertheless, the likely consequences of jargon aphasia for communication make partner training a priority.

Conclusions (H1)

This chapter has reviewed the treatment approaches that have been attempted with people who have jargon aphasia. In so doing, it has presented evidence that the problems of jargon can be mitigated, either through direct remediation of the impairment or through indirect approaches that encourage compensations. The chapter also considered techniques that have barely been tested with people who jargon, but which might be advocated; most notably, the training of conversation partners.

In many respects therapy with jargon speakers is unexceptional. For example, it will involve the same stages of treatment as for any other person with aphasia. That is, the therapist will typically start with an exploration of the problems and the setting of goals. This will lead to the development of a treatment plan, followed by the administration of therapy and outcome measurement. Yet, each of these stages may be beset with problems if the person has jargon aphasia. Just to take one instance, exploration and goal setting will be very difficult with a client who has minimal awareness of the speech difficulties, and hence no appreciation of the need for therapy.

Some responses to these challenges have been presented, largely drawn from the literature. However, more treatment studies are needed. Ideally these will take different forms. We need experimental evidence to determine which jargon symptoms respond best to which treatments. But we also need qualitative accounts that discuss the detail of how therapy is conducted and how clients respond. Such a combined literature should help clinicians to tease apart the dos and don'ts of jargon therapy.

Case Study (H1)

Sam is a 76 year old man who experienced a left hemisphere stroke approximately one year prior to the current course of treatment. At the time of his stroke he was diagnosed with a Wernicke-type aphasia, severe anomia, and unintelligible speech containing semantic errors, unrelated errors, and neologisms. Sam received in- and outpatient speech and language therapy for 5 months after his stroke. Treatment goals were auditory comprehension of single words; item-specific functional communication, such as a word or gesture for a favourite food; and naming. Although Sam showed progress in all areas, at discharge he was judged to be highly dependent on his communication partner in most conversation exchanges.

Sam lives independently with his wife, Linda, who recently observed some improvement in Sam's communication abilities. Linda has also persuaded Sam to join a weekly stroke group. She is seeking additional speech and language therapy in the hope that this will promote further improvement, and support Sam's uptake of the group.

The therapist's initial session with Sam and Linda involved a discussion about Sam's current communication status and what they hoped to achieve in therapy. Sam's speech was observed to be fluent and still largely unintelligible, with semantic errors, unrelated real word errors and neologisms. With prompting from Linda, he occasionally attempted to write. For example, when asked what soccer team he supported, he wrote 'LIV' (Liverpool). Linda described everyday communication as 'difficult'. She was often unable to determine Sam's meaning and said that he rarely attempted to gesture or write when his speech was unintelligible. She felt that Sam could not judge if his speech was making sense. She also commented that he often misunderstood others, particularly if they spoke quickly.

In terms of goals, Sam indicated that he wanted to improve his speech. Linda agreed that this would be positive. She also wanted Sam to be more aware of his speech errors, and to make better use of other modalities, such as writing. She felt that they needed help with Sam's comprehension difficulties. The therapist asked about communication activities that Sam and Linda wanted to target. They agreed on the following:

- Communicating basic information at home, such as food preferences or choices of leisure activities
- Participating in conversations at the stroke group
- Participating in Skype conversations (internet video communication) with Sam's adult granddaughter

In the light of this discussion, the therapist decided to administer four assessments. The first explored Sam's production, using the 40 item picture naming test from the PALPA (Kay et al, 1992).

The therapist introduced two modifications to the test. After Sam attempted to say the name of each item, he was asked to judge if his response was correct or not (by pointing to a tick or a cross). He was then invited to write the name of the picture. Two assessments explored his auditory comprehension: the Spoken Word to Picture Matching and Sentence to Picture Matching subtests of the Comprehensive Aphasia Test (Swinburn et al, 2004). Finally the therapist administered the all picture version of the Pyramids and Palm Trees Test (Howard and Patterson, 1992).

Sam named only five items correctly in the first test, all other responses being real or non word errors. However, he judged 60% of his responses to be correct. His written attempts were better, with 12 correct responses and a further eight in which he achieved at least the first letter. His comprehension of words and particularly of sentences was impaired, although he scored above chance on both tests. He was close to normal limits on the Pyramids and Palm Trees test, showing retained non verbal semantic knowledge.

Drawing on the initial discussion and the test results the therapist drew up her therapy plan. The regime spanned 4 months, with two, one hour sessions per week. There were four streams of therapy aiming to meet the activity targets identified by Sam and Linda. The streams were:

- Vocabulary training
- Awareness training
- Script training
- Supported conversation

Most of the streams were administered in parallel, although vocabulary training was provided before script training.

Vocabulary training: Sam and Linda drew up a list of 40 words that would help Sam to convey personally relevant information. Drawing on published naming therapy techniques (e.g. Davis et al, 2006) Sam was invited to make a series of semantic judgements about these words. He

was then encouraged to say them and judge whether or not his attempt was correct. Finally he was asked to write the words down, in response to a hierarchy of cues (e.g. see Robson et al, 1998).

Awareness training: The therapist began this stream by discussing the awareness problem with Sam, using simple, aphasia friendly materials. They also viewed videos of Sam talking, so that he could observe his speech difficulties. Linda, his granddaughter and a stroke group volunteer agreed on a feedback strategy. They used a consistent hand gesture and facial expression to indicate that they had not understood Sam, and encouraged him to use writing or gesture instead. They also discussed when to apply this (so that they were not always giving Sam negative feedback). During production tasks (see above and below) Sam was encouraged to listen to his responses and judge if they were correct. Initially he judged recordings of his speech; later he attempted to judge without a recording.

Script training: This stream drew on the principles of Aphasia Scripts (Cherney et al, 2008). The therapist, Sam, and Linda developed ten personally relevant scripts for Sam to practise, all of which integrated at least one item from his vocabulary training. Scripts were designed to convey basic information or support Sam's conversation goals. For example, one was about walking his dog. Practice followed the hierarchy of Aphasia Scripts. In addition, Sam was encouraged to write relevant words if his speech production broke down. During practice, the therapist frequently asked Sam to judge whether he had said the target correctly.

Supported conversation: This involved sessions with Sam's main conversation partners to give them skills in supporting Sam's communication. The partners were Linda, a volunteer at the stroke group and his granddaughter. The sessions covered Sam's comprehension difficulties, how to modify speech to support his understanding, how to elicit output and responding to his errors (see above). The therapist also drew on the principles of Conversation Coaching (Hopper et al, 2002). Sam was videoed in conversation with Linda and his granddaughter. They discussed strategies that worked (and did not work) in the conversation, and attempted to repeat the conversation making

more use of the positive strategies. Conversation coaching with the granddaughter took place over Skype, so that strategies suitable for Skype could be promoted.

Sam showed strong item specific gains from therapy. His naming of practiced vocabulary improved dramatically, both in speech and writing, as did his production of the scripts. Linda reported that Sam made some use of the trained material in everyday interactions, although this was variable. Sam's conversation partners became skilled at using supported communication, and Sam continued to skype his granddaughter successfully almost every week. He integrated well into the stroke group and the volunteers reported that he was involved in both individual and group conversations. At the end of therapy the intelligibility of Sam's speech was still low and communication remained difficult with unfamiliar conversation partners. However, Sam showed more awareness of his speech difficulties, and became more likely to use writing or gesture when communication broke down.

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