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MILD APHASIA THERAPY

RESEARCH REPORT

To the sentence and beyond: a single case therapy report for mild aphasia.**Julie Hickin^{1,2}, Beejal Mehta and Lucy Dipper¹**¹ Division of Language and Communication Science, City University London, UK² School of Allied and Public Health, Australian Catholic University, Melbourne, Australia

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Background: Mild aphasia has received limited attention in the research literature, with few published treatment studies despite significant disruption of communication reported by affected individuals. This includes difficulty understanding and producing grammatically complex language, and consequent discourse and/or conversational difficulties. The limited research may be due to a lack of clarity regarding the deficits underlying the disorder, with

MILD APHASIA THERAPY

1
2
3 linguistic and/or cognitive impairments implicated, as well as limited research and treatment
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5 resources being targeted at those with more severe deficits.

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7 *Aims:* This single case study investigated the effectiveness of a multifaceted treatment
8
9 approach designed to improve the complex sentence and discourse production of a young
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11 woman with mild aphasia.

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15 *Methods & Procedures:* The participant, BM, was a 22 year old female with mild aphasia
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17 following a left sided embolic CVA approximately two years prior to the study. She
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19 participated in 16 sessions of impairment-based treatment on a weekly basis. The study used
20
21 a multiple baseline design across time and behaviours. Due to the lack of published
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23 assessments suitable for mild aphasia, the study included informal outcome measures
24
25 comprising linguistic analysis of Cinderella narratives, as well as the picture description tasks
26
27 of the Comprehensive Aphasia Test (Swinburn, Porter & Howard, 2004).
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31 *Outcomes & Results:* BM's picture description demonstrated modest improvements in spoken
32
33 language production immediately post treatment. Her Cinderella narrative gave further
34
35 indications of improvements in complex sentence production. Analysis of her functional
36
37 language output at the end of treatment indicated that improvement was most evident in
38
39 written narrative production using voice recognition software.
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43 *Conclusions:* This study provides some preliminary evidence that impairment-based
44
45 treatment for mild aphasia can improve complex sentence and discourse production. Given
46
47 the multicomponent nature of treatment, it is not possible to identify what aspects of
48
49 treatment were (most) effective. However, the study highlights the potential effectiveness of
50
51 impairment-based treatments for high level language deficits, and of multimedia technology
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53 both as therapy software and in the form of assistive technologies. The development of
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MILD APHASIA THERAPY

assessments suitable for mild aphasia and potential future directions for research are discussed.

Keywords: mild aphasia; complex sentences; narrative; treatment; multimedia technology.

For Peer Review Only

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MILD APHASIA THERAPY

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3 It is now recognised that people with mild aphasia can experience significant limitations to
4 their communication with consequent effects on activity, participation and well-being (e.g.
5 Cruice, Worrall, & Flickson, 2006; Hilari & Northcott, 2006; Teasdale & Engberg, 2005).
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10 However it remains largely neglected in the research literature (e.g. Armstrong, Fox and
11 Wilkinson, 2013). Typical presenting symptoms include mild word-finding problems, a
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13
14 reduction in word fluency, difficulty understanding and producing grammatically complex
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17 language, and discourse and/or conversational difficulties. In the research literature there is
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19
20 uncertainty about the deficits underlying mild aphasia. Whilst the presenting symptoms may
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22
23 appear to reflect linguistic difficulties, recent research has explored the potential role that
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25
26 cognitive deficits may also play, for example impairments of attention (e.g. Hunting Pompon,
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29 Silkes, Kendall, & Bacon Moore, 2010; Murray, Holland, & Beeson, 1998; Murray, Keeton,
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32 & Karcher, 2006), memory (e.g. Francis, Clark & Humphries, 2003) and executive
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35 functioning (e.g. Frankel, Penn & Ormond-Brown, 2007).

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The likely complexities of the aetiology underlying mild aphasia may account for the relatively sparse literature on the subject and for the very few treatments which have been proposed. In addition, clients with mild aphasia are often not seen as priorities for therapy, with limited services being targeted at those with a more severe deficit. This is despite evidence of the complexity of the relationship between aphasia severity and its impact on a person's quality of life (e.g. Cruice, Worrall, Hickson, & Murison, 2003; Ross & Wertz, 2002).

AETIOLOGY

There is conflicting evidence about the role of linguistic and/or cognitive deficits in mild aphasia. The overt symptoms point to mild linguistic difficulties in terms of, for example, impairment of word retrieval for later acquired, more abstract, longer and less frequent

MILD APHASIA THERAPY

1
2
3 words, and impaired ability to both understand and formulate complex rather than simple
4
5 sentences (Ross & Wertz 2004a; Fox, Armstrong & Boles, 2009). Frankel et al. (2007) note it
6
7 is possible that decreased syntactic complexity in output may also reflect “the adaptation of
8
9 the aphasic speaker to the demands of the communicative environment by minimising
10
11 syntactic demands in order to reduce or avoid communication breakdown (p.820).”
12
13 Nevertheless the likely significance of the underlying linguistic deficit in mild aphasia is
14
15 indicated by recent research. Kroenke, Kraft, Regenbrecht & Obrig (2013) taught novel
16
17 words to 30 participants with mild aphasia using either gesture plus repetition or repetition
18
19 alone and found that whilst participants with lesser lexico-semantic impairment benefited
20
21 more from the gesture condition, those with better preserved segmental phonological abilities
22
23 responded best to repetition alone. Despite this there is a surprising absence of research
24
25 exploring the precise nature of linguistic difficulties in mild aphasia, with a concentration on
26
27 the role of cognitive deficits instead.
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32 Indeed, Hunting Pompon et al. (2010) state their belief that the underlying deficit/s in
33
34 mild aphasia may be cognitive. They compared the performance of 14 people with mild
35
36 aphasia to age and education matched nonaphasic controls on a visuospatial task, with and
37
38 without linguistic interference (i.e. a simultaneous reading task). Participants with aphasia
39
40 showed impairment of selective attention in the linguistic interference condition. The authors
41
42 advocate the need for detailed neuropsychological investigation of people with mild aphasia
43
44 in order to identify the possible contribution of cognitive deficits to their difficulties with
45
46 communication.
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50 Frankel et al. (2007) combined conversation analysis with neuropsychological
51
52 assessment to explore the contribution of deficits in executive functioning to the
53
54 communication difficulties of a woman with mild aphasia. Armstrong et al., (2013) also
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56 implicate deficits in executive functioning in the conversational difficulties experienced by
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MILD APHASIA THERAPY

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3 their client in conversation with her husband. Murray et al., (1998) explored the impact of
4
5 divided attention on the language produced by mildly aphasic participants in a picture
6
7 description task. In comparison to an age-matched control group whose language remained
8
9 unaffected by attention levels as they shifted from isolation to divided-attention conditions,
10
11 the aphasic participants produced fewer syntactically complete and complex utterances, fewer
12
13 words, and demonstrated poorer word-finding accuracy, whilst in pragmatic terms, their
14
15 communication was considered less successful and less efficient. Murray et al. (2006)
16
17 explored the impact of attention training on attention and memory in a man with mild
18
19 conduction aphasia. Although they found improved performance on specific assessments,
20
21 neither the participant nor his wife reported any noticeable improvement in his daily attention
22
23 or communication abilities.
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THE EFFECTS OF MILD APHASIA ON COMMUNICATION

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31 There is limited research investigating the impact of mild aphasia on communication. In a
32
33 rare detailed investigation of the impact of mild aphasia at the level of discourse, Armstrong,
34
35 Fox and Wilkinson (2012) highlight its effect on the ability to participate in the sort of robust
36
37 discussion typical of so many of our interactions with family and friends. They recorded four
38
39 10 minute conversations between a mildly aphasic woman and her husband discussing topics
40
41 upon which they disagreed, but about which they enjoyed talking. Significant difficulties
42
43 emerged for the aphasic woman in developing her argument and subsequently retaining the
44
45 conversational floor. Armstrong et al. state that “individual ‘word-finding difficulties’ could
46
47 not always account for her propositional simplification and non-specificity” (Discussion,
48
49 para. 2) hinting at the potential interaction of a number of factors underlying this. They also
50
51 point out “the potential usefulness of multi-level analysis and complex (discourse)¹ tasks
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MILD APHASIA THERAPY

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3 when assessing someone with mild aphasia and planning intervention” (Discussion, para. 4) a
4
5 topic which will be revisited.
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8 In a subsequent paper based on the same case study, Armstrong et al. (2013) use
9
10 Systemic Functional Linguistics (SFL) to explore in more detail the difficulties experienced
11
12 by their client in participating in discussions - in formulating arguments and counter
13
14 arguments. Indeed difficulty in participating in discussion was a key concern for the client
15
16 discussed here, and this is a common complaint of people with mild aphasia.
17
18

19
20 The wider effects of mild aphasia - on activity, participation and well-being - have
21
22 begun to be explored in recent years. Cruice et al. (2003) established that the relationship
23
24 between severity of impairment in aphasia and its impact at the other levels of the World
25
26 Health Organisation International Classification of Functioning Disability and Health (WHO-
27
28 ICF, 2001) is not straightforward, with mild impairments having the potential to produce
29
30 severe impact. In this regard, another common difficulty reported by people with mild
31
32 aphasia is limited “flexibility” in language such that their choices in how to express a desire,
33
34 thought or opinion are limited. This can impair the ability to express subtle differences in
35
36 meaning or intention. As a result people with mild aphasia report concern about, or the
37
38 experience of, being misunderstood or offending others because they have communicated a
39
40 message more directly than intended, with consequent effects on relationships with family
41
42 and friends. This is borne out by descriptions in the literature such as that of Sheila (Pound,
43
44 Parr, Lindsay & Woolf, 2000), Jasvinder and Sue (Parr, Duchan & Pound, 2003). All of these
45
46 individuals illustrate the devastating effects of a “mild” impairment on career, family
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48 relationships, identity, self-efficacy and confidence.
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ASSESSMENT OF MILD APHASIA

MILD APHASIA THERAPY

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3 When trying to assess the deficits underlying mild aphasia, the clinician is confronted by the
4
5 problem of finding sufficiently sensitive assessments. This problem is referred to by Ross and
6
7 Wertz (2004a and 2004b) who note the difficulties of differentially diagnosing mild aphasia
8
9 from the changes to language associated with normal ageing. Hunting Pompon et al. (2010)
10
11 also note that people with mild aphasia who, “often score within normal limits on traditional
12
13 assessments of language function are often underdiagnosed and underserved” as a result
14
15 (Introduction).
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17

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19 The lack of sensitivity of assessments to mild aphasia may be because most of the
20
21 clinical tests at the level of impairment do not mirror the complexity of producing language
22
23 in a naturalistic context, instead separating out linguistic levels in order to test the integrity of
24
25 skills (e.g. word to picture matching). This is a valid aim but means the tests do not replicate
26
27 the online processing load of producing language in everyday conversation, and it is often
28
29 only in conversations which place a particularly high processing load on the aphasic
30
31 interlocutor (e.g. group conversations, phone conversations and conversing in noisy,
32
33 distracting conditions) that people with mild aphasia report the manifestation of aphasia.
34
35 Presumably this is because it is only under these more exacting conditions that their mildly
36
37 impaired linguistic and/or cognitive processing systems begin to overload.
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42 Another reason for the lack of sensitivity may be that assessment tasks do not require
43
44 the use of complex language and thus may not expose the difficulties of mild aphasia.
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46 Nippold (2010) discusses this in relation to her work with secondary (high) school aged
47
48 children with specific language impairment (SLI). She states that students are most likely to
49
50 use complex language when they are genuinely interested in and knowledgeable about the
51
52 topic under discussion, genuinely motivated to talk about it, and talking about complex
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54 matters. It is not clear that these conditions are met by the tests we might ask people with
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56 mild aphasia to perform and so we may not detect the difficulties being experienced.
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MILD APHASIA THERAPY

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3 A somewhat similar issue arises in relation to the aphasia tests which aim to measure
4 the impact of aphasia on wellbeing. The majority of these tests are perhaps more geared to
5 those with moderate to severe aphasia (e.g. the Communication Disability Profile [Swinburn
6 & Byng, 2006]) in that many of the items assess the transactional and functional aspects of
7 communication rather than the interactional aspects. The former are unlikely to be affected in
8 mild aphasia; the latter are likely to be. For someone with mild aphasia, what are needed are
9 instruments which capture the more subtle impacts of the communication disability, such as
10 feelings about the ability to communicate and the impact of this on identity, confidence and
11 self-efficacy.
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TREATMENT

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27 Clients with mild aphasia are often not seen as priorities for therapy due to limited services
28 being targeted at those with a more severe deficit. One of the few published therapy studies
29 designed for this client group is reported by Deborah Graham (2006). Graham worked with a
30 man, KB, who initially presented with moderate aphasia. Following intervention this evolved
31 into a milder impairment and the therapy given at this stage provided both inspiration and
32 ideas for treatment described here. Graham comments that “it can be difficult to locate
33 therapy resources at this level” (p.65) and her tailor-made therapy involved a hierarchy of
34 tasks designed to enable her client to develop his ability to construct a narrative. Initial
35 activities involved giving the client two simple sentences and asking him to combine them as
36 a compound/complex sentence. Subsequent stages involved giving a series of sentences with
37 the task of linking them as a narrative using appropriate connectives, and bringing to
38 conscious awareness aspects of the planning of language such as perspective taking and the
39 number of ideas to be expressed. In doing this, Graham’s approach targeted the interaction of
40 linguistic and cognitive deficits which may ultimately be the essence of mild aphasia.
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MILD APHASIA THERAPY

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3 McCall, Virata, Linebarger & Berndt (2009) used SentenceShaper[®] software in a
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5 single-case treatment study which explicitly targeted multi-clause constructions, focussing on
6
7 the connectives *because*, *before* and *after*. Therapy focussed on the semantics of the
8
9 connectives; their role in signifying causal and temporal relationships between events in order
10
11 to encourage a multi clause response. Practice tasks used questions containing the targeted
12
13 connective and sentence frames containing the first clause of the target response. By
14
15 contrast, numerous other studies using the same software report cases where
16
17 SentenceShaper[®] is used to ‘scaffold’ production without explicit input from a therapist. The
18
19 software is designed to support sentence production in individuals with nonfluent aphasia, on
20
21 the assumption that agrammatic sentence production is due, at least in part, to insufficient
22
23 processing resources (Linebarger, Schwartz, & Kohn, 2001). It allows the user to record
24
25 short utterances in his or her own voice and to combine them using a desktop workspace on
26
27 which the audio files of each utterance are represented by abstract icons. Several papers (e.g.,
28
29 Linebarger, McCall, Virata, and Berndt, 2007; Linebarger & Schwartz, 2005) report
30
31 improvements in both sentence structure and narrative content, despite the lack of explicit
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33 intervention. Although not aimed at people with mild aphasia, these studies are of relevance
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35 here because of their potential for the remediation of the high-level sentence and discourse
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37 problems characteristic of mild aphasia.
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44 Finally, Marshall & Cairns (2005) discuss the difficulty of enabling clients to
45
46 generalize clinical improvements in language production to real-life communication,
47
48 including narrative. They theorise that this may relate to difficulties at the macroplanning
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50 level, that is, “an ability to sequence a series of propositions and so direct the focus of the
51
52 listener over the developing discourse.”(p.1018) They gave their client EM a second phase of
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54 therapy which provided her with “strategies for thinking about multiple and complex events .
55
56 . (and which) . . . extended her gains (from phase 1)¹ to more open speaking situations”
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MILD APHASIA THERAPY

(p.1018). Whitworth (2010) also used an intervention based on narrative structure to help two clients generalize improvements in word and sentence production to real-life conversation. Once again, whilst these treatments were not carried out with people with mild aphasia, they have potential to improve difficulties with complex language production as manifested in this type of aphasia.

METHOD

This therapy study was carried out at the **City University London** Aphasia Research Clinic during 2010 and 2011. The design was a single case study using a multiple baseline across time and behaviours. Ethical approval was obtained from the CITY University Ethics Committee (**Division of Language and Communication Science**).

Participant

BM is a right handed female who had a left embolic CVA in November 2008 aged 22 when she was on holiday in India, and 18 months after she had completed her undergraduate degree to qualify as a health professional. She initially presented with a severe nonfluent aphasia and right sided hemiparesis affecting her arm and leg. No information on scans taken at this time is available. She returned home to the UK as soon as possible and was hospitalised for 1 week, subsequently receiving services via the community rehabilitation team for 6 months which included speech and language therapy, physiotherapy and occupational therapy. BM was independently mobile but at the start of the study was occasionally assisted by the use of a walking aid.

BM self-referred to the clinic around two years post-stroke in 2010. She presented with fluent but hesitant speech characterised by mild word finding difficulties, some difficulty producing multisyllabic words and limited use of complex sentences. Performance

MILD APHASIA THERAPY

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3 in the written modality was similar, however her writing and typing skills were further
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5 hindered by a dense hemi-paresis of her dominant right hand. BM is British Asian and has
6
7 some comprehension of Gujarati, however her main language has always been English. She
8
9 has a close and supportive family and network of friends. Her interests include films, fashion
10
11 and shopping. BM had begun to study some foundation courses in psychology in the hope of
12
13 retraining as a psychologist.
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16
17 BM was aware that she had made a “good” recovery but reported frustration and
18
19 reduced self-confidence in her communication. In particular, she described difficulties in
20
21 professional communication with colleagues and clients, as well as in group interaction with
22
23 family and friends. For example she reported that she was no longer able to participate in
24
25 discussions with friends about films in the same way: pre-stroke she had been known as the
26
27 group’s “film buff” but she no longer felt able to express this aspect of her
28
29 personality/interests effectively, consciously limiting her language to avert the possibility of
30
31 it breaking down, and the potential embarrassment that might ensue from this. She addressed
32
33 these difficulties partly by socialising less and also by communicating with friends via
34
35 multimedia technology e.g. texting and using Facebook.
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40 Regarding written communication, BM wrote and typed using her non-dominant left
41
42 hand. She reported that her written language was fine for informal purposes. Formal writing
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44 was problematic however, with BM reporting that essays took twice as long to write as they
45
46 had pre-morbidly. Regarding reading, BM stated that she needed to read text through more
47
48 than once to understand it, but wondered if her difficulties were more in terms of attention
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50 rather than language. In summary BM showed considerable insight and described many of
51
52 the difficulties classically associated with mild aphasia.
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Design

MILD APHASIA THERAPY

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3 The single case design used in this study included a pre-treatment phase of approximately 12
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5 weeks during which background assessments were administered to elucidate the extent of the
6
7 communication difficulty and the underlying deficits. A range of outcome measures were
8
9 also administered at the beginning and end of this period. This allowed us to monitor both
10
11 stability of performance over time as well as the effect of “therapist charm” since there was
12
13 weekly contact with the therapist during this time, mirroring the pattern used during the
14
15 treatment period. Treatment comprised sixteen weekly sessions of approximately 1 hour, with
16
17 BM carrying out home practice as often as her busy schedule allowed. Outcome and control
18
19 measures were repeated immediately post-treatment.
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24 Outcome measures included the Comprehensive Aphasia Test (CAT) (Swinburn, et
25
26 al., 2004) with a focus on the spoken and written picture description subtests, and narration of
27
28 the Cinderella story (e.g. Bird & Franklin, 1996). BM was also asked a set of quality of life
29
30 questions before and after treatment (Cruice, Hill, Worrall, & Hickson, 2010). Control
31
32 measures were difficult to find because the mild nature of BM’s difficulties meant that she
33
34 performed at ceiling level on many of the tests undertaken. However, some subtests of the
35
36 CAT on which BM did not score 100% were repeated post-treatment.
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Background Assessment

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43 BM’s cognitive skills were initially screened using the cognitive subsection of the CAT when
44
45 she scored 100% on tests of semantic and recognition memory. Further assessment was
46
47 carried out using the Wisconsin Card Sorting Test (Grant & Berg, 1993) which also indicated
48
49 good cognitive functioning (e.g. Total Number of Errors: 12 [SS = 104]; Percent Errors: 17
50
51 [SS = 101]; Number of Categories Completed: 6 [Percentile Range >16]).
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55 BM’s communication skills were assessed in a number of ways. Language
56
57 impairment was assessed using the Language Battery of the CAT. Her performance on this
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MILD APHASIA THERAPY

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3 was within normal limits for people without aphasia for all subtests except naming of objects
4 (raw score = 41, T score = 60) and naming of actions (raw score = 8, T score = 59) pointing
5 to word retrieval difficulties. Also of interest was her performance on the spoken and written
6 picture description tasks (insert table 1 about here). For spoken picture description, BM
7 scored a total of 39 (T score = 62), but was outside normal limits on syntactic variety (raw
8 score = 3, T score = 53) and speed (raw score = 2, T score = 48). Analysis of her description
9 pointed to problems with complex sentence production, with a limited variety of conjunctions
10 used, and predominant use of “and” to create compound sentences, or to concatenate them.
11 The result was a lack of complex, embedded sentence structure. Written picture description
12 (insert table 2 about here) BM showed less reliance on “and” (possibly because writing with
13 her non-dominant hand slowed down her output and allowed more monitoring/processing
14 time) but again her description showed a very limited variety of syntactic structures. This was
15 replicated in an essay which BM had written for a psychology course (which was typed on
16 her computer).

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35 BM was also asked to retell the story of Cinderella (Bird & Franklin, 1996) and to
36 discuss topics of interest to her, and these were transcribed and subjected to linguistic
37 analysis. The expectation was that these tasks would place a greater processing load on both
38 her linguistic and cognitive skills, as well as being more stimulating to discuss. A
39 transcription of a sample of BM’s pre-treatment Cinderella narrative is given in Appendix A,
40 and a transcription of her pre-treatment description of the most recent film she had seen is
41 given in Appendix B. Analysis of these samples provided further evidence of BM’s
42 difficulties producing complex sentences and gave some useful pointers for therapy (see next
43 section). Furthermore, the Cinderella narratives produced pre- and post- therapy were
44 compared for evidence of improvement using the following outcome measures: quantitative
45 production analysis (Saffran, Berndt and Schwartz, 1989); local coherence analysis (Glosser
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MILD APHASIA THERAPY

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3 & Deser, 1990); global coherence analysis (Wright, Koutsoftas, Fergadiotis, and Capilouto,
4
5 2010); story grammar (Ulatowska, Freedman Stern, Weiss Doyel, Macaluso-Haynes, and
6
7 North, 1983).
8
9

10 To explore the impact of BM's mild aphasia on her life, she was asked a set of
11
12 Quality of Life questions (Cruice et al., 2010). The enormous impact of her communication
13
14 difficulties was evident from her responses to these questions: for example, when asked
15
16 "Does communication have an impact on the quality of your life?" BM said "Yes – everyday
17
18 - every single second of everyday." These questions stimulated discussion which revealed
19
20 that BM's primary concerns were 1) the limitations in her ability to participate in
21
22 conversations both professionally and with family and friends: she wanted, as she said, "to be
23
24 able to express my character more in discussions, to be able to elaborate my ideas and have
25
26 more influence on the discussion" 2) she was concerned about her ability to complete written
27
28 work for the psychology courses she was taking with regard to both speed and the content of
29
30 her written language: she wanted to complete essays quicker and to use more complex
31
32 language within them.
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38 These concerns were identified as the main therapy goals for BM and represented part
39
40 of a collaborative approach to the setting of goals that were SMARTER (Shared, Monitored,
41
42 Accessible, Relevant, Transparent, Evolving and Relationship-centred) as advocated by
43
44 Hersh and colleagues (Hersh, Worrall, Howe, Sherratt & Davidson, 2012). Common to both
45
46 of BM's goals was the need to produce more complex language. It was hoped that
47
48 improvement in this would also result in improved confidence in her ability to communicate.
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Therapy

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55 Given the lack of published treatment studies and therapy resources for mild aphasia,
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57 the approach used was eclectic. It was based on clinical research in the fields of both aphasia
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MILD APHASIA THERAPY

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2
3 therapy and therapy with secondary school students with SLI. Inspiration was drawn from
4 materials used in Teaching English as a Foreign Language (TeFL) - for example a website
5 which explains the differences between simple, compound and complex sentences
6
7 (<http://www.eslbee.com/sentences.htm>) and to source pictorial material suitable for a person
8
9 of BM's age to stimulate discussion. We also explored how we could use multimedia
10
11 technology (MMT) in BM's therapy, as this was a particular focus of our work at the
12
13 Research Clinic (e.g. Hickin, Cauté & Woolf, 2012).
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20 The overall structure for the language therapy programme was based on Graham
21
22 (2006). We aimed to increase the complexity of BM's spoken language by encouraging
23
24 production of a wider variety of discourse connectives to address her dependence on "and"
25
26 (see Appendix A and B). This would expand the types of meanings she could convey within a
27
28 narrative, for example by using additive conjunctions (e.g. but), adversative conjunctions
29
30 (e.g. however, although) and temporal ones (e.g. since, while). It was hypothesized that as a
31
32 result of therapy there would be a reduction in the number of compound sentences produced
33
34 using "and" combined with an increase in compound sentences using different connectives,
35
36 and complex sentence production.²
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41 We started with highly structured tasks (e.g. we gave BM two simple sentences [two
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43 clauses] and asked her to combine them as a complex sentence using provided target
44
45 connectives). At this early stage we also used colour coding (e.g. Byng, 1988; Ebbls & van
46
47 der Lely, 2001) to address the difficulty BM sometimes demonstrated in mapping events in
48
49 the correct order in relation to a connective (e.g. putting the causative event after "because"
50
51 but before "therefore"). In addition, treatment at this stage involved discussion of the
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53 different functions connectives could serve in a narrative such as establishing the timing of
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55 events (e.g. next, before), causality (e.g. because, therefore) and to discuss and debate (e.g.
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57 however, although).
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MILD APHASIA THERAPY

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3 We gradually increased the complexity of therapy tasks: for example by providing not
4 just two sentences but a series and asking her to link them as a narrative. An example of a
5 task at the next stage would be to show BM picture sequences and ask her to produce a
6 narrative description. Sessions towards the end of treatment required her to produce
7 spontaneous narratives about a topic of interest such as the current storyline in her favourite
8 soap opera or the latest film she had seen. In these later sessions BM was encouraged to be
9 more ambitious in language output, and it was noted that as her ability to use a wider range of
10 connectives improved and she attempted to convey more complex ideas, she was having
11 some difficulties structuring her narratives. A Story Grammar Outline (e.g. Nippold, 2007;
12 Whitworth, 2010) was therefore introduced to help her organise her narrative and express her
13 ideas more clearly (e.g. by first establishing the setting and the main characters of her
14 narrative).

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31 As well as paper exercises, we used MMT in BM's therapy. Once paper-based
32 exercises had raised BM's awareness of how she could use a wider variety of connectives in
33 her discourse, and to what purpose, SentenceShaper[®] therapy software was introduced. This
34 gave BM the opportunity to record and reflect upon her spoken language as she experimented
35 with the different connectives. Initially BM worked on the D series workbooks which use
36 pictures to depict a series of events and are designed to train the production of "because"
37 clauses. BM then went on to use the blank workbooks (E series) which do not have pictures
38 and can therefore be used to create free narratives on topics of the client's (or therapist's)
39 choosing. The cue buttons along the side of the screen contained some of the connective
40 words that were the target of treatment to support BM's narrative production if required.
41 Verbal feedback was provided by the therapist and written prompts such as list of different
42 types of connectives were also provided to help scaffold BM's attempts at producing more
43 complex language. Twelve of the sixteen therapy sessions involved BM producing narratives
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MILD APHASIA THERAPY

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3 using SentenceShaper[®] in this context. BM also had a copy of SentenceShaper[®] on her own
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5 computer which meant that she could practice this part of her therapy independently. The
6
7 amount of home practice varied due to BM balancing her part-time job with her studies.
8
9 However, she completed 6 sessions, three producing narratives using SentenceShaper[®] and
10
11 three completing paper based-exercises.
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15 It was hoped that any improvements in BM's spoken language would generalize to
16
17 written language production thus addressing her second therapy goal. However, an additional
18
19 problem for BM was the speed at which she could type. Therefore WriteOnline[®] (a specialist
20
21 assistive software package designed to promote literacy development in primary - secondary
22
23 school aged children) was trialed with her as it had a number of features which could
24
25 potentially help. These features included word prediction and word banks. The latter allow
26
27 the user to create banks of words relevant to the topic they are writing about, display them on
28
29 screen and to select and enter them into the text with one key stroke. Both of these features
30
31 could speed up written language production by assisting with BM's mild anomia, and also
32
33 importantly by reducing the number of keystrokes required. BM responded well to the trial
34
35 but unfortunately statutory funding available to support her in her retraining could only be
36
37 used to purchase prescribed software which did not include WriteOnline[®]. It had been
38
39 planned to trial Dragon Naturally Speaking[®] voice recognition software with BM as another
40
41 means of addressing the issue of typing speed, and this was funded. Therefore she now
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43 proceeded to set this software up on her laptop at home. As she had good oral reading skills
44
45 BM was able to train the software to recognize her voice successfully, and so the entire focus
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47 of therapy was now on improving BM's spoken language production, not only to improve her
48
49 participation in discussions professionally and socially but also to input to Dragon[®] and thus
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51 improve her written language also.
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RESULTS

MILD APHASIA THERAPY

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3 Transcriptions of and scores for BM's post treatment CAT (Swinburn, et al., 2004) spoken
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5 and written picture descriptions are given in tables 3 and 4 respectively (insert tables 3 and 4
6
7 about here). These show that BM's spoken picture description improved post-treatment (see
8
9 figure 1 – insert figure 1 about here). This improvement was mainly as a result of an increase
10
11 in the number of appropriate information carrying words she produced, although rating of
12
13 syntactic variety increased to 4.5 post-treatment (from 3 and 3.5 at pre-treatment assessments
14
15 1 and 2 respectively). Her written picture description remained stable possibly because this
16
17 was a time limited task so that BM could not write more, especially given the use of her non-
18
19 dominant hand.
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24 Evidence of an improvement in BM's spoken language also came from her post-
25
26 treatment Cinderella narrative (see Appendix C). QPA analysis revealed that, pre-therapy,
27
28 BM had retold the Cinderella story using 329 narrative words in 41 complete sentences, and
29
30 had used 7 embeddings. In contrast, after therapy BM retold the same story using 835
31
32 narrative words in 74 complete sentences, and had used 29 embeddings. Figure 2 shows this
33
34 increased use of embedding reflected in a decrease in the production of simple unconnected
35
36 sentences which was statistically significant ($\chi^2=18.2824$, $p < 0.001$), as was the decrease in
37
38 compound sentences using "and" ($\chi^2 = 6.7431$, $p < 0.01$). This was accompanied by a
39
40 statistically significant increase in the production of compound sentences using other
41
42 connectives (use of "so" $\chi^2 = 9.4347$, $p < 0.005$; use of "whilst" $\chi^2 = 4.329$, $p < 0.05$) and an
43
44 increase in relative clause production which was not however significant ($\chi^2 = 2.1661$, $p = >$
45
46 0.05) (insert figure 2 about here). This is in line with changes predicted pre-treatment.
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51 The gains BM made with connectives were not matched by gains on macrostructural
52
53 measures. Pre therapy, the Cinderella narrative scored 3.7 for local coherence (Glosser &
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55 Deser, 1990); 4 for global coherence (Wright et al., 2010) , and BM used 8 story grammar
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MILD APHASIA THERAPY

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3 elements in her story (Ulatowska et al., 1983). Post therapy the results were similar: local
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5 coherence scored 3.8, global coherence scored 4, and 9 story grammar elements were used.
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9 Further evidence of improvements in spoken language production came from BM's
10 responses to the discussion tasks used as informal measures of her functional improvement
11 throughout the therapy programme. These included discussing films. In the last session of
12 treatment, BM was asked to describe one of her favourite films - Toy Story - dictating her
13 description into Dragon[®]. BM was directed not to edit this during production and did not
14
15 overtly look at the text produced, particularly as she was struggling to remember the plot (see
16
17 Appendix D for the text produced as a result). This is unedited so contains some lexical
18
19 recognition errors on the part of the software which are underlined. BM subsequently edited
20
21 what she had produced and brought this version to the next session (see Appendix E).
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24
25 Qualitatively, both samples show a decrease in the production of compound sentences using
26
27 "and" and simple unconnected sentences, and an increase in the production of complex
28
29 (relative) clauses. A type and token count of connectives used in the pre and post-treatment
30
31 film descriptions is given in Table 5 and demonstrates a five-fold increase in the types of
32
33 connectives used by BM at the end of treatment (insert table 5 about here) including ones
34
35 specifically targeted in impairment-based treatment. For example, she writes the sentence
36
37 "Woody was the leader of the pack, hence he brought all of the other toys together"
38
39 (paragraph 2, Appendix E) which contains an embedded clause linked to the main clause with
40
41 the connective 'hence', a connective explicitly targeted in therapy. It is acknowledged that
42
43 Toy Story is a simpler film to describe than Inception and that this may have affected the
44
45 language BM used. It is also acknowledged that the end of treatment film descriptions are
46
47 examples of aided language production and so are not directly comparable to the film
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49 description pre-treatment which was unaided. However, they are of interest because they
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51 demonstrate the functional improvement in BM's language production as a result of
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MILD APHASIA THERAPY

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3 impairment-based treatment combined with assistive software, and BM continued to use this
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5 combination of assistive software followed by a process of editing to successfully complete
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7 essays for her psychology degree which was one of her therapy goals.
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10
11 With regard to the wider impact of her improved spoken language, BM reported some
12
13 positive changes in response to the set of quality of life questions (Cruice et al., 2010) post-
14
15 treatment. For example, at the beginning of treatment BM had described the quality of her
16
17 life as “OK”, and at the end of treatment she described enjoying friends and family and how
18
19 close they were. She said that pre-treatment she had found it difficult to talk to someone she
20
21 didn’t know and had felt like “a little child” talking with her friends as she only contributed
22
23 about 10% to discussions. At the end of treatment she felt the balance was much more even,
24
25 because she was able to contribute about 40% to conversations and also reported that she felt
26
27 much better about talking to strangers. Finally, at the end of treatment BM reported that she
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29 was due to give a presentation at a conference the following week, and now felt confident
30
31 enough to do this using bullet points. This compared to a presentation she gave during the
32
33 pre-therapy assessment phase when she used a script.
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39 As stated earlier, it was difficult to find control tasks which were not at ceiling
40
41 because of the mild nature of BM’s difficulties. However, some subtests of the CAT on
42
43 which BM did not score 100% were repeated post-treatment. The results for these are given
44
45 in the table 6 (insert table 6 about here). BM’s performance on the CAT subtests shows some
46
47 stable performance, and some slight improvements. Given that she was already within normal
48
49 limits on all of these subtests at pre-treatment baseline 2, it is difficult to draw any firm
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51 conclusions from this pattern of performance. In addition, it was difficult to predict what
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53 might remain stable/unaffected by treatment given that we were working on both written and
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55 spoken output. This involved encouraging BM to be more ambitious in her language
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57 production (which might have been expected to also improve word retrieval) and involved
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MILD APHASIA THERAPY

her monitoring her own output closely (which might have been expected to also improve input).

DISCUSSION

This study provides some preliminary evidence to support the fact that impaired complex language production in mild aphasia can be treated. The study also demonstrates the profound impact that the so-called “mild” deficits of this type of aphasia can have on activity, participation and well-being, and that impairment-based treatment can do something to ameliorate this. The factors which may have contributed to the success of treatment will now be discussed.

The treatment approach used with BM was unashamedly eclectic because of the lack of published and evidence-based therapy programmes for mild aphasia. The main aim of therapy was to enable BM to use a greater variety of connectives and thus to increase sentence complexity with the ultimate aim of allowing her to convey a greater variety of meanings – “to be able to express my character more” as BM put it. The approaches used to achieve this raised her metalinguistic awareness of her linguistic deficits first of all at a microstructural level (e.g. colour coding). She was also encouraged to be more ambitious in her use of language and this was scaffolded by introducing a Story Grammar Outline later in therapy (e.g. Nippold, 2007; Whitworth, 2010) thereby increasing her metalinguistic awareness at a macrostructural level. Here therapy could also be argued to have targeted so-called “thinking for speaking” as advocated by Marshall and Cairns (2005).

BM made significant gains in terms of her use of targeted connectives but this improvement was not reflected in gains in the three macrostructural measures used here. However because scores on these measures were high pre-therapy, and the range of achievable scores was narrow (0-4 for both coherence measures), significant change could

MILD APHASIA THERAPY

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2
3 not be expected. Future research is needed to investigate the best methods for capturing
4
5 change at a macrostructural level. Nevertheless, it is perhaps this interaction of therapies
6
7 aimed at both a micro and macro linguistic levels that gave BM the tools to regain some of
8
9 the flexibility with language that she had prior to her aphasia. In combination with
10
11 encouragement and perhaps a little more confidence in her language skills, this may have had
12
13 something of a “snowball effect” so that BM produced not only a wider variety of
14
15 connectives and more complex sentences, but also produced more language, including more
16
17 content and elaboration in her narrative post treatment, as demonstrated by the linguistic
18
19 analysis. All of these approaches, both at the micro and macro structural level, merit further
20
21 investigation.
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26 The use of multimedia technology may have complemented these metalinguistic
27
28 approaches in a number of ways. Sentenceshaper[®] software may have addressed any mild
29
30 cognitive impairment present as it may “reduce the impact of processing limitations by
31
32 allowing repeated refreshing of working memory and by increasing the opportunity for
33
34 aphasic subjects to monitor their own speech” (Linebarger et al., 2007 p.53). Indeed, BM
35
36 commented explicitly on the monitoring benefits of Sentenceshaper[®]. Dragon[®] software may
37
38 have reinforced this by also supporting BM’s memory and self-monitoring, allowing her to
39
40 edit and elaborate her written output. The use of technology in treatment may have had
41
42 additional benefits similar to those reported in a number of other studies including increased
43
44 client satisfaction with therapy as a result of the client having autonomy in its delivery (e.g.
45
46 Wade, Mortley & Enderby, 2003).
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51 In relation to the use of MMT, it was disappointing that WriteOnline[®] software could
52
53 not be used because of funding issues. It seems possible that this may have been more
54
55 effective than Dragon[®] because 1) word banks and word prediction may have improved
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57 BM’s (albeit) mild word finding difficulties, and this may have had knock-on effects in terms
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MILD APHASIA THERAPY

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3 of “freeing up” processing capacity for other aspects of language production such as complex
4 sentence formation 2) the process of typing into WriteOnline[®] and producing written
5 language directly followed by the process of reading and editing the written text may have
6 complemented the same process which was occurring in relation to spoken language via
7 paper exercises and the use of SentenceShaper,[®] thus producing greater therapy effects.
8
9 Finally, BM reported some continued post-treatment difficulties with Dragon[®] making word
10 recognition errors due to her aphasia (as was evident in Appendix D and has been previously
11 reported for people with aphasia e.g. Estes and Bloom, 2011). This would not have occurred
12 with WriteOnline[®] and it would be useful to further explore the potential of this software to
13 assist people with aphasia to write.
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25 Another important factor underlying the effectiveness of treatment may have been
26 that therapy goals and the content of therapy materials were based on an intimate
27 understanding of the impact of BM’s aphasia on her life. Thus they were both functional and
28 motivating. This was achieved through detailed assessment and discussion with BM as part of
29 a collaborative approach to goal planning to set SMARTER goals (Hersh et al., 2012). Indeed
30 it was this collaborative process that revealed the pervasive and profound effect of BM’s
31 “mild” aphasia on her life – to the difficulties she experienced “expressing her character” in
32 her personal life and the problems with written language in her professional life and academic
33 studies - and consequently to impairment-based language therapy being at the core of the
34 therapy design. The approaches and materials used in therapy were chosen with particular
35 care to reflect and target her interests (e.g. popular TV shows), activities (e.g. writing essays)
36 and participation (e.g. discussing films), with a dual focus on spoken and written language
37 production (via Dragon) to mirror her therapy goals.
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55 The study has a number of limitations. These include the lack of follow up
56 assessments to monitor whether improvements observed immediately post-treatment were
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MILD APHASIA THERAPY

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3 maintained. This was as a result of the treating clinician (first author) emigrating before the
4
5 study was complete. Limitations also arise from the lack of published, standardised
6
7 assessments suitable for this client group such that the study largely relied on informal
8
9 outcome measures to detect change. It was also difficult to find control measures which were
10
11 not at ceiling level for our client, which means they may not have been sensitive to any
12
13 spontaneous recovery which may have occurred.
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17 In relation to the assessment of mild aphasia, one challenge is to develop tasks which
18
19 require the use of complex language and thus are sensitive to the high level difficulties of
20
21 mild aphasia. It is not clear that these conditions are always met by tests we might currently
22
23 use. Indeed, this may well have been the case in relation to BM's CAT picture descriptions
24
25 which showed little change post treatment, whereas the (presumably more demanding and
26
27 motivating) Cinderella narrative did. In assessing a person with mild aphasia we therefore
28
29 need to consider whether the tasks we use are likely to elicit complex language and thus
30
31 expose the deficits we are searching for, an issue also raised by Armstrong et al., (2012).
32
33

34
35 Another challenge is to develop tasks which are sensitive to the potential interaction
36
37 between linguistic and cognitive deficits which may underlie the communication impairment
38
39 observed in mild aphasia. The pioneering work of Murray et al. (1998) points to how this
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41 might be achieved. They demonstrated the negative impact of divided attention on the
42
43 language production of participants with aphasia. Conducting assessments under conditions
44
45 which mimic those cited by people with aphasia as problematic (e.g. communicating against
46
47 background noise) may be informative in exposing difficulties masked under normal test
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49 conditions.
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53 An additional limitation arises from the use of an eclectic approach to treatment. This
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55 meant it was not possible to identify which elements of the treatment were (most) effective.
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57 There is a clear need for further research to establish this, including investigation of
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MILD APHASIA THERAPY

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3 impairment-based approaches such as those used here to target our client's linguistic deficits,
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5 impairment-based treatment of cognitive deficits (e.g. Murray et al., 2006) and indirect
6
7 approaches arising from the use of conversation analysis and systemic functional linguistics
8
9 currently being explored by Armstrong and colleagues (Armstrong et al., 2013; Fox et al.,
10
11 2009). The potential for multimedia technologies to help people with mild aphasia is also
12
13 under-researched in terms of **technologies which are specifically designed for people with**
14
15 **aphasia such as SentenceShaper[®] and those which are not such as Dragon[®] and**
16
17 **WriteOnline[®].**
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21
22 Finally, it seems fitting to end with the thoughts of BM herself about her treatment:
23
24 this study would not have been possible without her immense courage, insight and generosity
25
26 of spirit which taught the clinicians and students who worked with her much about the lived
27
28 experience of mild aphasia.
29

30
31 "The ideas that you gave me were just what I needed! I haven't been able to do that much on
32
33 it as yet because I've been busy, however, what little I have done on it has worked really well.
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35 I found it challenging on one part but I felt a sense of accomplishment being able re-jig and
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37 put my own interpretation on the sentences that I couldn't have done a year, or even 6 months
38
39 ago. And I know if I 'put my own spin' on the sentences for this whole summer, then
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41 hopefully, I should be more prepared for my Uni course which starts in oct at the least if not
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43 many other things as well!" (Sent from her Blackberry).
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MILD APHASIA THERAPY

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MILD APHASIA THERAPY

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MILD APHASIA THERAPY

APPENDIX A: TRANSCRIPTION OF BM'S PRE-TREATMENT CINDERELLA

NARRATIVE*

1. There was a girl ~~called sti~~ called Cinderella
2. ~~and~~ she lived with her dad
3. ~~and~~ he died
4. ~~and he had~~ she had a step mum with two step sisters *who* also lived there ~~but~~
5. *when* her dad died her step-mum looked after them all ~~and~~
6. her step-mum was nice to those two sisters *but* wasn't nice to her
7. ~~and~~ she was like a like a servant for them
8. ~~so she she~~ she grew up
9. ~~and whilst being a servant and~~ she had a kingdom ~~and everything~~
10. ~~but~~ she was a servant in it
11. ~~and~~ one day a man came to the house to say *that* you are all invited ~~to~~ to the prince's ball like thing *yeah*
12. you should come
13. ~~and~~ he's going to pick a princess ~~and everything like that~~
14. ~~and yeah~~ the step sisters found out about it and were excited about it and everything and were choosing their outfits ~~and everything like that~~
15. ~~and oh my God yeah but~~ Cinderella couldn't go *because* her step mother locked her in the cellar or something
16. ~~and yeah~~ she wanted to go
17. ~~but~~ she didn't ~~didn't~~ have enough money to get a new outfit or anything like that
18. ~~and so~~ this fairy godmother magically appeared to her
19. ~~and~~ said you shall go to the ball
20. ~~and~~ she dressed her in an outfit ~~and everything~~
21. ~~and she~~ they had a big pumpkin *like*
22. she made it into a carriage

MILD APHASIA THERAPY

- 1
2
3 23. **and** she made the mice *that* were in the cellar into horses
4
5 24. **and** she went off into the night to the ball
6
7 25. ~~yeah the prince~~ the step mother and step sisters and the prince couldn't recognise her
8
9 *because* she looked so pretty
10
11 26. **and** she looked so made-up
12
13 27. **and** he really liked her
14
15 28. ~~but she but~~ he didn't know her name or anything like that
16
17 29. ~~so when her~~ at 12 o'clock the spell ~~had broke had~~ was going to finish
18
19 30. ~~and so~~ she ran out of the ball ~~£~~
20
21 31. ~~to so~~ she wouldn't ~~she wouldn't~~ be seen to ~~to~~ be like ~~a~~ a servant in the ball
22
23 32. ~~so~~ she ran out
24
25 33. **and** she left her ~~glass~~ glass slipper behind
26
27 34. **and** ~~so~~ the prince ran after her
28
29 35. ~~but she but~~ she ran too fast or something
30
31 36. **and** the prince only found her glass slipper
32
33 37. ~~so~~ the next day ~~he~~ he like searched ~~for~~ for the person *who* wore the glass slipper **and**
34
35 *everything*
36
37 38. **and** her two sip' sisters tried them on
38
39 39. ~~but they were~~ their feet were too big
40
41 40. **and** ~~finally~~ Cinderella tried it on
42
43 41. **and** it fit
44
45 42. **and** ~~yeah and the rest is history~~

47 *The crossed through words are non-narrative utterances (as defined in Saffran, Berndt &
48 Schwartz 1989). Use of "and" is emboldened to highlight the lack of variety. The use of
49 other connectives and relative pronouns is italicized.
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MILD APHASIA THERAPY

APPENDIX B: TRANSCRIPTION OF PRE-TREATMENT FILM REVIEW

BM verbally reviewed this film without the aid of any software.

Inception*

erm I last saw Inception about yeah, that totally mind boggling yeah I sawed it about 2 weeks ago on DVD it's about yeah erm erm yeah it's hard to describe *first of all* **and** yeah basically there is a Leonardo Decaprio is in it **and** he is playing a umm a dream erm

erm it's all about erm getting it's all about these dreams erm we are all people *who* have dreams

and erm there is a dream within a dream **and** *then* there is a dream within a dream

and *then* a dream within a dream **and** erm yeah Leonardo Decaprio is playing the erm the erm the controller, not controller exactly *but* erm, he is the head of the dream or something erm **and** he is like a he can like change the dreams or something like that.. erm yeah, its sort of all about that really erm yeah

erm no not exactly *but* like a erm underneath the God like character erm like a prophet of something like that anyway erm yeah he yeah he's in between us and erm the God like character, so to speak erm *so* it's all about that that's the only way I can explain it

* Use of "and" is emboldened to highlight the lack of variety. The use of other connectives and relative pronouns is italicized.

MILD APHASIA THERAPY

APPENDIX C: TRANSCRIPTION OF A SAMPLE OF BM'S POST-TREATMENT

CINDERELLA NARRATIVE*

1. ~~So~~ Cinderella was ~~set in a~~ set in a faraway land of magical beauty
2. ~~and~~ the characters were Cinderella ~~obviously~~ and also her step mother and her two ugly step sisters and the prince ~~and yeah that was it really~~
3. ~~and~~ the plot was Cinderella and her two step sisters were living in a house
4. ~~and~~ she had a father and a step mum *who* lived there ~~also~~
5. her father died of a heart attack or something else
6. ~~and so~~ she was bought up by her step mum and ~~yeah~~ her two step sisters
7. ~~and she was~~ she was made into being a servant for her two step sisters and her step mum *because* she was prettier than them
8. ~~and~~ she was ~~she was~~ more caring than them
9. ~~and~~ they didn't like her *because* they didn't see her as their family
10. ~~and so~~ she was made to be a servant
11. ~~and~~ she did all the housework and all the yard work and all the cooking and cleaning and stuff like that ~~anyway~~
12. ~~and~~ she made friends with all the other servants and with the little mice and with the birds and everything else with all the animals ~~yeah~~
13. ~~until and~~ that was her life *until* she was about 18 or something ~~yeah~~
14. ~~and and then the~~ there was this prince *who* was about 18 or 20 or 21 or something *who* was a little bit older than her *who* had never heard of her or her sisters or her step sisters or anything like that
15. ~~but~~ he was looking for a bride
16. ~~and so he~~ he was throwing a big wedding a big wedding a big party
17. ~~and~~ he wanted to invite ~~all the~~ all the young ladies ~~who were ready for marry yeah~~ *who were ready for to to* *who* were ready to be approached to get married ~~or something like that anyway~~
18. ~~and so~~ there were hundreds of young ladies in there
19. ~~and~~ *whilst* this was all going on *before* the party she had met the prince ~~I can't remember the story~~

MILD APHASIA THERAPY

- 1
2
3 20. she met the prince *whilst* she was wearing her sister's clothes
4
5 21. ~~so she was~~ she was prim and proper and stuff like that
6
7 22. ~~she showed~~ she showed the prince *that* not only was she prim and proper and
8 everything she was also caring and kind and lovely
9
10 23. she had a sense of humour and everything
11
12 24. ~~and~~ he eventually ~~she~~ fell in love with her on the first sighting of her
13
14 25. ~~but~~ she didn't tell him her name
15
16 26. ~~so~~ he went to ~~all the~~ all the young ladies ~~and~~ to find her
17
18 27. ~~and~~ he didn't
19
20 28. ~~and then when~~ the party was ~~was~~ approaching ~~yeah there were like there were so her~~
21 sisters ~~so~~ her two ugly step sisters were very excited about the party *because* they
22 thought *that* they would obviously ~~be~~ be set for marriage to the prince
23
24 29. ~~and no yeah she yeah and~~ there was no doubt about it
25
26 30. ~~and so~~ they got ready and dressed and everything
27
28 31. ~~and she and~~ the invitation said all the women of the house
29
30 32. ~~so that~~ she was also invited
31
32 33. ~~but~~ her step mum didn't let her go
33
34 34. she locked her in the store room cupboard and wouldn't let her out *until* the party was
35 over
36
37 35. ~~and so they went~~ her step mum and her step sister went to the party ~~yeah~~
38
39 36. ~~and~~ she stayed at home
40
41 37. ~~but~~ the servants and the animals and everything was saying to her to go to the party
42 and everything
43
44 38. ~~and~~ she actually had three fairy godmothers *who* came to her
45
46 39. ~~and she said~~ I have nothing to wear
47
48 40. ~~as they they~~ they gave her something to wear
49
50 41. it was a lovely dress
51
52 42. ~~and she said I have~~ I have nowhere to go there
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MILD APHASIA THERAPY

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2
3 43. ~~and so and so they gave her~~ there were like three little mice *who* were miraculously
4 turned into three horses by the fairy god mothers
5
6 44. ~~and the there was a pumpkin~~ there was a huge pumpkin *which* was actually turned
7 into a carriage
8
9 45. ~~and she said I have no nothing~~ no shoes to wear as well
10
11 46. ~~and so~~ they gave her two glass slippers ~~yeah~~
12
13 47. ~~so~~ she was all ready and set and everything
14
15 48. ~~but~~ the spell would end at midnight
16
17 49. ~~so yeah she said yes so she says yes~~ I'll be back by midnight
18
19 50. ~~so~~ she went along to the prince's house to the prince's palace
20
21 51. ~~and whilst he was looking at he was~~ he was looking or thought about all the young
22 ladies *who* were there he couldn't stop thinking about the Cinderella *which* he had met
23 previously
24
25 52. ~~and once she once she~~ got into the palace he knew *that* it was her he wanted to be
26 with her ~~yeah~~
27
28 53. he fell in love with her
29
30 54. ~~and~~ he wanted to be with her forever
31
32 55. ~~but by then~~ it was 12 o'clock at night
33
34 56. ~~and~~ she had to go
35
36 57. ~~so~~ she went
37
38 58. ~~but~~ she went down the palace steps and everything on the outside
39
40 59. ~~but then she~~ she forgot her glass slipper ~~during her~~ *during* her quick paced out of there
41
42 60. ~~so~~ that was the only thing he had to go on *that* she was wearing beautiful glass
43 slippers and the shoe size
44
45 61. ~~and so in the morning the next day~~ her step mother and her sister and her step sisters
46 didn't know that she'd gone out
47
48 62. they thought *that* ~~she~~ she stayed at home in the locked cupboard and everything
49
50 63. ~~but yeah~~ the prince ~~came~~ went to every young woman's house to find her
51
52 64. ~~and so~~ he took the glass slipper with him
53
54 65. ~~and~~ he tried it on every young lady's foot
55
56
57
58
59
60

MILD APHASIA THERAPY

1
2
3 66. **and** it didn't fit any of them

4
5 67. **and** *eventually* he tried it on her two step sisters

6
7 68. **and** their feet were too big

8
9 69. *but* ~~there was a little~~ he thought there was a ~~little servant girl a little servant woman a~~
10 little servant young lady *who* was there

11
12 70. **and** ~~so~~ he tried it on her as well

13
14 71. **and** it fit

15
16 72. **and** ~~so~~ he knew that she was the one ~~yeah the rest is history (laughs)~~

17
18 73. **and** ~~so they all~~ he married her

19
20 74. **and** ~~they lived happily ever after and~~ the step mum and the step sisters were unhappy
21 to say the least

22
23 75. *but* they just had to deal with it

24
25 *The crossed through words are non-narrative utterances (as defined in Saffran et al 1989).

26
27 Use of "and" is emboldened to highlight the lack of variety. The use of other connectives and
28
29 relative pronouns is italicized.
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MILD APHASIA THERAPY

APPENDIX D: TRANSCRIPTION OF POST-TREATMENT SPOKEN DESCRIPTION

This test represents the immediate output from Dragon voice recognition software, before BM made any edits

Toy story *

The setting, or where it took place, was in this little boy's, called Andy, bedroom.

The setting *where all the Toy's came to life* was in a little boy's, called Andy, bedroom. Andy was about 6 or 7 news old, **and** he had a little sister *which was about 2 or 3 years old*, **and** he had a mom and dad. *But* the story is not really about them. The main characters where his Toys.

First of all there was Woody, *who was a cowboy action figure*, **and** Andy's favourite toy *since he was a baby*. *And then* there was Mr Potato head, a dinosaur, Little Bo Peep, a dog *which was also a slinky*, and many others. They all would come to life *when the humans were not around* **and** they all had their own individual personalities. Woody was the leader of the pack *so* he showed more confidence and leadership and intellectual skills **and** he was just a nice guy.

However then on Andy's 8th birthday he had a big party. **And** he invited a lot of his friends **and** they brought with them a whole lot of presents. The Toys were anxious about the presents. *Because* they thought *that they were going to be replaced*. *So* there was a mission to get all of the Army guys to do a surveillance on the presents, **and** it was like all kinds of lunchboxes, and towels, and a telescope, and is games, **and** none of them seem to be replaced. *But then* all of a sudden his mom brought a large present towards them **and** that ended up being Buzz light year!

MILD APHASIA THERAPY

1
2
3 Buzz Light year was a astronaut action figure *who had technology up to the Ying Yang*, like
4
5 he had a laser beam, and he had wings *that could fly* etc **and** at the start he got along great
6
7 with the toys **and** he as well showed much leadership **and** confidence **and** high self-esteem
8
9 **and** is he was in nice guy also. And Woody was threatened. *Because* Woody wasn't
10
11 technologically advanced. Woody only had a string on his back *which when you pulled it* he
12
13 would say a few words, **and** that was it.

14
15
16
17 There was a yard sale at their house. **And** by mistake bars and Woody got solves to the next
18
19 neighbour's house. Sid. *Now* said was a little boy *who was about Andy's age* barks he'll lose
20
21 dangerous to say the least. He liked to blow stuff up, he liked diamond mine is **and** fireworks
22
23 **and** fire. He is set especially liked to blow his toys up. **And** bars and Woody when no
24
25 exception. *So* they were scared. Byatt's bar at *but* in actual fact they bonded over their
26
27 nervousness about is being blown up, **and** they both realised *that Andy know that there was*
28
29 *room in Naas for them both*. **And** they eventually, after a lot of mishaps, got outs of the net so
30
31 neighbours house **and** got back home.

32
33
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36
37
38
39 *So* I think toy story has lasted for 10 years or more no 10 or 20 years or more *because*
40
41 underneath it all it is all about friendship. About friendship and loyalty and insecurity **and**
42
43 coming through it all **and** being stronger. **And** it also has lots of humour, it is multilayered, it
44
45 has magnificent effects like CGI, **and** the actors *who play Woody and Andy Woody and Buzz*
46
47 are just brilliant. They really made the characters come to life.

48
49
50 * Use of "and" is emboldened to highlight the lack of variety. The use of other connectives
51
52 and relative pronouns is italicized.
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MILD APHASIA THERAPY

APPENDIX E: TRANSCRIPTION OF POST-TREATMENT SPOKEN DESCRIPTION

This test represents the output from Dragon voice recognition software which has subsequently been edited by BM

Toy story *

The place *where all the Toy's came to life*, was in a little boy's, called Andy, bedroom. Andy was about 6 or 7 years old, he had a little sister *who was about 2 or 3*, and he had a mum and dad. *But* the story is not really about them. The main characters were his Toys.

First of all there was Woody, *who was a cowboy action figure*, and Andy's favourite toy *since he was a baby*. *And then* there was Mr Potato head, a dinosaur, Little Bo Peep, a dog *that was also a slinky*, and many others. They all came to life *when the humans were not around* and each toy would have their very own personalities, characteristics and sense of humour. Woody was the leader of the pack, *hence he brought all of the other toys together* and they were working towards the same goal. He showed much leadership and authoritarian skills *as well as* sensitivity and he was just an all round nice guy.

On his 8th birthday Andy decided to have a big party. *So* he invited a lot of his friends and *consequently* they brought with them a whole heap of presents. *However* the toys had always been anxious about getting new presents *because if Andy got given new toys* they were afraid *that they were going to be replaced*. And so they were on a mission. There mission was to get all the Army guys to do a secret surveillance on the presents! *However* they needn't have worried *because the presents were anything but toys for example it was all kinds of lunchboxes, games, and one kid even brought a telescope!* *So* none of them seem to be replaced. *But then*, all of a sudden, his mum brought a large present towards him and that ended up being Buzz light year!

MILD APHASIA THERAPY

1
2
3 Buzz Light-year was an astronaut action figure *who had technology up to the Ying Yang*. He
4
5 had a laser beam, an open and shut helmet *as well as wings that could fly*, and at the start he
6
7 got along great with all the other toys as well. *Additionally*, he as well showed much
8
9 leadership and high self-esteem *and also* he showed that he as well was a really nice guy.
10
11 *Because* of that Woody felt threatened. Woody wasn't as technologically advanced, *in fact* he
12
13 only had a string on his back *which when you pulled it* he would say a few words, and that
14
15 was it, *so* its fair to say that he was a bit jealous.

16
17
18
19 There was a yard sale at Andy's house. And in all the upheaval by mistake Buzz and Woody
20
21 got sold to the next-door neighbour's house, they got sold to a boy named Sid. *Now* Sid was a
22
23 little boy *who was about Andy's age* but he was dangerous to say the least. Dangerous in the
24
25 way *that he liked to blow stuff up*, he liked anything *that would set something alight* such as
26
27 dynamite or fireworks etc. and he especially liked to blow up his toys, **and** Buzz and Woody
28
29 were no exception. *So* they were terrified *as anyone would be in that situation*. *But in actual*
30
31 *fact* they bonded over their mutual apprehension about being blown up, and they both
32
33 eventually realised *that there was room enough for them both in Andy's affections*.
34
35 *Additionally*, after an awful lot of mishaps, they got out of the next-door neighbour's house
36
37 and got back home.

38
39
40
41
42 I think toy story has lasted for 10 or 20 years or more *because underneath it all*, it about
43
44 friendship. It's about camaraderie and loyalty and also insecurity *but in the end* coming
45
46 through all the challenges and obstacles and being stronger for it. *Furthermore*, it also has
47
48 lots of humour! Multilayered humour, *so that* people of all ages can like it and be impressed
49
50 by it. *In addition*, it has magnificent special effects such as CGI, and the actors who play
51
52 Woody and Buzz are just brilliant. They really made the characters come to life.
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MILD APHASIA THERAPY

TABLE 1 Comprehensive Aphasia Test Spoken Picture Descriptions Pre-treatment

| CAT Spoken Picture Description Pre-Treatment 1 | | | | |
|--|--|---|---|---|
| Score (A – B) + C + D + E = 39 (T score = 62) | | | | |
| A Appropriate ICWs = 29 (T score = 61) | B Inappropriate ICWs = 1 (T score = 56) | C Syntactic Variety = 3 (T score = 53**) | D Grammatical Well-Formedness = 6 (T score = 64) | E Speed = 2 (T score = 48**) |
| <p>*The bald man is sleeping on the sofa and erm the books on the shelf are falling on him and the baby with a car is crying erm and the cat on the shelf is erm looking at the fishbowl underneath it on the shelf as well and there is a plant on the shelf erm above erm above the fishbowl and erm there is a stereo erm on the shelf erm below the fishbowl and erm the man is erm putting his feet up on a a table erm on some magazines and erm he had a erm he had a tea or coffee erm there is a book erm under the table on the lower shelf</p> | | | | |
| CAT Spoken Picture Description Pre-Treatment 2 | | | | |
| Score (A – B) + C + D + E = 39.5 (T score = 63) | | | | |
| A Appropriate ICWs = 29 (T score = 61) | B Inappropriate ICWs = 1 (T score = 56) | C Syntactic Variety = 3.5 (T score = 58) | D Grammatical Well-Formedness = 6 (T score = 64) | E Speed = 2 (T score = 48**) |

MILD APHASIA THERAPY

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3 Erm there are three shelves erm a cat is on the shelf erm on the /dɒp/ on the top shelf erm
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5 **and** there are books falling off the top shelf as well erm **and** they are erm falling on a
6
7 man on a bald man *who* is sleeping on a couch erm he is wearing a tie erm he is putting
8
9 his feet up on the table erm on a coffee table erm there is a glass on the coffee table **and**
10
11 there is a book underneath it **and** erm he is looking after a young boy *who* is playing with
12
13 a car **and** erm there is also erm on the second shelf erm there is also a fishbowl **and** on
14
15 the third shelf there is also a big hi-fi system as well **and** yeah on the top shelf there is a
16
17 plant a potted plant hmm the man is wearing a shirt and tie as well **and** that's about it
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22 ** outside of normal limits for people without aphasia
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MILD APHASIA THERAPY

TABLE 2 Comprehensive Aphasia Test Written Picture Description Pre-treatment

| | | |
|---|--|---|
| CAT Written Picture Description Pre-Treatment 1 | | |
| Score (A – B) + C = 20 (T score = 66) | | |
| A Appropriate ICWs = 16 (T score = 65) | B Inappropriate ICWs = 2 (T score = 38) | C Grammatical Well-Formedness = 6 (T score = 70) |
| *The bald man is sleeping on the couch. There are 3 shelves. On the top shelf there is a cat <i>which</i> is touching some water in the fishbowl below it and there are a few books <i>which</i> are falling on the bald man. | | |
| CAT Written Picture Description Pre-Treatment 2 | | |
| Score (A – B) + C = 22 (T score = 67) | | |
| A Appropriate ICWs = 17 (T score = 66) | B Inappropriate ICWs = 0 (T score = 57) | C Grammatical Well-Formedness = 5 (T score = 62) |
| There are three shelves in this picture. On the first shelf is a plant, a cat and some books <i>which</i> are toppling over. On the second shelf there is a goldfish bowl and on the third shelf there is hi-fi system. There is a bald man sleeping on a | | |

*Overuse of “and” is emboldened and the use of “who” to create a relative clause is italicised

MILD APHASIA THERAPY

TABLE 3 Comprehensive Aphasia Test Spoken Picture Description Post-treatment

| Score (A – B) + C + D + E = 48.5 (T score = 68) | | | | |
|---|---------------------------|------------------------------|------------------------------------|----------------------|
| A Appropriate | B Inappropriate | C Syntactic | D Grammatical | E Speed |
| ICWs = 38 (T score = 67) | ICWs = 2 (T score = 54**) | Variety = 4.5 (T score = 63) | Well-Formedness = 6 (T score = 64) | = 2 (T score = 48**) |
| <p>erm there are three shelves and on the first shelf there is a plant and next to it is a cat er <i>who</i> is bending down to look at a fishbowl erm and there are books erm falling erm and on the second shelf there is a fishbowl <i>which</i> the cat above is bending down to look at and on the third shelf erm there is a huge huge stereo erm and next to the bookshelf there is a man sitting in a chair erm sitting in sofa erm and he and he has some books on the shelf falling on top of him <i>but</i> he's asleep erm and he's sitting down lying back and putting his feet up on the erm table beside the chair and yeah the table beside the chair erm is he is putting his feet up on the er on the two pieces of paper anyway erm and he has a book under the second level of it and also has coffee cup on a coaster and then on the other side there's a baby <i>who</i> is playing with a car erm with a car erm on the floor</p> | | | | |

*“Overuse of “and” to connect sentences (into compound ones) is emboldened. The use of other connectives, relative and dependent clauses is italicised”

**Outside of normal limits for people without aphasia.

MILD APHASIA THERAPY

TABLE 4 Comprehensive Aphasia Test Written Picture Description Post-treatment

| | | |
|---|--|---|
| Score (A – B) + C = 22 (T score = 67) | | |
| A Appropriate ICWs = 16 (T score = 65) | B Inappropriate ICWs = 0 (T score = 57) | C Grammatical Well-Formedness = 6 (T score = 70) |
| <p>In the picture there are 3 shelves. On the first shelf there is a plant and next to it there is a cat. The cat is leaning over the second shelf <i>where</i> there is a fishbowl <i>with little fish in it</i> .</p> <p>On the top shelf there is also a heap of books.</p> | | |

* “Overuse of “and” to connect sentences (into compound ones) is emboldened. The use of other connectives, relative and dependent clauses is italicised”

MILD APHASIA THERAPY

TABLE 5 Pre and post-treatment film descriptions: connectives types and tokens count

| | Pre-treatment Film Description | Post-treatment Film Description Unedited | Post-treatment Film Description Edited |
|---------------------|---|---|---|
| first of all | 1 | | 1 |
| then | 2 | | |
| and then | | 1 | 1 |
| and also | | | 1 |
| but | 2 | 2 | 1 |
| but then | | 1 | 1 |
| so | 1 | 2 | 3 |
| so that | | | 1 |
| however | | 1 | 2 |
| because | | 3 | 1 |
| now | | 1 | 1 |
| furthermore | | | 1 |
| consequently | | | 1 |
| on his 8th birthday | | | 1 |

MILD APHASIA THERAPY

| | | | |
|-----------------------|----------|-----------|-----------|
| as well as | | | 1 |
| in fact | | | 1 |
| but in actual fact | | | 1 |
| additionally | | | 1 |
| in addition | | | 1 |
| because underneath it | | | 1 |
| all | | | |
| but in the end | | | 1 |
| TYPES | 4 | 7 | 20 |
| TOKENS | 6 | 11 | 23 |

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TABLE 6 Pre and post-treatment control measures

| CAT subtest | Pre-treatment 1 | | Pre-treatment 2 | | Post-treatment 3 | |
|--------------------------------|-----------------|---------|-----------------|---------|------------------|---------|
| | Raw Score | T score | Raw Score | T score | Raw Score | T score |
| Word fluency | 24 | 68 | 30 | 71 | 28 | 70 |
| Comprehension of spoken words | 26 | 53 | 28 | 58 | 28 | 58 |
| Comprehension of written words | 27 | 53* | 29 | 59 | 30 | 65 |
| Naming Objects | 41 | 60* | 44 | 62 | 48 | 66 |

MILD APHASIA THERAPY

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3 **Figure 1.** Pre and post-treatment CAT Spoken Picture Description Scores
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6 **Figure 2.** Simple and complex sentence production in Cinderella narratives pre and post-
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8 treatment.
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Footnotes

1 Our parentheses

2 BM occasionally produced sentences including a relative clause (e.g. utterance 23 of her
3 Cinderella narrative, Appendix A) and this could also have been a therapy target. However,
4 we felt that encouraging the use of complex sentence production would be more functionally
5 useful for BM at this stage. (Relative clauses were treated in a subsequent phase of therapy
6 using the Complexity Account of Therapy Effectiveness [CATE] approach [Thompson,
7 Shapiro, Kiran, & Sobecks, 2003] not reported here).

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22 3 A therapy idea initially explored with BM was to use mind maps to help her organise her
23 ideas prior to formulating the language to express them (see Whitworth, 2010). It was
24 hypothesised that this would assist by bringing to conscious awareness the language planning
25 process and that this might also, as a result, reduce her processing load. It was also theorised
26 that mind maps might enable her to better structure her argument and produce a more
27 elaborate and ambitious contribution to the discussion, as was her goal. However in
28 discussing mind maps with BM, she felt that she knew what she wanted to say i.e. could
29 formulate ideas, and it was translating these into sentences speedily that presented the
30 difficulty. She therefore felt that mind maps would not be useful to her. She agreed however
31 to reconsider this approach if we felt it might be beneficial as therapy progressed.
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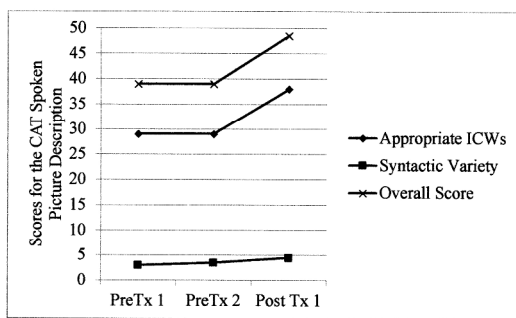


Figure 1. Pre and post-treatment CAT Spoken Picture Description Scores
297x420mm (300 x 300 DPI)

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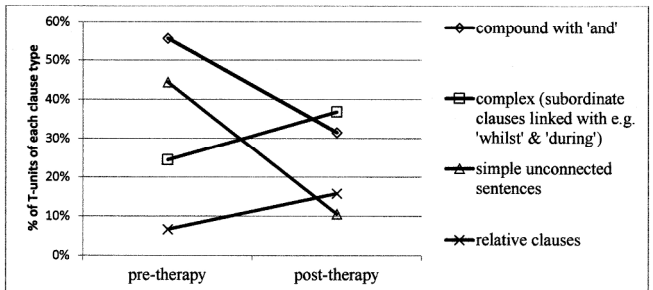


Figure 2. Simple and complex sentence production in Cinderella narratives pre and post-treatment.
297x420mm (300 x 300 DPI)