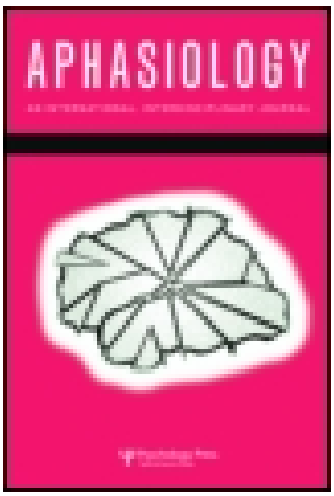

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Case Study

Aiding chronic written language expression difficulties: A case study

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Abstract

This paper describes some progress made in helping a young aphasic man (MD) to overcome what had appeared to be intractable written language expression difficulties, which continued to be significant for him. Traditional therapy methods based on cognitive neuropsychological assessment had failed to help MD to generalize improvement in his spelling particularly, but not exclusively, of longer and irregular words. Both a splint which allowed him to use his dominant hand for writing directly onto a computer screen and a simple word-processing programme with synthesized auditory feedback and lexical and grammatical prediction (Write:OutLoud® and Co:Writer®) enabled him to produce more normal written output (increased quantity and more normal quality). The discussion also focuses on how effectiveness of language therapy can be measured in this man with chronic aphasia.

Introduction

We present in this paper a young man with chronic aphasia, MD, who experienced (unusually in the current climate of health care) long-term speech and language therapy and re-referral at 9 years post-onset. His ability to benefit at that late stage from two very different 'aids' to writing, one physical and one linguistic, merits discussion.

Two clinical fora in *Aphasiology* are pertinent to this case and indeed the subject of one from 1995 which examined 'left and right hand productions in aphasic agraphic hemiplegics' motivated one aspect of the interventions described below. The second, more recent forum in 1998 considered 'discharge dilemmas in chronic aphasia' and presents two alternative models of aphasia therapy, one medically- and the other socially-based. Issues raised in that forum are recognized in the present discussion.

Some brief comments follow before MD and his most recent therapy are discussed. These relate to the idea that some aphasic people can write better with their dominant hand than their non-dominant hand, to the use of computers in aphasia therapy and finally to the use of single cases in efficacy research.

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Prosthesis for the dominant hand promotes 'better' written output

There has been interest for at least 15 years in the difference in written output produced by people with severe or global aphasia when using their dominant but hemiplegic arm or their non-dominant hand (Brown *et al*. 1983, Leischner 1983). Lorch (1995) reviews the relevant literature in detail and examines theoretical explanations for the side difference, none of which adequately explain the phenomenon. This study will augment already-published case studies and answers Sasanuma's (1995) call for more detailed studies of people with mild or moderate aphasic agraphia. However it again reports on a case who was able to benefit from using his dominant hand rather than on someone who was not.

Computers in aphasia therapy

Following early enthusiasm in the 1980s and despite the excellent work being undertaken by the Aphasia Computer Team at Frenchay Hospital, Bristol, and by others, computer technology has so far failed to live up to therapeutic hopes for the general population of people with aphasia and examples of effective computer-based treatment have been sparse in the literature. The development of much more sophisticated software and the continuing reduction in the cost of hardware and software may again hold promise for the aphasia clinic. In particular the availability of auditory feedback, lexical and grammatical prediction, spell-checkers and Internet access should encourage aphasiologists to re-examine the potential of computer technology for their clients. For example, Bluestone (1998) described a case whose life developed from social isolation in a residential home setting to relative independence with the help of the Internet.

The predictive software used to aid MD's spelling and written expression is another example of how computer technology has advanced and how commercially available programmes can now be functional aids rather than merely presenting a limited range of traditional drill-and-practice exercises in another modality. A positive feature of such technology is its 'normality' when compared to a range of augmentative and alternative communication devices for people with aphasia which are under development (e.g. Rostron *et al*. 1996, Waller *et al*. 1998). King and Hux (1995) provide an example of language gains. They describe a single case whose spelling error rate decreased when using a talking word processing programme (Write:OutLoud®, which MD also used in combination with a predictive programme, Co:Writer®).

Efficacy of therapy and single cases

The effectiveness of speech and language therapy for people with aphasia continues to be a very live topic and its measurement has to some extent transferred from group studies to single case studies. Enderby and Emerson (1995, p. 33) review the literature in aphasia therapy effectiveness but state that 'what constitutes a positive outcome has yet to be defined'. One of their concluding statements is also very pertinent to the present discussion of MD:

> All workers in the field are faced with the question as to what constitutes good recovery, and whilst there are many standardized tests of language function, these may not inform us regarding the efficiency, effectiveness, naturalness of a person's communication and his or her ability to cope with life. (Enderby and Emerson 1995, p. 28)

As will be seen, on one standardized language measure, MD's language could be described as recovered. This test result fails to account however for MD's continuing difficulties in regaining full communicative functioning. We recognize that single cases 'will [only] provide evidence for the efficacy of a specific treatment with a specific aphasic patient' (Wertz 1995, p. 329) but hope that this report of late intervention will show change that Wertz calls of 'clinical significance' (Wertz 1995, p. 334).

Aims of the present study

We sought to discover whether MD's written language expression could be improved under two separate conditions: (1) using his dominant but hemiplegic arm and hand; and (2) with the aid of a word-processing programme which provided auditory feedback and word and grammatical prediction. In addition, we discuss MD's mainly non-aphasic problems which seem to be contributing to his unemployability and the problem of how to measure any effectiveness of therapy in his case so late post-onset.

Case information

Relevant medical history

In 1982 MD (date of birth: 15 March 1963) had a subarachnoid haemorrhage with no deficit. At that time total cerebral angiography revealed a left parietal arteriovenous malformation (AVM), filling predominantly from the middle cerebral and vertebral arteries. It was considered unsuitable for radiotherapy embolization. He collapsed on 4 December 1986. The CT scan showed a 'massive left hemisphere clot with an old thrombosed AVM'. The intracerebral haematoma was surgically removed and he was ventilated and tracheostomized. In January 1987 a ventriculoperitoneal shunt was inserted. MD was left with aphasia, right hemiplegia more marked in his arm than leg, right VII weakness, right hemianopia and drug-controlled epilepsy.

A sketch of language recovery and previous therapy

Western Aphasia Battery (WAB)(Kertsez 1982) results over an 8-year period document MD's language recovery (see figure 1). There was early noteworthy improvement in all modalities, with the subsections of spontaneous speech, repetition and naming reaching near ceiling within two years of his neurosurgery. Auditory verbal comprehension was slower to recover–it was not until 7 years post-onset of aphasia that MD scored almost 90% in that subsection. Reading and writing scores (although not always recorded) did not exceed 83%, with the writing subtests accounting for the depleted score. His aphasia quotient (AQ) was over 90 by mid-1990 and was within what the test's author considers the normal range (93.8+) by the end of 1993.

These formal assessment scores are augmented by descriptions of MD's language abilities and disabilities in speech and language therapy reports. Initially diagnosis of Broca's aphasia with greater comprehension involvement than classic Broca's was made. On 3 September 1987 MD had 'marked problems with writing. MD is

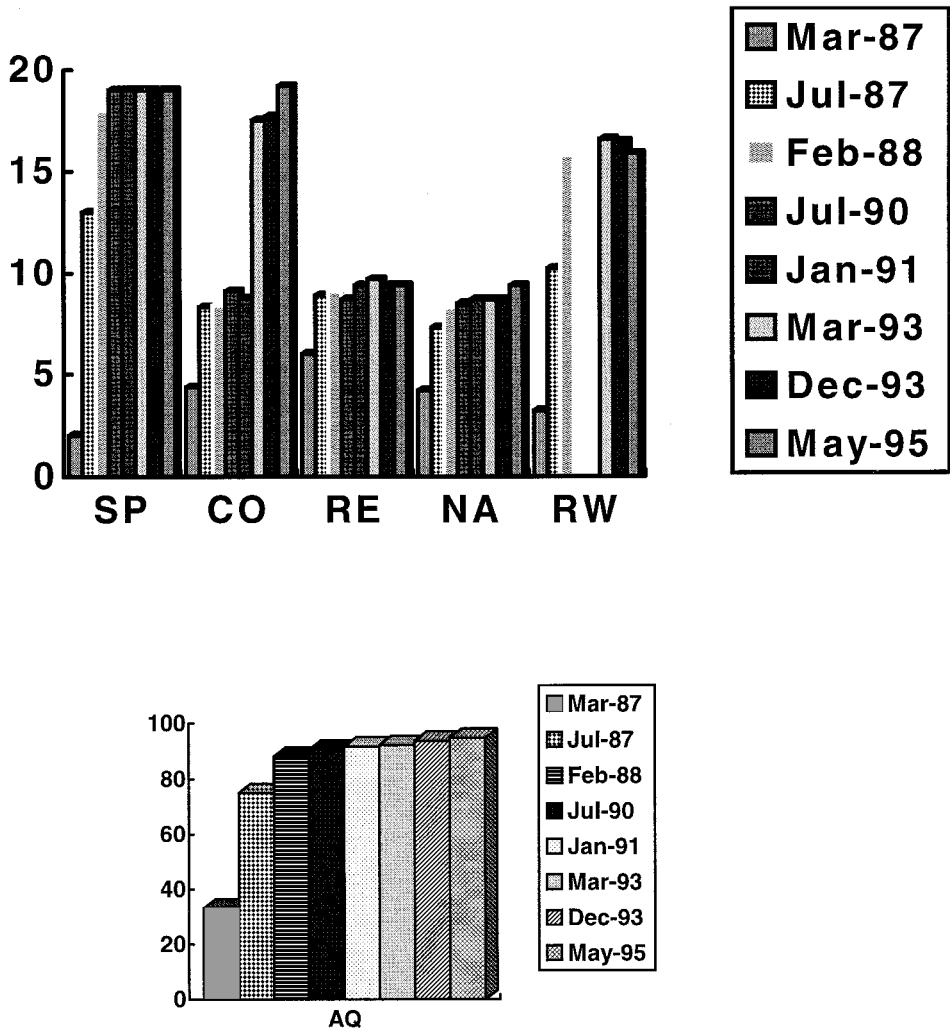

Figure 1. MD's WAB results 1988–1995. SP – spontaneous speech; CO – auditory verbal comprehension; RE – repetition; NA – naming; RW – reading and writing; AQ – aphasia quotient.

now able to copy with the left non-preferred hand, but continues to exhibit a writing dyspraxia.' A year later, following a period of rehabilitation, he had 'slightly telegrammatic expressive language: non-fluent and effortful. He has severe word finding difficulties but also finds it difficult to plan and structure sentences ... auditory memory is poor ... comprehension of complex syntactic structures is poor.' His 'propositional writing reflects and magnifies his problems in spoken language. He uses a more telegrammatic style and is extremely slow. He has difficulty converting sounds to letters, and also often omits letters'. In reading he was using a whole-word route and had difficulty with grapheme-phoneme conversion. Therapy at that time concentrated on his word finding and grapheme-phoneme conversion.

By 1988 he was receiving both weekly group and individual therapy. His language had been investigated in detail using tests based on cognitive neuro-

psychological theory. It was found that he had no difficulty with lexical decision or reading aloud real words irrespective of syllable length or imageability, but could not read aloud non-word letter strings (he tended to lexicalize these). He became distressed at his inability to write down non-word letter strings but had more success with real regular words. A problem in orthographic output lexicon was hypothesized and individual therapy focused on grapheme-phoneme conversion, especially of vowels. At that time self-monitoring of written output was noted to be good. MD himself wished to focus on his writing but he tired quickly in therapy sessions and feared that concentration for a protracted period might have induced a fit.

In the 1989–90 session, the spelling of irregular words was targeted in therapy. A set of 50 irregular words was employed. MD was taught several strategies to help him spell the targets–guessing word length, leaving blanks to return to and incorporating irregular words into sentences. Overall, from a base-line score of 14/50, a 45% improvement was noted six months later (35/50). For words which had been included in two periods of therapy there was a 80% improvement, in one period of therapy a 70% improvement and for words not targeted in therapy a 27% improvement. Unfortunately these improvements did not generalize and were not enduring, as later assessment showed, but do demonstrate some ability to learn.

Between March 1990 and May 1991 MD participated in the 'Computer-based Microworld Reading Project' (Crerar *et al*. 1996). This project provided computerized therapy for comprehension of reversible verb and preposition sentences using a 'microworld' of three characters (ball, box and star). He did not have a good outcome–slightly better performance on prepositions (but not on verbs) was offset by a much slower performance. His main problems were described as 'poor concentration and reduced internal capacity [i.e. working memory at sentence level]'.

Later therapy concentrated on reading comprehension and timed written word fluency. Assessment results from November 1992 reveal that MD was still having difficulty with the spelling of irregular words (e.g. 'gost' for 'ghost', 'lenth' for 'length'). Individual therapy was discontinued in early 1994 when his performance was felt to have plateaued and when he was able to use taught strategies in therapy sessions. At the time of discharge MD was reminded of strategies to use in his speech, reading and writing (in outline–to be concise, to highlight important information and to use a dictionary respectively). His group therapy continued for another two years and involved a wide range of communicative activities, including writing (description of composite pictures, constructing sentences from three given words, sentence completion and form filling), reading comprehension of passages, socio-interactive role play, giving instructions, verbal planning, debates, word finding (suggesting verbs related to a specific noun, semantic links, opposites and crosswords), grammar (use of function words and prepositions), homophones and question words (selecting appropriate 'wh' words and constructing sentences with them).

Prior to discharge from individual therapy strenuous attempts were made to establish some meaningful employment for MD whose sole social activity outwith the parental home had been attendance at a day centre. These proved unsuccessful and MD enrolled in a college of further education on a course for people with special needs.

Dominant hand and computer-aided writing therapy

The possibility of splinting his dominant hand was first investigated during his college attendance in conjunction with staff from the local communication aids centre, KEYCOMM. Individual sessions were then re-instated at his speech and language therapy clinic for training in the use of his dominant hand. Before the commencement of dominant hand and aided writing therapy and from late 1994 to early 1995, MD had trials to familiarize him with a mouse pen. A Macintosh-based drawing programme (KidPix) was employed with which MD initially practised drawing lines and creating shapes. An individualized input device was made which consisted of a perspex frame which held the mouse pen at right angles to a large mouse pad. A standard cock-up splint was attached to the frame which MD had strapped to his right hand. An Ergo Arm Rest with velcro supported his right forearm to improve its mobility. Initially the mouse pen selection facility was emulated on a single switch which MD operated with his left hand. This proved problematic so MD soon began to operate the mouse button with his left hand. This use of a mousepen presents a development of the usual paradigm (e.g. Whurr and Lorch 1991) which does not involve computer technology.

Base-line assessments

Several assessments were administered before two formal periods of intervention began based on: (1) the use of the prosthesis; and then (2) predictive writing programmes. Sentence level material analysed for graphemic and linguistic (syntactic and semantic) effects was collected as Lorch (1995) suggested. In addition, single words written to dictation were also elicited. All three base-line assessments were completed with MD using only his left, non-dominant hand for writing. Five items were used from the word definition subtest of the Test of Word Knowledge (TOWK) (Wiig and Secord 1991). Whilst a larger data-set would have been advantageous, the very slow speed of MD's output limited the number of items used. His written word definition responses for the words 'magician', 'envelope', 'teacher', 'scarf' and 'bus' are shown in figure 2. Some difficulty in written sentence construction is evident as are several spelling errors, e.g. 'teathes' for 'teaches' and 'vichal' for 'vehicle'. Spelling errors account for 35% of total words. The sample also include examples of MD's strategies, e.g. leaving blanks to fill in later and scoring out.

A written picture description was elicited using the WAB picture (see figure 3). This task produced a more normally expressed, if limited, written sample–20 words and two grammatically correct sentences (11 and 9 words long) with one spelling error ('pic-nac' for 'picnic') (i.e. 5% of total words). One of the subtests of the Psycholinguistic Assessments of Language Processing in Aphasia (PALPA) (Kay *et al*. 1992) was used to evaluate MD's spelling performance on regular and exception words (PALPA 44). Targets and MD's attempts are shown in table 1 below with the scores he achieved. Inspection of the errors made show a length effect for both regular and exception words and twice as many errors on exception words than regular words. Types of errors include one semantic paralexia ('sleigh' for 'sledge'), several examples where word pronunciation rather than known spelling has driven the response (e.g. 'casul' for 'castle') and some vowel phoneme-grapheme errors (e.g. 'wetch' for 'watch').

Table 1. Base-line PALPA 44 results

Regular target	MD error	Exception	Error
cat		aunt	
jam		lamb	
pet		egg	
nest		ghost	gost
bump	boop	knock	nork
swim	suiw	shoe	sho
hold		move	
bird		queen	
tent		sledge	sleigh
frog		yacht	yeight
wind		watch	wetch
canal		castle	casul
robin		giraffe	draff
tiger		squirrel	squill
potato		sword	[self-corrected]
sister		soldier	slo er
spring	squim	heart	
banana	bananer	aeroplane	aroplane
holiday	holaday	photograph	tetograh
caravan	caraven	elephant	elecate
MD score	14/20	MD score	7/20

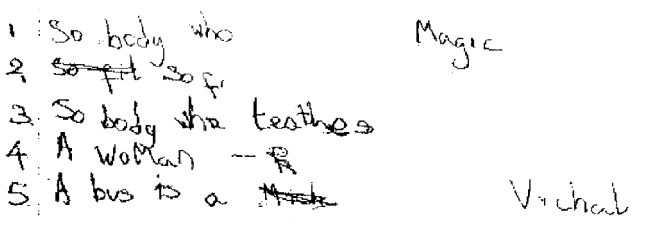

Figure 2. Base-line assessment (TOWK word definitions).

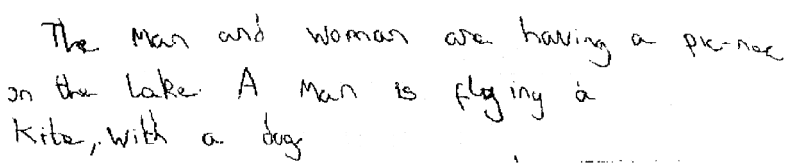

Figure 3. Base-line assessment (WAB picture description).

Prosthesis trials

Some pre-trial practice of single letter and short word formation across the screen and adjustment of the physical environment (e.g. seat height) was completed before 12 weekly sessions of training in the use of the prosthesis were undertaken over a period of four months with a break for holidays. The sessions focused initially on '-dge' words and 'CCC-' words with which MD had particular difficulty, before he was encouraged to write the names of pictures, words within categories and then sentences. See figure 4 for an example of sentence construction in the seventh

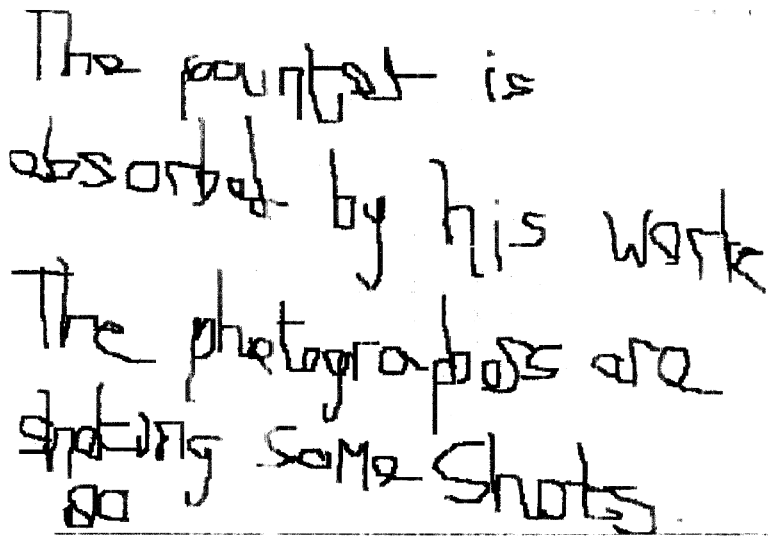

Figure 4. Description of occupations using right hand with mouse-pen and splint.

session during which he was asked to make written descriptions of pictures depicting occupations. It can be seen that although MD was able to produce legible handwriting with his aided dominant hand, its quality remained poorly formed at that stage. However the quality of his written production is markedly improved. He seems to have much more flexibility of expression, with more use of abstract verbs and fewer spelling errors (note especially 'photographers'). Again his self-correction ability is used in the second sentence where he adds 'oo' to indicate the correct vowel combination in 'shooting'.

Post prosthesis trials re-assessment

Following the 12 sessions, MD undertook the five items of the TOWK, PALPA 44 and a written description of the WAB picture as before but using his right hand with the mousepen and splint. His written output after the prosthesis trial is shown in figure 5. No statistical analysis of this small data-set has been attempted but his writings can be compared descriptively.

His word definitions were now longer and constituted full if ungrammatical sentences with some semantic errors (e.g. 'write' for 'send') which convey more information but took 29 minutes to write. Now spelling errors accounted for 18.75% of total words (approximately 50% less than in the base-line assessment). His WAB picture description was twice as long–40 words and three sentences long (9, 15 and 15 words) with no spelling errors and with adjectives but also with a noun-verb number agreement error. His spelling of regular words in PALPA 44 was slightly better (18/20) but he scored the same as before on exception words (although one word previously incorrectly spelled was now spelled correctly and one vice versa). Many of his errors were of letters omitted (e.g. 'g ost' for 'ghost', in which MD recognized a letter was missing but was unable to select it) and one was a letter addition ('yaicht' for 'yacht'). Again vowel errors were evident (e.g. 'airoplane' for 'aeroplane'). For one word which was again mis-spelled, MD now

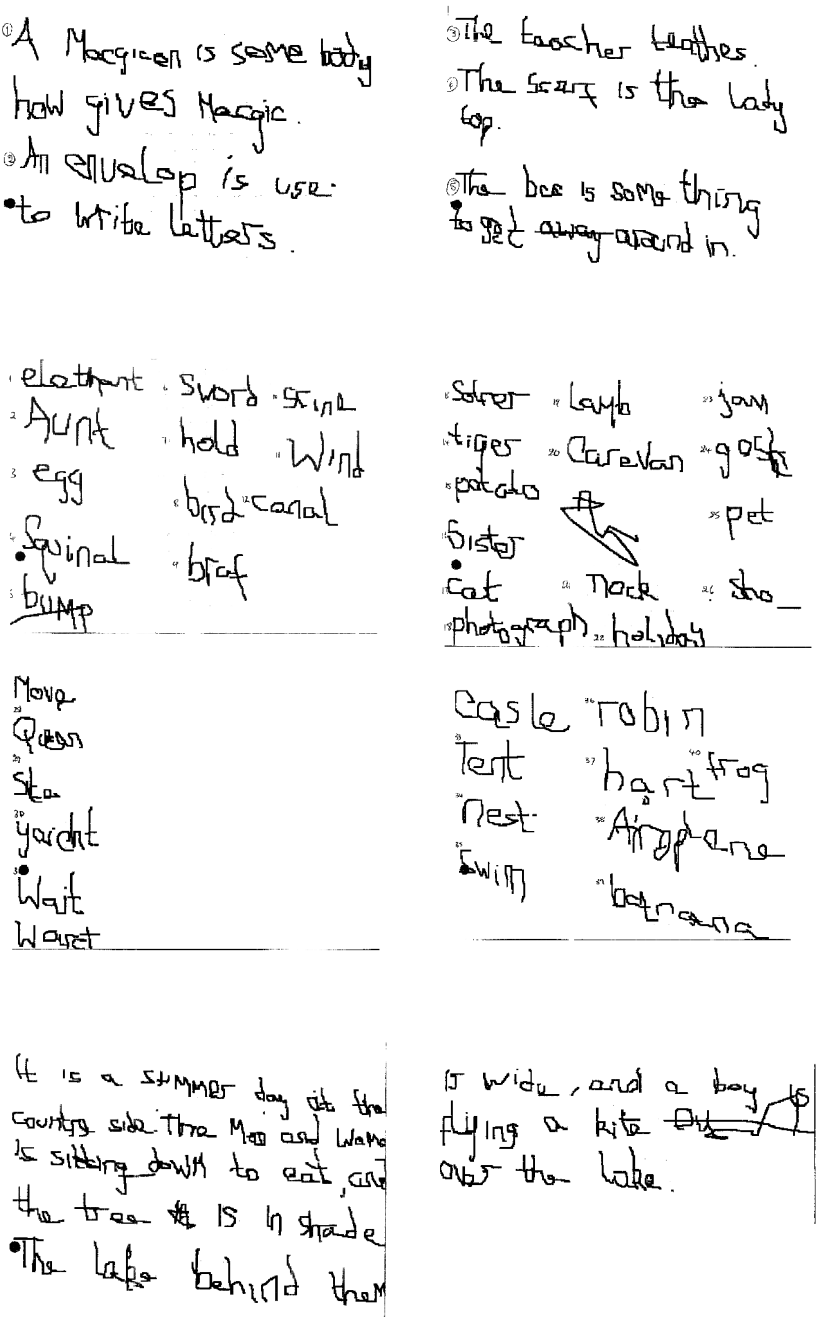

Figure 5. Post-prosthesis trials re-assessment.

had the correct number of syllables ('squinal' for 'squirrel'). He continued to have particular difficulty with phoneme-grapheme conversion of /dz/ in 'sledge', 'giraffe' and 'soldier'.

Immediately after these post-prosthesis trial re-assessments and before commencing the second, computerized trial, MD was asked to type the five TOWK

a person h beforms an art.

it is a name and address.

a teacher is somebody how teaches.

a bus is something to get around in.

Figure 6. Typed TOWK definitions.

The old woman was making a cake to give to the church bizarre.

The woman is lighting the birthday candles because the little boy is having a birthday party.

Figure 7. Sample of writing using the programmes (session 5).

definitions with his left hand, which took 25 minutes (see figure 6). He was unable to type a definition for 'scarf' (cf. figure 5). As in his prosthesis-aided attempt, he used 'how' for 'who' and 'performs' was mis-spelled ('beforms').

Predictive writing

MD next had 12 sessions in which he learned how to use two linked computer programmes. Write:OutLoud® is a simple word-processor programme with spelling monitor which can provide auditory feedback through synthesized speech at the end of a letter, word, sentence or paragraph so that the user can hear (repeatedly if required) as well as see their output. Co:Writer® is an intelligent prediction programme which can be used in conjunction with Write:OutLoud® or other word processing package. It has two useful functions in lexical and grammatical prediction as well as being a spelling-aid. Its producers suggest that it is helpful for people with language difficulties or physical limitations. There are examples in the literature of the use of predictive programmes, e.g. Newell *et al.* (1992), Wood *et al.* (1997). By inputting the first letter(s) of a word, Co:Writer® will predict possible targets, based on its own vocabulary, the user's frequency and recency of word use and British English spelling. Users can select the target from the list by typing the associated number. It also provides a degree of grammatical prediction, e.g. subject-verb agreement. The use of these programmes with people who have aphasia is discussed in MacDonald and Armstrong (1998).

At first MD's knowledge of the keyboard was assessed, then the different functions of the programmes introduced. MD very quickly benefited from the programmes. By the third session, in written picture descriptions his sentence construction and content appeared normal. He was able to select his target from the predicted words although his output was still very slow. The sample shown in figure 7 took approximately 20 minutes to complete and contains one mis-spelling 'bizarre' for 'bazaar'. This error exemplifies two of the problems with predictive programmes, i.e. if the user inputs an incorrect letter then a list unrelated to the

This is a rural seen. Two young friends are having a picnic at the side of the river back. Another boy is flying a kite and a dog is watching him as the kite is fluttering in the breeze.

Elephant. Aunt. Egg. Squirrels. Bump. Sword. Hold. Bird. Draff. S-ring.

29.10.96.

Wind. Canal. Sol-are. Tiger. Potato. Sister. Cat. Photograph. Lamb. Caravan. Nock. Holiday. Jam. Golt. Pet. Shoe. Move. Queen. Slegh. Yacht. Watch. Castle. ; Tent. Nest. Swim. Robin. Hearth. Aeroplane. Banana. Frog.

The mageshen is some body who bomes in public.
The envelope is something ret the name and addresses.
A teacher is somebody who controls the class.
write
A scrif is something that women go about in on her head.
The driver is somebody who drives a bus with people on bord.

Figure 8. Post predictive writing intervention re-assessments.

target may be generated and this list may lead the user to select from the unrelated list a word which sounds similar to the target, as in this example. More sophisticated tools of the word-processor, such as the spell-checker, proved too difficult for MD to learn.

Post predictive writing intervention assessments

The same battery of tasks was again completed by MD after the 12 computer-based sessions. His performance is shown in figure 8. TOWK word definitions were more complete grammatically and longer than at base-line assessment. There were still some spelling errors evident (8% of total words–10% less than when he was writing with his prosthesis-aided dominant hand) as well as grammatical errors and 'driver' seems to have been defined rather than 'bus'. His WAB picture description was again three sentences long (39 words–5, 14 and 20 words per sentence) and with two errors (5% of total words) which demonstrate MD's occasional difficulty with attention, word recognition or selection. These figures are comparable to those produced when MD was writing with his dominant hand using the prosthesis and the content is qualitatively similar, with the inclusion of adjectives and of more descriptive/less frequent verbs and nouns than those used in the base-line

assessment (e.g. 'fluttering' and 'breeze'). His spelling performance on PALPA 44 shows a slight improvement for regular words (his score was almost at ceiling when he was writing with the aid of the prosthesis) and an almost 100% improvement in his score of exception words (100% if the plural form of 'squirrel' is accepted as correct). Although MD had not been able to relearn the spelling of exception words (and using his dominant hand had not helped), he was often able to recognize the correct spelling predicted by the programme provided that he was able to input the first letter(s) correctly and so did not generate an unrelated list (cf. 'draff' for 'giraffe').

Discussion

Is MD's language normal?

According to most recent WAB results, MD's AQ lies within what Kertesz (1982) considers to be 'normal'. AQ does not include a reading and writing score, so MD's normal language is assessed on the oral subsections only. Based on the written output described in this paper several difficulties remain in spelling and in the semantics and syntax of written expression. The WAB fails to capture MD's specific problems as its written expression assessment data-set is limited in size and in scope.

The Microworld reading project also highlighted some difficulties for MD which would not be directly elucidated by clinically-available formal assessments of language. His processing speed was very slow and his learning capacity seemed diminished, associated with working memory deficit. MD requested to repeat the project as he felt he 'was just getting it' when the requisite number of sessions was completed the first time. Some of the assessments used during his most recent therapy were timed. Length of time taken to complete five TOWK definitions was regularly more than 20 minutes. However speed, accuracy and flexibility may work against each other, e.g. in the Microworld project improved scores were associated with longer times to complete tasks. Similarly the increased numbers of words produced when MD's writing was aided by a prosthesis or by computer programmes were associated with increased complexity but more spelling and grammar errors (i.e. compare WAB base-line written picture description with post-prosthesis and post-computer sessions). This latter need not be in a causative relationship as with longer and more complex sentences there is more opportunity for error.

Effect of splinting and programmes on written output

Both splinting and use of the computer programmes are methods of compensation for physical and linguistic difficulties, rather than methods of remediation per se. Both resulted in some positive effect on spelling and in improved quantity and quality of written output than that produced at base-line assessment. In table 2 below empty cells represent correct responses at base-line, following prosthesis trials and word-processing sessions. Both prosthesis and word-processing aid allow MD to spell longer regular words more accurately. Use of the prosthesis has minimal effect on the number of exception words spelled correctly, but arguably some of the mis-spelled exception words are closer to target than at base-line

Table 2. PALPA 44 results

Target	LH	RH	WP
Regular:			
cat			
jam			
pet			
nest			
bump	boop		
swim	suiw		
hold			
bird			
tent			
frog			
wind			
canal			
robin			
tiger			
potato			
sister			
spring	squim	srine	s_ring
banana	bananer		
holiday	holaday		
caravan	caraven	carevan	
Total/20	16	18	19
Exception			
aunt			
lamb			
egg			
ghost	gost	g ost	golt
knock	nork	nock	nock
shoe	sho	sho_	
move			
queen			
sledge	sleigh	sle	slegh
yacht	yeight	yaicht	
watch	wetch	warct	
castle	casul	cas le	
giraffe	draff	braff	draff
squirrel	squill	squinal	squirrels
sword	[self-corrected]		
soldier	slo er	solner	sol_are
heart		hart	hearth
aeroplane	aroplane	airoplane	
photograph	tetogra h		
elephant	elecate	elethant	
Total/20	6	7	13

LH – written with left, non-dominant hand; RH – written with prosthesis-aided dominant hand; WP – word-processed with the aid of Co: Wwriter® and Write: OutLoud®.

assessment (e.g. 'yaicht' rather than 'yeight' for 'yacht' and 'cas le' rather than 'casul' for 'castle'). Because MD has sentence-level reading comprehension ability, he was able to use that ability to improve his spelling of exception words with the aid of the word prediction programme. Despite doubling his score, MD still spelled incorrectly approximately 30% of the exception words with the prediction

programme but did spell the longest three words correctly. He continued in both aided conditions to have specific difficulty in phoneme-grapheme conversion of /dz/.

In sentence level material, MD produced more words and made fewer spelling errors overall when using the prosthesis and when using the word-processing programme than at base-line. However the increased complexity of his written output was accompanied by more grammatical and semantic errors. Although difficult to quantify, both aids seemed to allow MD to express himself in a more abstract and complex way.

MD was very positive about his use of the splint to enable him to write with his dominant hand but found it difficult to express exactly what was improved. Both use of the prosthesis and of the word-processing programmes appear overall in our clinical trials to have improved MD's written output. The former has disadvantage in its 'clinical' appearance whereas use of the computer programmes would appear much more normal.

Follow-up November 1998

In the longer-term MD has bought a PC and has opted to continue to employ the word prediction programme in preference to the splint as he finds it more useful. He reports that he uses the computer regularly at home for writing—approximately four times per week. He is still slow to find his way around the keyboard but feels that he is much better at this than he used to be. He loads the programmes and closes down entirely independently. He mainly writes letters and has been provided with a list of address labels to facilitate addressing. When asked if he writes a diary or stories, he said that he 'doodles' at stories but does not save them. His independent use of the computer to write letters represents achievement of MD's aim for this late written expression therapy and demonstrates that he has chosen to generalise his use of the word-processing programmes as an aid to writing, rather than the use of his prosthesis.

What would be an effective therapy outcome for MD?

MD was initially discharged from individual speech and language therapy at eight years post-onset, having had both individual and group treatment over a much more extended period than is usually available to people with aphasia. At that time, on formal assessment his oral language was 'normal' although his communication skills were clearly not fully recovered and his WAB scores had remained similar for some time (he had reached a 'plateau'). He had learned communicative coping strategies but was unable to resume employment in his previous profession and had another 30 or more years before the age for retirement.

Further improvement in writing for MD could be measured in a variety of ways: quicker responses; increased range of word classes in written output; increased frequency and imageability range of words written; better spelling; fewer sessions to learn; generalization or increased confidence in writing. His motivation for improving this modality remains high but he cannot be considered a priority for therapy.

It is very pertinent to ask for MD 'what lies beyond the plateau' (Hersh 1998) since he appears to have been able to take some steps beyond that plateau with

novel approaches to his difficulties. Re-entry into paid employment was not a goal for the therapy described here but this issue is discussed briefly below as it affects all people who become aphasic at MD's age.

It is probably not only his aphasic and writing difficulties which are preventing MD from being able to take up paid employment, especially in his previous chosen field of work where considerable interpersonal contact is required as are quick decision-making skills, constant new learning and the ability to function well despite long and unsocial working hours. Working memory deficit, organisational functioning, impaired motor skills and slowness in processing all impact on his employability. Factors such as those described by Pound (1998, p. 224), 'hidden comprehension impairments, fatigue or day-to-day fluctuations in communicative ability', will also affect how able to work people with aphasia will be–as well as the general rates of unemployment in the country.

This theme is discussed also by Parr *et al*. (1997, p. 27) whose figures for people in their study show that before the onset of aphasia most were in full-time employment but after the onset of aphasia most were not working. These authors identify both external and internal factors which affect the possibility of return to work. These include 'the opportunities, alternatives and support which are available, and the decisions made and advice given by others, including doctors and employers', how well the person with aphasia 'understands the nature and severity of the aphasia and the other effects of stroke' as well as their work attitudes. MD currently works part-time on a voluntary basis as a helper with a voluntary organization.

Conclusion

Whilst age should never be considered as a major factor in discharge decisions, in the case of MD the possibility of further review of his communicative skills in the future rather than absolute discharge would seem fair. He has demonstrated ability to benefit from two different approaches to his spelling and written expression difficulties and to be motivated to do so. Should new therapy approaches become available which aim to increase speed of language processing without detriment to accuracy, for example, then MD might be considered a suitable candidate.

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