Phonological and orthographic cueing therapy: A case of generalised improvement

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Phonological and orthographic cueing therapy: A case of generalised improvement

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Background: Phonological and orthographic cues can both be effective in the treatment of anomia, and are often used clinically. However, studies using phonological and orthographical cues in aphasia therapy have tended to be equivocal about their benefits, and most demonstrate improvements limited to treated items. Few previous studies investigate change in conversation or in people’s own views of their aphasia.

Aims: The aim of the study was to investigate the effect of a weekly delivered therapy, using combined phonological and orthographic cues, on word retrieval, connected speech, conversation, and on the participant’s own views of his aphasia.

Methods & Procedures: A person with anomia (TE) is presented as a detailed single-case study. Two baselines, 8 weeks apart, were followed by two 8-week phases of therapy, delivered weekly in a clinical setting. The first phase involved the use of combined phonological and orthographic cues to aid retrieval of a targeted set of words. The second phase encouraged the use of targeted words in connected speech and conversation. TE was reassessed after each phase of therapy and again 2 months later, after a period of no therapy. The study involved controls for improvement due to regular contact but without intervention (the baseline phase) and investigated generalisation to untreated items (treated and untreated sets were used, balanced for performance prior to therapy). Finally, non-specific effects of therapy were determined by testing throughout the study on a set of language control tasks (predicted to be unaffected by the therapy).

Outcome & Results: TE demonstrated significant and enduring improvements in picture naming, which had generalised to untreated items. Significant improvements were also demonstrated in the broader measures of connected speech, aspects of conversation, and his own views of his aphasia, while performance on control tasks remained fairly

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The study was funded by The Stroke Association, Wycombe Primary Care Trust, and the Tavistock Trust for Aphasia. The authors wish to thank TE and his wife for their enthusiastic participation in the study. We would also like to thank Kate Swinburn and Sally Byng for allowing the use of the Communication Disability Profile pre-publication version, Lyndsey Nickels for her helpful comments on a draft version of the paper, and Professor David Howard for invaluable support with statistics. Finally we would like to thank Jenny Sugden for her unfailing support throughout the study.

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stable. There was a significant relationship between changes in word finding and changes in TE’s views of his communication activity across the course of the study, with a pattern of stability over baseline and change with intervention, particularly the first phase of therapy, i.e., using cues.

**Conclusions:** These findings demonstrate that a combined phonological and orthographic cueing therapy targeting word retrieval can have lasting benefits, not just on targeted items but also on untreated words, connected speech, and the views of the person with aphasia. Furthermore, such improvements can be achieved within a prevalent service delivery model.

**Keywords:** Anomia; Aphasia therapy; Phonological cues; Orthographic cues; Generalisation.

Word-finding difficulties are a common aspect of aphasia. A growing body of research exists that demonstrates positive effects of a variety of cognitive approaches to the remediation of such difficulties. The majority of research has focused on semantic techniques that, for many years, were thought to be more effective than phonological tasks in improving word retrieval (see Nickels, 2002a, for a review). While there are studies that demonstrate benefits in word finding as a result of phonological therapy, most show item-specific improvements at a single-word level (Wambaugh, 2003). This, in itself, is a valid aim for therapy, in that improvement in just a small set of treated items, if functionally relevant, can result in a marked reduction in disability. However, a treatment that results in improvements beyond the treated items might be considered the most successful. Clearly, it is important that we consider the impact of any changes resulting from impairment therapy, be they item specific or more general, on the everyday communicative activities of the person with aphasia, and indeed on the person’s own views of his/her communication. This type of outcome measurement has been lacking in the evidence base for anomia therapy thus far (Best, Greenwood, Grassly, & Hickin, 2008).

This paper will describe TE, a man with aphasia who, following therapy for anomia, demonstrates generalisation to untreated items and shows positive changes in a number of broader measures of word retrieval, from connected speech to the impact of these language changes on his daily life. The therapy programme with TE was part of a case series study (Best et al., 2008) that replicated and extended a study carried out by Hickin, Best, Herbert, Howard, and Osborne (2002). This demonstrated beneficial and enduring outcomes using phonological and orthographic cues with people with word-finding difficulties due to aphasia. The participants in Hickin et al.’s study were required to make a choice between correct cues and distractors. The authors felt this reflected the deeper processing of many semantic tasks, which produced longer-term changes in word retrieval.

In addition to picture naming the study has included broader measures of word retrieval and its impact on the person’s life. These measures include Cinderella (Bird & Franklin, 1996), the retelling of a fairytale to obtain replicable samples of word-finding in narrative, the Profile Of Word Errors and Retrieval in Speech (Herbert, Hickin, Howard, Osborne, & Best, 2008), a measure that analyses word retrieval in a sample of natural conversation, and the Communication Disability Profile (Swinburn with Byng, 2006), which seeks to measure the impact of any change in word finding on the client’s perception of their difficulties.

It has been suggested that phonological tasks serve to prime retrieval of the phonological form, focusing at the level of activation of individual entries in the
phonological lexicon. Thus we would expect item-specific effects (Miceli, Amitrano, Capasso, & Caramazza, 1996). However, a few studies have suggested that some individuals with phonological errors in speech production may, with phonological therapy, produce results that generalise beyond the specific words treated. Although it is acknowledged that phonological activation for words invariably leads to some semantic activation (Dell, Schwartz, Martin, Saffran, & Gagnon, 1997), precisely how and why this spread of activation occurs remains unclear.

Robson, Marshall, Pring, and Chiat (1998) describe GF, a fluent jargon-aphasic adult who appeared unable to retrieve the phonological form. GF was given tasks in which she was required to reflect on the target word’s syllable structure and first phoneme in order to promote a conscious self-cueing strategy. GF’s naming performance improved; however, she failed to demonstrate any strategic use of cues when naming. Consequently, the authors concluded that therapy might have brought about improved access to the lexicon without use of a conscious strategy.

Perhaps indicating a similar process of therapy effects, JOW (Best, Howard, Bruce, & Gatehouse, 1997), a severely anomic gentleman with a hypothesised semantic lexical deficit, showed some generalisation to untreated items following tasks where phonological and orthographic stimuli were used simultaneously. Following therapy JOW, like GF, failed to demonstrate the use of a strategy when naming. The authors suggested that the therapy tasks might have focused on the links between phonology and orthography, thus improving his automatic ability to use existing incomplete orthographic knowledge to aid word production. (See also Howard & Harding, 1998, for generalised benefits in word finding as a result of use of a letter board.)

Furthermore, Franklin, Buerk, and Howard (2002) describe MB who presents with a diagnosed reproduction conduction aphasia. They postulated that MB has a post-lexical deficit and he was given therapy that aimed to improve his self-monitoring and correction of errors. The authors predicted that MB’s improvement will generalise to untreated items as increased self-monitoring will bring about a strategic change in word production. However they suggest, in hindsight, that treatment appeared to bring about generalisation through an improvement in the phonological encoding process itself.

Howard (2000) suggested that the generalisation seen in some studies may simply be accounted for by the repeated naming of the “control” items throughout the treatment period. Indeed, JAW (Nickels 2002b) demonstrated that improvement, simply through repeated attempts at naming items, is possible. Nickels suggests that each successful retrieval of an item can increase the activation of that item at the lexical level. The inherent variability in JAW’s naming success allows “resting levels” of activation to build up for more and more items over subsequent sessions. Thus, overall, his naming performance improves.

While this generalisation beyond treated items is clearly desirable, questions relating to the wider carry-over, the real-life impact, of any such improvement are being raised (Hewitt & Byng, 2003). In clinical practice it is often assumed that “improved” language skills and a reduction in impairment as demonstrated by higher scores on picture-naming tasks, will be transferred into the everyday life conversation and views of the person with aphasia. Thus it is assumed there will be a corresponding reduction in disability. However, there has been relatively little systematic investigation of such wider communication issues before and after therapy (Douglas, Brown, & Barry, 2004). Although there are well-established measures of language processing
and functional communication for people with aphasia, measures of the impact of language disability on an individual’s life are more sparse (Simmons-Mackie, 2000). Little is documented on the relationship between language impairment and wider communication in daily life or views of the person with aphasia. Ross and Wertz (2002) found that there were no significant relationships between language impairment measures and quality of life measures within a group of people with aphasia. Cruice, Worrall, Hickson, and Murison (2003), however, demonstrated that communication skills did indeed predict quality of life in their participants with aphasia. Best et al. (2008), in the group study in which TE participated, demonstrated a strong relationship between change in word-finding ability and change in participants’ self-rated communication activity over the course of an impairment-based intervention.

The current study therefore aims to investigate whether a phonological and orthographic cueing therapy will effect improvements in picture naming, in untreated items, and beyond picture naming to connected speech, to conversation, and to self-evaluation of communication skills, and whether a choice of combined (spoken and written) cues is more effective than a single combined cue.

The paper describes the study design, the content of the therapy, and TE’s response to intervention, before discussing the possible mechanisms for change with reference to current models of speech production (see Wilshire, 2008, for an overview of cognitive neuropsychological accounts of aphasic word production).

METHOD

Design

TE was one of 10 individuals with aphasia participating in a study that adopted a case series design (Best et al., 2008). The study consisted of four phases: a period of background assessment, two treatment phases, and a period of no intervention. Each phase lasted approximately 8 weeks and any change was measured by a set of baseline assessments (A1 to A5) as illustrated in Figure 1.

```
A1 Pre-therapy baseline assessment 1
8 weeks Background language assessments
A2 Pre-therapy baseline assessment 2
8 weeks Cueing therapy
A3 Post-cueing therapy baseline assessment
8 weeks Connected speech therapy
A4 Post-connected speech therapy baseline assessment
8 weeks No therapy
A5 Follow-up assessment
```

Figure 1. Timeline of study.
The baseline assessments (A1 to A5) consisted of the following:

**Picture naming**
- 200 black and white line drawings used in previous studies, originally selected as having high name agreement among older speakers (Hickin et al., 2002) and controlled to include a range of frequency, imageability, and syllable length.
- 40 coloured items (primarily photographs) chosen by TE and his wife for their functional relevance to his day-to-day life.

**A quantified measure of word retrieval in conversation**
The Profile of Word Errors and Retrieval in Speech (POWERS; Herbert et al., 2008) allows quantification of a number of features from conversation between the person with aphasia and the conversation partner. These features include production of nouns, paraphasias, and pauses, as well as conversational turns and collaborative repair. A conversation sample is acquired by recording 10 minutes of conversation between the person with aphasia and their usual conversation partner using audiotape. The middle 5 minutes of this sample are then analysed.

**A measure of the person with aphasia’s views on their communication**
The Communication Disability Profile (CDP; Swinburn with Byng, 2006) assesses language disability from the perspective of the person with aphasia, exploring the impact of acquiring and living with aphasia by focusing on issues within four sections: activity, social participation, external influences, and emotional consequences. The “activity” section looks at commonly occurring situations and communication activities and asks the person to rate the impact of their aphasia upon these. The “participation” section focuses on how the person with aphasia perceives his or her ability to participate within his or her own individual social circumstances. “External influences” looks at who, or what, the person with aphasia feels are barriers to, and facilitators of, successful communication, and the “emotional consequences” section seeks to measure both the positive and negative emotional impact of aphasia on the individual. The person responds to each question by rating their ability on a pictorial analogue scale, which can be translated into a numerical score. Examples of the questions are given in Appendix 1.

**A measure of word finding in connected speech**
This measure used the story of Cinderella (Bird & Franklin 1996). This requires the participant to retell a well-known fairytale in order to obtain replicable samples of word retrieval in a narrative.

**A set of control tasks**
- Short-term memory picture pointing (Waters, Rochon, & Caplan, 1992)
- Written sentence comprehension ($n = 16$, from Comprehensive Aphasia Test, Swinburn, Porter, & Howard, 2005)
• Reading aloud words \((n = 52)\) (Howard, personal communication), selected to include items varying in frequency, imageability, and length
• Reading aloud nonwords \((n = 26)\) (Howard, personal communication)
• Written naming was assessed at the start and end of the study (A1 and A5), using a subset of the 200 naming items selected to include a variety of semantic categories and orthographic patterns.

Participant

TE is a 67-year-old male who suffered a CVA in January 2002. A CT scan revealed a large, low-density infarct in the left parietal lobe. TE is married with two children and four grandchildren. Prior to his CVA he ran his own building business. His wife reported that he was a hard-working, outgoing character with a strong determination to succeed. TE entered the study 18 months after the onset of his CVA. His spontaneous speech was syntactically fluent with moderate word-finding difficulties characterised by frequent phonological errors, primarily on nouns. He displayed good comprehension and there was no evidence of significant hearing loss, or oral or verbal dyspraxia. TE had a mild right hemiplegia, but was able to walk with a stick and use his right hand with effort.

TE was selected for this case study, from a group of 10 individuals participating in a wider study (Best et al., 2008), due to his generalised improvements following therapy.

Table 1 shows the results of some of the background language assessments carried out between A1 and A2. The tasks were drawn from a range of assessments and aimed to provide a detailed profile of TE’s abilities within different stages of language processing.

These results confirmed TE’s good auditory comprehension skills and suggested good semantic processing despite some semantic errors in naming. The number of phonological errors produced in naming, TE’s better performance in word repetition

<table>
<thead>
<tr>
<th>Background assessment</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyramids and Palm Trees ((n = 52))</td>
<td>100%</td>
</tr>
<tr>
<td>Spoken word – picture matching ((n = 30))</td>
<td>100%</td>
</tr>
<tr>
<td>Written word – picture matching ((n = 30))</td>
<td>100%</td>
</tr>
<tr>
<td>Spoken sentence – picture matching ((n = 16))</td>
<td>100%</td>
</tr>
<tr>
<td>Written sentence – picture matching ((n = 16)) (mean A1 + A2)</td>
<td>91%</td>
</tr>
<tr>
<td>Picture decision ((n = 10)) (selection of “nonsense” picture from choice of 4)</td>
<td>100%</td>
</tr>
<tr>
<td>Ravens coloured progressive matrices ((n = 12))</td>
<td>83%</td>
</tr>
<tr>
<td>STM picture pointing ((n = 12)) (mean A1 + A2)</td>
<td>4.1</td>
</tr>
<tr>
<td>Picture naming* ((n = 200)) (mean A1 + A2)</td>
<td>74%</td>
</tr>
<tr>
<td>Errors: semantic</td>
<td>16%</td>
</tr>
<tr>
<td>Errors: phonological</td>
<td>50%</td>
</tr>
<tr>
<td>Written naming ((n = 40)) (complete target word scored as correct)</td>
<td>65%</td>
</tr>
<tr>
<td>Repetition ((n = 182)) (complete target word scored as correct)</td>
<td>87%</td>
</tr>
<tr>
<td>Word reading ((n = 182)) (complete target word scored as correct)</td>
<td>88%</td>
</tr>
<tr>
<td>Nonword reading ((n = 26)) (mean A1+A2)</td>
<td>27%</td>
</tr>
</tbody>
</table>

*Examples of “easier” targets = tea, door, flower. Examples of more “difficult” targets = colander, binoculars, signal.
and word reading, but difficulties with nonword reading, suggested TE’s underlying
deficit may lie in mapping semantics to phonology and in later stage phonological
assembly. This latter hypothesis was further supported by the fact that TE was signif-
ically worse at naming longer items than shorter items (Jonckheere Trend Test, $z = 3.62, p = .0001$).

Selecting items for therapy

The 200 words used in the baseline naming task were divided into four sets of 50
items matched for baseline naming accuracy (i.e., at A1 and A2). These four sets
were then randomly assigned to treatment and control conditions. In Phase 1 of ther-
apy one set of 50 items was treated using a choice of foils (phonological and ortho-
graphic cues were presented simultaneously, see next section for details), one set was
treated using a single foil, one set was shown to TE for naming but no cue or help
was offered, and the final set was unseen (control).

In Phase 2 of therapy each of the sets of 50 was further divided into groups of 25,
allowing a matched group of 100 items to be treated in the second phase of therapy
(see pathway of items in Figure 2 below). The design of the study was similar to that
used by Hickin et al. 2002 and Herbert, Best, Hickin, and Osborne 2003.

In addition to the line drawings TE, aided by his conversational partner, gener-
ated 40 items that he felt would have a useful impact on his everyday life. These were
depicted, usually in photographic form, so that even if they were ambiguous to other
people, TE associated the picture with his chosen target word (see Appendix 2 for
examples).

These 40 personally chosen words were also divided into treatment and control
sets matched for baseline naming performance (see Figure 3), making a total of 120
treated items in each phase of therapy. The personally chosen items treated in Phase
1 were divided into two sets matched for naming at A2. Half were treated with a
choice of cues and half with a single cue.

![Figure 2](image-url)

**Figure 2.** Allocation of items to sub-sets over the two phases of therapy.
Multi-syllabic items

After Phase 1 of therapy an additional set of 75 multi-syllabic items was added, which was treated only in Phase 2. This was introduced at this stage in order for any additional change to be recorded over a wider set of items.

Therapy: Phase 1

TE was seen once a week for 8 weeks. Therapy sessions lasted approximately 1 hour. The approach in this phase of therapy aimed to hierarchically highlight the phonological and orthographic aspects of each target word in isolation using cues. Each picture was presented once to TE during the therapy session. One set of 60 items (50 from the baseline naming test and 10 personally chosen) were presented simultaneously in written and auditory modalities, with a choice of foil hierarchy. If TE was unable to name the target word within 5 seconds, he was given the first phoneme (plus schwa) and grapheme of the target word and of a semantically unrelated distractor. If still unable to name the word, TE was given the first syllable of the target and of the distractor. If still unable to name the target within 5 seconds, TE was given the whole word and distractor. At each stage the cues were provided simultaneously in phonological and orthographic form. The number of distractors was increased gradually over the sessions (by the final session there were three distractors) and the order of presentation of the cues and distractors was randomised.

A further set of 60 items was presented within a single foil condition. TE was given the same hierarchy of cues, presented in auditory and written form simultaneously, but without distractors. Thus, overall, 120 items were treated in Phase 1.

An example of both types of cue condition within Phase 1 is given in Figure 4.

An additional set of 50 items from the baseline naming test was presented to TE for naming, but not facilitated with cues. Again he was given 5 seconds for each item and was scored correct when the target was named without errors. This was to assess the effect of repeated attempts at naming on his word retrieval. The presentation of the three sets was randomly ordered within the therapy session, as was the presentation of the items within the sets. The final set of 50 items remained unseen during this phase of therapy.
Therapy: Phase 2

The second phase of therapy moved away from single picture naming, encouraging the use of the targeted words in interaction related to TE’s interests, for example, gardening. Again 120 items were treated in this phase: 20 personally chosen words (untreated in Phase 1) and 100 items from the baseline naming test (25 treated with a choice of combined—spoken and written—cues in Phase 1; 25 treated with a single combined cue in Phase 1; 25 exposed for naming in Phase 1; and 25 untreated in Phase 1). These target items, with the corresponding hierarchy of cues, were sorted into conversational categories to create TE’s individual file to which he had access throughout the session as needed. In TE’s case only single foils were used in line with TE’s own preference. This decision was reinforced by the short-term results of Phase 1 which suggested that, for him, there was no advantage in making a choice between the correct cue and distractors presented in written and auditory modalities.

Again TE was seen for 8 weeks, with each therapy session lasting approximately 1 hour. Initially the sessions included transitional tasks, such as naming to definition, but moved on to hierarchies of functional tasks, including making lists, allowing production of target items in a single word context, through to free conversation, within the chosen topics. See Appendix 4 for an example of a Phase 2 session plan. Appendix 5 is an example of a Phase 2 score sheet.

RESULTS

Effects of treatment: Picture naming

The results for picture naming are broken down into the following five sections (a) 200 items, (b) 40 personally chosen words, (c) multi-syllabic items, (d) progress during treatment, (e) change in errors with treatment.
Naming 200 controlled items

Figure 5a shows TE’s performance in naming the 200 items (controlled for frequency, imageability, length, and age of acquisition) over a period of 40 weeks. Overall, there was no significant change over baseline (A1 → A2, McNemar Test, ns, 1-tailed). However, there was a significant change after Phase 1 (using cues to name items) therapy (A2 → A3, McNemar Test, \( p \leq .0001 \), 1-tailed). This was also the case when A3 was compared with the baseline assessments together (A1 and A2 vs. A3, Wilcoxon matched samples, \( z = 5.86, p \leq .0001 \), 1-tailed). Following Phase 2 of therapy, where the emphasis of treatment was on the use of the target words in everyday situations, performance on picture naming dropped slightly (A3 → A4, McNemar Test, ns, 1-tailed), returning to its peak at follow-up eight weeks later (A3 → A5, McNemar Test, ns, 1-tailed).

Figure 5b shows the effects of the different treatment conditions on TE’s naming performance at each assessment. At A3, after cueing therapy, there was no difference between those items treated with a choice of foils presented phonologically and orthographically, and those treated with a single foil presented phonologically and orthographically. There was also no difference between TE’s naming of the treated and untreated items. Items treated with the choice of foils were numerically more likely to maintain beyond therapy, i.e., at A4 there was a slight difference between the choice and single foil sets, but this difference was very small. Overall, the four sets of items showed a strikingly similar pattern of change.

Naming 40 personally chosen words

Figure 6 shows the total change in TE’s naming of 40 personally chosen items following treatment. These items were selected during the baseline phase of the study and

![Figure 5.](image-url)
therefore were not assessed at A1. The pattern is similar to that of the 200 item naming in that TE improves significantly (McNemar test, 1-tailed, \( p = .0064 \)) following Phase 1 of therapy, remains static (McNemar Test, \( ns, p = .6230 \), 1-tailed) after Phase 2, and maintains the improvement after a period of no therapy (A4 \( \rightarrow \) A5 McNemar Test, \( ns, p = .5 \), 1-tailed). It is worth noting that these personally chosen items were all multi-syllabic and semantically more similar than the 200 controlled items, for example, “rhododendron”, “nasturtion” and “clematis”.

**Multi-syllabic items**

The results for multi-syllabic items, which were introduced into the study only after the first phase of therapy when TE was approaching ceiling on the 200 item set, are shown in Table 2 broken down by syllable number. It is clear that, despite his stability between A3 and A4 on the 200 items and personally chosen set, TE’s naming of this set of longer words improved after the second phase of therapy (A3 \( \rightarrow \) A4, McNemar Test, \( p = .0005 \), 1-tailed). This improvement maintained following an eight week period without therapy (A4 \( \rightarrow \) A5 McNemar Test, \( ns, p = .39 \) 1-tailed).

**TABLE 2**

<table>
<thead>
<tr>
<th>Assessment</th>
<th>A3</th>
<th>A4</th>
<th>A5</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-syllable items (n = 51)</td>
<td>0.63</td>
<td>0.88</td>
<td>0.82</td>
</tr>
<tr>
<td>3 syllable items (n = 20)</td>
<td>0.35</td>
<td>0.45</td>
<td>0.70</td>
</tr>
<tr>
<td>4 syllable items (n = 4)</td>
<td>0.00</td>
<td>0.50</td>
<td>0.50</td>
</tr>
<tr>
<td>Total (n = 75)</td>
<td>0.52</td>
<td>0.75</td>
<td>0.77</td>
</tr>
</tbody>
</table>

Figure 6. Naming of 40 personally chosen items from A2 to A5, subdivided by set for Phase 1 therapy. Note there is no baseline period for these items.
Progress during treatment

Figure 7 shows how TE’s naming of treated and seen items changed over the eight treatment sessions of Phase 1. It is clear that the change on both sets of items was gradual and, particularly for the 150 items, TE’s performance appeared to begin to plateau at around 85–95% accuracy for the last two therapy sessions.

Error change in naming

As shown previously, the majority of TE’s error responses were phonological. We examined the relationship (overlap) between phonological errors and targets over the course of the study using the formula recommended by Schwartz, Wilshire, Gagnon, and Polansky (2004); 2 points for each shared phoneme divided by the sum of the number of segments in the target and the number of segments in error. For example:

Target: “sock”, error: [snok]

\[
\text{Overlap} = \frac{6 \text{ (3 shared phonemes)}}{3 \text{ (segments in target word)} + 4 \text{ (segments in error)}} = 0.86
\]

This was calculated for all items in the 200 word set where two or more phonological errors were produced across assessments 1 or 2 to assessment 5. The overlap between targets and errors is shown in Table 3.

In order to examine the significance of change after the first, cueing phase of therapy (where there was the most change in terms of number of items named correctly), an ANOVA was conducted, the assessments being weighted as follows: A1 3, A2 3, A3 –2, A4 –2, A5 –2. Thus, the pre-Phase 1 assessments received equal weighting, as

<table>
<thead>
<tr>
<th>Assessment</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
<th>A5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overlap between targets and errors</td>
<td>0.45</td>
<td>0.53</td>
<td>0.68</td>
<td>0.69</td>
<td>0.78</td>
</tr>
</tbody>
</table>
did all the post-Phase 1 therapy assessments (see Hickin et al., 2002 for a similar approach involving weighting scores). So the analysis asked the question, “Was there a difference in the relationship of phonological errors to the targets before and after the cueing therapy?” The null hypothesis is that the relationship between errors and targets was the same before and after therapy. The results were significant ($F = 11.13$, $p = .0012$) demonstrating a difference in proximity of phonological errors to the target after the cueing therapy.

Effects of treatment: Word finding in connected speech (Cinderella)

Transcripts of TE’s retelling of the Cinderella story were analysed using Bird and Franklin’s (1996) identification of content words present, and type-token ratios for each noun subset were calculated. TE’s type-token ratios varied slightly across the study but there was no clear pattern. The mean repeated attempts at the target nouns was stable over baseline (A1 to A2) and decreased following therapy, shown in Table 4, indicating a positive change in TE’s fluency in noun retrieval, although this did not reach significance.

Effects of treatment: Word finding in conversation

Figure 8 demonstrates two aspects of conversation as measured by POWERS. The graphs show the results for A1, A3, A4, and A5. Although a “conversation” was recorded at A2 just prior to therapy, on listening to the audiotape this turned out to be a monologue and involved TE reading aloud at some points. His partner produced only four turns in this sample. Thus, unfortunately, these data had to be

| TABLE 4 |
| Mean repeated attempts at target nouns and type/token ratios in Cinderella narrative |

<table>
<thead>
<tr>
<th>Assessment</th>
<th>$A1$</th>
<th>$A2$</th>
<th>$A3$</th>
<th>$A4$</th>
<th>$A5$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean repeated attempts at target noun</td>
<td>2.72</td>
<td>2.72</td>
<td>1.62</td>
<td>2.31</td>
<td>1.47</td>
</tr>
<tr>
<td>Type–token ratio (nouns)</td>
<td>0.58 (28:47)</td>
<td>0.49 (35:71)</td>
<td>0.55 (39:71)</td>
<td>0.48 (32:66)</td>
<td>0.44 (41:94)</td>
</tr>
</tbody>
</table>

Assessment 3 follows the cueing therapy, Assessment 4 follows the therapy involving connected speech, and Assessment 5 follows a period of no contact.

Figure 8. Word finding in conversation as measured by POWERS.
excluded as they could not be considered a true conversation. Graph A demonstrates that, after Phase 1 of therapy and at follow-up, TE produced more content words in conversation. Graph B demonstrates a reduction in content word errors following each phase of intervention, although at follow-up this increases again to a similar level to after Phase 1 treatment.

Effects of treatment: Communication Disability Profile

Figure 9 shows the changes in ratings at the five assessments throughout the investigation relative to TE’s activity, participation and emotional consequences scores following treatment. These scores represent real gains in day-to-day life and confidence; for example, TE would now answer the phone, go out independently, and he felt more positive about himself with aphasia.

There was a striking and significant positive relationship between changes in word finding (naming 200 items) and changes in CDP scores (activity ratings) across the course of the study (Spearman’s $r = .975$, 1-tailed, $3 df$, $p = .0024$), see Figure 10.

Effects of treatment: Control tasks

TE’s score in the nonword reading task fell slightly at Assessment 2 but thereafter remained fairly stable (see Table 5). Word reading and written sentence to picture matching remained fairly stable across the assessments, but on neither task was he very

<table>
<thead>
<tr>
<th>Assessment</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
<th>A5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonword reading ($n = 26$)</td>
<td>35%</td>
<td>19%</td>
<td>15%</td>
<td>15%</td>
<td>23%</td>
</tr>
<tr>
<td>Word reading ($n = 52$)</td>
<td>94%</td>
<td>88.5%</td>
<td>96%</td>
<td>94%</td>
<td>96%</td>
</tr>
<tr>
<td>Written sentence to picture matching ($n = 16$)</td>
<td>87.5%</td>
<td>94%</td>
<td>94%</td>
<td>94%</td>
<td>87.5%</td>
</tr>
<tr>
<td>STM picture pointing</td>
<td>4.1</td>
<td>4.1</td>
<td>4.1</td>
<td>4.1</td>
<td>4.3</td>
</tr>
</tbody>
</table>
far from ceiling. TE’s short-term memory as measured by picture pointing was remark-
ably stable across the study. As this task had no ceiling score, any general cognitive or
linguistic changes happening over this time might have been reflected in an increased
score.

**TE’s feedback**

A typical example of TE’s feedback at the end of each treatment session is given in
Appendix 7. TE expressed a preference for the Phase 1 type of therapy where the
repetitive nature of the task allowed him to monitor his progress and afforded him
control within the session. He also expressed a preference for the single foil condition,
reporting that a choice served to distract and confuse him.

Overall TE expressed delight with his progress during the study: “All the places I
go, people say how much it’s got better”, “I answer the phone now”, “I wouldn’t talk
to people on walks before”. TE’s wife also felt the therapy had helped considerably:
“It made him feel it wasn’t hopeless”, “I forget he’s had a stroke”.

**Summary of results**

Following treatment TE showed a significant improvement in naming the 200 tested
items and the 40 personally chosen items. This change related to both treated and
untreated items indicating generalisation of treatment. TE also showed positive
outcomes in aspects of connected speech, conversation, and in his Communication
Disability Profile (CDP) scores, suggesting that this impairment-based approach can
impact on everyday conversation as well as how the person with aphasia views
himself and his ability to participate in life.

TE did not show significant changes in any of the control tasks, i.e., short-term
memory (STM picture pointing), nonword reading aloud, word reading aloud, and

![Graph showing change in naming and CDP activity rating vs a short-term memory control task (picture pointing).](image-url)
written sentence comprehension, suggesting, together with the stable performance in naming and conversation across the two baseline assessments, that the improvements above cannot be attributed to spontaneous recovery or non-specific effects of intervention. His written naming performance was also stable across the study (A1 26/40: A5 27/40). His errors were similar across the two occasions, usually containing graphemes from the target word e.g., “solider” for “soldier”, and including real-word errors e.g., “python” for “pyjamas”.

TE’s performance in naming, connected speech, conversation, and the CDP showed no decline after a period of no therapy, demonstrating that the positive effects of therapy had been maintained.

DISCUSSION

The key aspects of TE’s word-finding difficulties will be discussed relative to his response to therapy and manner in which the therapy may have assisted TE in relation to current models of speech production.

Effects of treatment on picture naming

The results suggest that the hierarchical cueing therapy, using combined phonological and orthographic cues, resulted in significant improvements in picture naming following lexical intervention. This improvement generalised to untreated items. There was little change following Phase 2 (targeting connected speech) but at follow-up assessment, the improvement was maintained. As naming prior to therapy was stable, and control tasks were unaffected, it is suggested that TE’s progress was not part of a spontaneous and general language improvement, nor an effect of therapist contact, but the result of a specific intervention targeting word production. Furthermore, the second phase of intervention did appear to improve TE’s naming of a hitherto untreated set of multi-syllabic items.

The nature of TE’s difficulty in finding/producing words

TE produced primarily phonological errors that increased with target word length. Most theories of word production ascribe phonological errors to post-lexical impairments. These impairments may involve difficulty assembling or encoding phonemes or in accessing phonemes from words. However, it is argued that TE’s underlying deficit may be more complex. He occasionally made semantic errors in the absence of any central semantic difficulties. Reading aloud and repetition of single words were considerably better than naming, suggesting that phonological representations were available but that TE was unable to reliably access them without activation of additional lexical routes. Moreover, TE often described seeing “something of the word” in his head when attempting to name, and sometimes showed knowledge of the first phoneme, the syllabic structure, and the stress pattern of the target word. His difficulty in reading and repeating nonwords suggests that direct grapheme or acoustic to phonological conversion routes were only partially available to him. However, his tendency to lexicalise the target nonword in a reading task might suggest that he is relying on a whole word route and, given partial phonological/orthographic information, he is able to use activation of the lexical route to produce a similar real word, such as, “cuskontet” became [kastɔ̃ma], “sarog” became [sɔɾoŋ].
Generalisation to untreated items

TE’s improvement generalised to untreated items. This will be addressed in relation to models of language production. However, the possibility that TE has learned a set of words through repeated exposure or repeated attempts at naming (Nickels, 2002b) should be excluded. This would seem unlikely for TE as the naming assessment included a wide range of items in addition to those treated or exposed in therapy. Furthermore, the full 200 pictures were only administered at five assessment points throughout the whole study. In addition, there was no further improvement in naming beyond the third assessment immediately after Phase 1 of therapy. Phase 2 covered items not treated in Phase 1, but TE showed little change in naming performance. If repeated naming of all these items was to account for improved performance then we would anticipate that TE’s naming score would have continued to improve beyond Assessment 3. He did, however, show improved naming of additional multi-syllabic items introduced into Phase 2 of therapy, and therefore we cannot rule out the possibility that, for TE, there may have been a ceiling effect with the 200 controlled items which is reached following the first phase of therapy.

Personally chosen words

TE’s performance in naming personally chosen words also improved significantly, with generalisation to untreated items. In contrast to the 200 variable-controlled items, many of TE’s personally chosen words were semantically related, such as place names, plant names, and bird names. Additionally, these words tended to be longer, multi-syllabic items, which have been identified as more difficult for TE. In naming these items he produced more circumlocution and semantic errors, particularly with proper names. Repeated attempts to produce these proper names often progressed initially through semantic errors to phonological errors, which frequently shared first phoneme, syllable, and stress pattern with the target item, for example, “Impatiens” became [intrensn]. Given the semantic similarity between the personally chosen words, it is perhaps surprising that TE’s naming performance improved so dramatically with the cueing therapy. His baseline performance with this set of words was considerably lower than for the 200 variable-controlled set, perhaps giving more scope for improvement. Also, given that these were items self-identified by TE as functionally relevant to his daily life, it is likely that he had increased motivation to improve his production of these words (Robson et al., 2004), and may have had increased naming attempts of the words between sessions through use in day-to-day activities.

Phase 1 vs Phase 2

TE made significant gains in picture naming following Phase 1 of therapy but failed to make any further gains following Phase 2. This pattern was reflected in both the 200 variable-controlled items and the 40 personally chosen words, as well as in activity ratings for the CDP. The difference in therapy approach in the two phases of treatment may account for the apparent difference in response. Central to the first treatment phase were structure, repetition, and constrained targets, in contrast to the more informal, conversational approach in Phase 2. Although phonological and orthographic cues were provided in both phases when difficulties retrieving the target word arose, Phase 1 presented more opportunities to produce the target word in
isolation, without syntactic or semantic priming/interference. It is also of note that TE reported feeling generally under par during the week of reassessment following Phase 2, and it cannot be ruled out that his lack of improvement in this phase was not therefore directly related to the therapy itself, but more to reassessment at a time when he was less likely to benefit (Howard, 2000).

An alternative possibility is that, as suggested previously, following Phase 1 of therapy further improvement may have been constrained by ceiling effects, particularly as TE’s naming score on the 200 items at baseline was relatively high. This view is reinforced by improvement in the multi-syllabic items, which were untreated except in the second phase of therapy. Thus it is argued that structured therapy was most helpful for TE; however, on item sets where there was considerable scope for change, his word finding could still improve with the less-constrained second phase of therapy.

**Single cue vs Choice of cue**

For TE, there was no significant difference in his gains in picture naming between items cued with a single foil and those cued with a choice of foils. Hence the hypothesised benefits from the “deeper” processing required when asked to eliminate foils were not confirmed. TE, in fact, regularly stated a preference for single foils, maintaining that he found the choice distracting and confusing: “Single cues were easier, one letter, one part, not that b***** lot.” This was not borne out in his naming scores following therapy, but perhaps does endorse his apparent learning preference for structure, repetition, and constrained targets.

**Changes in connected speech and conversation**

Although the findings from the Cinderella story and the POWERS measure of conversation do not convincingly demonstrate generalisation of therapy effects into connected speech, when they are taken together with findings from picture naming, they provide strong evidence that the therapy “worked” in the very real sense of changing TE’s speech production. While the lack of two baseline measures for POWERS is unfortunate, the baselines for Cinderella with respect to the mean repeated attempts at each target noun are remarkably stable. It is not clear why TE demonstrated a large increase in content words per turn at the final follow-up assessment.

The reduction in content word errors in conversation following each phase of therapy adds strength to the argument that TE had not just improved on a set of words exposed at each assessment. The topics of conversation analysed varied greatly, with subjects ranging from shopping to television programmes, and involved a wide range of content words not included in the set of 200 variable-controlled items or his 40 personally chosen words. Furthermore, the reduction in repeated attempts at target nouns following the first phase of therapy fitted well with TE’s large improvement in word retrieval at this point (see Figure 5a). The improvement in connected speech following Phase 1 of therapy was encouraging given the focus on single words. It is perhaps relevant that TE had no agrammatic difficulties in spite of his word-finding difficulties, and this may have had some bearing on his ability to generalise more easily to connected speech. Importantly, however, Hickin, Herbert, Best, Howard, and Osborne (2007) also report improvement in the conversation of HM, a participant in the earlier, related therapy study, whose aphasia was characterised by agrammatic verbal output.
Generalisation to daily life and views of activity and participation

Carry-over of any improvement in word-finding difficulties to activities of daily life, and to the views of the person with aphasia, is obviously the most desirable outcome of any intervention. TE showed significant changes in activity, participation, and emotional consequence scores following therapy, as measured by the CDP. Moreover, the relationship between his word-finding scores and the CDP activity ratings across the five assessments was highly correlated (compare Figure 5a with activity ratings shown on Figure 9). The lack of change in his CDP ratings between assessments 1 and 2 prior to therapy suggests he was using the profile in a similar way on each occasion. The significant relationship between TE’s word retrieval scores and his CDP activity scores over the study strongly suggests that the positive change in impairment can be reflected in a measurable impact on his views of his aphasia and his daily activities.

Delivery of therapy

It is clinically important to note that this therapy was delivered on a weekly basis for two blocks of 8 weeks, within a clinical environment. It is not known whether therapy delivered more intensively or, for example, in a home setting would have yielded more dramatic positive results. However, contrary to the claims of some studies (Bhogel, Teasel, & Speechley, 2003), where it is suggested that only more intensively delivered therapy can be beneficial, this study demonstrates that very positive gains can be achieved with more limited resources.

How is therapy working?

We will now consider how intervention might be working for TE in relation to different processes common to several models of single-word processing (Ellis & Young, 1988; Kay & Ellis, 1987) and speech production (e.g., Dell, 1988, Goldrick & Rapp, 2002). In such models skills can be disrupted in various ways; for example, representations at different levels may decay too quickly to reach threshold, or the links between different levels may be insufficiently strong for the target to be produced (Wilshire, 2008).

**Account 1: Semantic representations**

It is unlikely the intervention is operating at this level of semantic processing. First, there was no strong evidence that TE has a deficit in semantic processing. His performance was at ceiling on spoken word to picture matching, written word to picture matching, and Pyramids and Palm Trees (see Table 1). Second, if such a deficit did exist, changes in other language tasks reliant on the semantic system would be expected, such as written picture naming. In this task TE’s performance was stable from the start to the end of the study.

**Account 2: Accessing phonological forms from semantic representations**

There is some evidence that part of TE’s difficulties may lie at this level. He demonstrated good semantic processing, and well-preserved phonological representations
as shown by his performance on real-word repetition (87% at A1) and ability to respond to phonological cues. However, priming data from unimpaired speakers and facilitation data from people with aphasia, suggest that any priming in these links results only in item specific changes (Howard, Hickin, Redmond, Clark, & Best, 2006; Wheeldon & Monsell, 1992) and not in generalisation to untreated items. This contrasts markedly with the findings from TE, who demonstrates significant improvement for both treated and untreated items.

**Account 3: Phonological and orthographic links**

As the therapy tasks used both phonological and orthographic cues simultaneously, we speculate about whether TE benefited from improved links between orthography and phonology, which serve to facilitate access to the phonological lexicon (Best et al., 1997). The design of the present study does not allow us to compare the effects of only phonological cues with phonological and orthographic cues combined in therapy but, in previously administered facilitation tasks, TE had shown more success with orthographic cues than phonological cues, both immediately and after a delay.

How might this orthographic cueing be helping TE? If we are to accept the hypothesis that improved links between orthography and phonology are central to TE’s improvement, then we might consider that the following processes are intrinsic to this account:

a. Prior to therapy TE has better access to initial graphemes than to phonological word forms and indeed orthographic word forms. His written naming was 65% correct. However, on a further 27.5% of items the initial grapheme was correct.

b. The therapy using orthographic cues enabled TE to use orthographic information to access phonological forms. Nickels (1992) indicated that TRC’s generalised response to therapy might have been the result of this phenomenon.

c. While we do not make claims about the exact mechanism by which the therapy works, one possibility is via a direct connection between the visual input lexicon and the phonological output lexicon, and for TE this link has been strengthened by the orthographic cueing therapy. Howard and Harding (1998) propose that this mechanism accounts for their participant’s improved word retrieval in the presence of a letter board.

d. In order to account for TE’s improved word retrieval without the external orthographic cue being present, we suggest he must be internalising the process of generating phonological forms from orthographic representations (see Lorenz & Nickels, 2007, for further discussion of this issue).

**Account 4: Post-lexical phonological assembly**

Could the intervention be working by helping TE to combine phonemes for output, i.e., at the “phoneme” level of models of speech production (e.g., Dell, 1988)? In this case the orthographic/phonological cues may serve to prime/reduce decay of the phonemes and allow feedback from this level to activate the target item. While there is evidence that TE has difficulties with post-lexical processing, a change here might be expected to impact on other tasks that tap this level such as those involving nonwords.

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1Facilitation involves examining the effect of a single cue on delayed naming (Best et al., 2002).
TE’s nonword reading did not improve over the study. Performance was far from ceiling so it might be expected that any changes in TE’s ability to assemble phonemes be reflected in an improvement in this task. However, this account might still be plausible if it is assumed that TE has additional and ongoing difficulties at an earlier stage of processing within the grapheme-to-phoneme conversion route and that this impairs his ability to read nonwords.

Account 5: Links between phonological forms and phonemes

In some models of speech production links between word forms and phonological forms are feed-forward (e.g., Levelt, Roelofs, & Meyer, 1999), in others there is a bidirectional flow of information (e.g., Goldrick & Rapp, 2002). We will assume the latter, for which there is good evidence from neuropsychological case studies, in which activation from phonemes feeds back to lexical items. The important question here is how a change in processing in these bidirectional connections would be reflected in changes in behaviour and how this maps onto the changes for TE. There are two key ways in which the predictions and behaviour match. First, as each phoneme links to many lexical items, changes at this level would be predicted to affect retrieval of treated and untreated items. This was the case for TE. Second, one would predict that, even when the target word is not correctly produced, facilitating the connections between words and phonemes would increase the phonological proximity of errors to the target. This was indeed the case. Assessments after the first, and most effective phase of therapy showed TE’s errors were closer to the targets than during the pre-therapy baseline (Assessment 1 to Assessment 2). If generalised changes were operating at this level, however, wouldn’t we also predict changes in real-word reading? TE’s word reading was stable over the course of the study, which does not fit with this account. However, it is important to note that his reading was very close to ceiling with very little scope for change (for example, only two errors at A3 and A5); thus this cannot be a fair test of this final account.

In conclusion, while we favour the fifth account—that the intervention strengthened the connections between phonemes and lexical items—there is no evidence to rule out some strengthening of orthographic to phonological connections (account 3) or some improvement in combining phonemes for output, at a post-lexical stage of speech production. The intervention conditions provided in this study, combined with TE’s tendency to show generalisation to untreated items, suggest that it is not possible to discriminate between these different accounts of how the therapy enhanced performance. Indeed, there may be changes occurring at more than one level of language processing. We must also consider that TE’s high level of motivation in undertaking and practising the therapy tasks may have contributed to his generalised improvement. The relative mildness of his word-finding difficulties at the beginning of the study may also be a factor, although data from the wider group study (Best et al., 2010) would suggest severity of word retrieval difficulty is not a barrier to generalisation. We have nevertheless demonstrated that changes occurred, with strong evidence that the changes resulted from the therapy. Moreover these changes had a real impact on TE’s life.
REFERENCES


**APPENDIX 1**

Examples of questions from the prototype version of the Communication Disability Profile (Swinburn with Byng, 2006).

**Activity section**

During the last week, how easy is it for you to talk with a group of friends?
During the last week, how easy is it for you to read and follow a headline?
(Pictures are used to set the context for each sub-section, augment all questions, and facilitate rating)

**Participation section**

Who helps?
(People, for example, friends, family and professionals are identified within a pictured group)
What makes it harder?
(Possible barriers, for example, two people talking at once, are illustrated with pictures)

**Emotional consequences section**

Does aphasia make you feel embarrassed? When/why do you feel that?
Do you feel content? When/why do you feel that?
(Pictorial rating scales allow strength and frequency of emotion to be rated)
APPENDIX 2

Examples of pictures representing TE’s personally chosen words.

Woodpecker

New Zealand

Maple

APPENDIX 3

Section of a Phase 1 scoresheet for TE.

Phase 1 Scoresheet

<table>
<thead>
<tr>
<th>TARGET</th>
<th>Spont Naming?</th>
<th>Choice of Cue</th>
<th>CUE: 1st CONS</th>
<th>CUE: 1st Syll</th>
<th>CUE: WholeWord/ Repetition</th>
<th>Indicated written target</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 blackbird</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 gardener</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 sandwich</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 hedge</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 muscle</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
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<td>8 maple</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>9 mirror</td>
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<td>mira</td>
<td>3</td>
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<td>✓</td>
</tr>
<tr>
<td>10 crocodile</td>
<td></td>
<td>aigiseta</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>11 submarine</td>
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<td>✓</td>
<td>3</td>
<td></td>
<td>✓</td>
</tr>
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<td>12 lavender</td>
<td></td>
<td>nas</td>
<td>3</td>
<td>3</td>
<td>leenin</td>
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</tr>
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<td>13 collar</td>
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</tr>
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<td></td>
<td></td>
<td></td>
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</tr>
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<td>15 lighter</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 nastro</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17 clown</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Session: 5
Researcher: 29.1.04
APPENDIX 4

Example of Phase 2 session plan for TE.

**Session 3: Gardening**

Target vocabulary:

<table>
<thead>
<tr>
<th>gardener</th>
<th>hedge</th>
<th>daffodil</th>
<th>vegetables</th>
<th>carrot</th>
<th>tree</th>
</tr>
</thead>
<tbody>
<tr>
<td>cabbage</td>
<td>tomato</td>
<td>tulip</td>
<td>impatiens</td>
<td>snail</td>
<td>grass</td>
</tr>
<tr>
<td>caterpillar</td>
<td>dandelion</td>
<td>fuchsia</td>
<td>antirrhinum</td>
<td>lobelia</td>
<td>clematis</td>
</tr>
<tr>
<td>lily</td>
<td>rhododendron</td>
<td>butterfly</td>
<td>snail</td>
<td>grass</td>
<td></td>
</tr>
</tbody>
</table>

- Present target vocabulary pictures for naming and explain to TE. He may want to use these words when discussing gardening throughout the session. Use hierarchy of cues when difficulty accessing target word.
- Ask TE to dictate list of (a) summer bedding plants, (b) spring bulbs, (c) vegetable seeds to buy at the Garden Centre. Encourage use of pictures and hierarchy of cues if needed.
- Make a plan of the garden and make lists of plants/shrubs/bulbs to put in different areas. Discuss aspect, soils, plant/vegetable preferences, garden insects/pests, care required etc. Encourage to use pictures and hierarchy of cues if needed.
- Discuss favourite plants and gardens to visit. Use magazines as props/cues/discussion points. Encourage to use pictures and cues as before.
- Use score sheet to document number and which target words produced, together with transcriptions of errors and cues required.

APPENDIX 5

Section of a Phase 2 score sheet.

```
<table>
<thead>
<tr>
<th>Title</th>
<th>Initial naming</th>
<th>Use in session</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spontaneous</td>
<td>With cue</td>
</tr>
<tr>
<td></td>
<td>Lists</td>
<td>Plans</td>
</tr>
<tr>
<td></td>
<td>Discussion</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>carrot</td>
<td>✓</td>
</tr>
<tr>
<td>2</td>
<td>tulip</td>
<td>✓</td>
</tr>
<tr>
<td>3</td>
<td>caterpillar</td>
<td>✓</td>
</tr>
<tr>
<td>4</td>
<td>lobelia</td>
<td>“Penruch”</td>
</tr>
<tr>
<td>5</td>
<td>butterfly</td>
<td>✓</td>
</tr>
<tr>
<td>6</td>
<td>impatiens</td>
<td>✓</td>
</tr>
<tr>
<td>7</td>
<td>dandelion</td>
<td>“Dentillan”</td>
</tr>
<tr>
<td>8</td>
<td>clematis</td>
<td>“Camecin”</td>
</tr>
<tr>
<td>9</td>
<td>squirrel</td>
<td>✓</td>
</tr>
<tr>
<td>10</td>
<td>vegetables</td>
<td>✓</td>
</tr>
<tr>
<td>11</td>
<td>gardener</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>rhododendron</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>muntjac</td>
<td>“Dampback”</td>
</tr>
<tr>
<td>14</td>
<td>daffodil</td>
<td>“Dafabul”</td>
</tr>
<tr>
<td>15</td>
<td>cabbage</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>tomato</td>
<td></td>
</tr>
</tbody>
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THERAPY SESSION SUMMARY SHEET: PARTICIPANT'S VIEWS

1. Was today a good day or a bad day for in general (but especially re talking)?
   - good day
   - average day
   - bad day

   Comments: Very bad day due to overdoing the gardening at the weekend. Not as bad as previous 2 days when difficulties speaking it.

2. How useful did you find the therapy session?
   - very useful
   - moderately useful
   - not useful

3. What was most useful - i.e. what helped you to recall a word most? Seeing pictures again, sound cue / written cue, choosing between cues, repeating the word, saying it aloud?
   - Repeating the word, seeing the last letter or syllable

4. How difficult was it to find words in the therapy?
   - easy
   - moderately difficult
   - very difficult

   Comments:

5. Would anything have made the session more useful? No