Research report

Aphasia rehabilitation: Does generalisation from anomia therapy occur and is it predictable? A case series study

Wendy Best [a,*], *Alison Greenwood* [b], *Jennie Grassly* [a,b], *Ruth Herbert* [c], *Julie Hickin* [d] and *David Howard* [e]

[a] *Psychology & Language Sciences, UCL, London, UK*
[b] *Amersham Hospital, Buckinghamshire, UK*
[c] *Department of Human Communication Sciences, University of Sheffield, UK*
[d] *School of Health and Human Services, Central Queensland University, Rockhampton, Australia*
[e] *School of Education, Communication and Language Sciences, University of Newcastle upon Tyne, Newcastle upon Tyne, UK*

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ABSTRACT

Introduction: The majority of adults with acquired aphasia have anomia which can respond to rehabilitation with cues. However, the literature and clinical consensus suggest change is usually limited to treated items. We investigated the effect of an experimentally controlled intervention using progressive cues in the rehabilitation of noun retrieval/production in 16 participants with chronic aphasia.

Method: Participants were sub-divided relative to the group according to performance on semantic tasks (spoken/written word to picture matching) and phonological output processing (presence/absence of word length effect and proportion of phonological errors in picture naming) in order to investigate outcome in relation to language profile. Cueing therapy took place weekly for 8 weeks.

Results: Intervention resulted in significant improvement on naming treated items for 15/16 participants, with stable performance on control tasks. Change occurred at the point of intervention and not during pre-therapy assessments. We predicted particular patterns of generalisation which were upheld. Only participants classified as having relatively less of a semantic difficulty *and* more of a phonological output deficit demonstrated generalisation to untreated items. Outcome did not relate to traditional aphasia classification.

Conclusion: A cueing hierarchy can improve word retrieval/production for adults with aphasia. In some cases generalisation to untreated items also occurs. The study demonstrates that the results of behavioural testing can be used to guide predictions of recovery with intervention.

* *Corresponding author.* UCL Division of Psychology and Language Sciences, Chandler House, 2 Wakefield Street, London WC1, United Kingdom.
    E-mail address: w.best@ucl.ac.uk (W. Best).

1.   Introduction

The majority of people with aphasia have difficulty in finding or producing words and this can be a significant cause of breakdown in conversation (e.g., Perkins et al., 1999). There is a large and growing body of evidence demonstrating that intervention can help improve word retrieval or word production (see Nickels, 2002 for a review). However, the majority of interventions result in change primarily on treated items (e.g., Abel et al., 2005; Fillingham et al., 2006; Laganaro et al., 2003; Wisenburn and Mahoney, 2009).

Given these fairly consistent findings a key question of both clinical and theoretical importance arises: what pattern(/s) of strengths and difficulties leads to generalisation to untreated items? The answer to this question may inform clinical practice and our understanding of how intervention is altering word retrieval/production.

1.1.   Models and levels of impairment

There are several models of 'speech production', more recently and accurately termed 'language production' ranging from classic 'box and arrow' models (Ellis and Young, 1988; Kay et al., 1992) to connectionist models (Dell et al., 1997; Goldrick and Rapp, 2002; Levelt et al., 1999). While the models vary considerably in their specification, in relation to retrieving single words for production, all require the following three stages:

(1) Lexical-semantic processing or accessing word meaning (sometimes termed 'lexical semantics' and usually distinguished from 'conceptual semantics')
(2) Accessing abstract phonological word form (the 'phonological output lexicon' in box and arrow models; the 'phonological level' in Dell's account)
(3) Phonological encoding (or 'phonological assembly' in box and arrow models, commonly also termed 'post-lexical' processing).

In this paper 'word (or, for connected speech, language) production' will be used to refer to all three stages of processing. Thus, 'word production' incorporates retrieving the word's meaning and form and abstract phonological encoding. 'Word production' is more general than specific difficulties with word finding or word retrieval, sometimes used to refer exclusively to stage (2) above. All these occur prior to motor programming for speech (Ziegler, 2002).

Detailed single case studies link aphasic individuals' patterns of language strengths and weaknesses to difficulties with a particular level of processing. For example, E.E. (Howard, 1995) was held to have a deficit within the phonological output lexicon: he was consistent in the items he was unable to retrieve and was not helped by phonological cues. Howard suggests items were lost from his lexicon. Franklin et al. (2002) describe M.B. whose output included many phonological errors and whose performance was better on short than long words. M.B.'s difficulty was in assembling phonemes for production.

There is a confound in much of the research to date between the level of deficit and the target of intervention. This study employs the same intervention with participants with different levels of deficit enabling us to investigate the relationship between the level of impairment and outcome, in particular any generalisation to untreated items.

1.2.   Linking outcome to background findings

In a seminal study, Hillis (1989) investigated a cueing therapy designed to improve written naming in two participants with severe aphasia. The participant with more lexical-semantic difficulty (stage 1 on the model above and common to accessing both written and spoken forms for production) improved and the change generalised to untreated items (and spoken naming). The second participant, with written naming difficulties arising from an orthographic equivalent to level 2, improved only on written naming of treated items. Hillis argued it is important to determine the source of an individual's naming difficulty in order to predict the outcome of intervention.

However, more recently, Lorenz and Ziegler (2009) did not find a direct relationship between the nature of the deficit and treatment approach. Participants with post-semantic anomia (stages 2 or 3 above) benefited from semantic intervention and also participants with semantic anomia (stage 1 on the model outlined above) benefitted from phonological/orthographic (word form) approach. Neither of these findings would be predicted from a straightforward link between intervention approach and breakdown in level of word production.

Fillingham et al. (2006) compared errorless learning with errorful learning. All participants completed a detailed language and neuropsychological assessment battery prior to intervention. Fillingham et al. found strong relationships between response to therapy and underlying neuropsychological profiles, with participants who responded better overall to both types of therapy having better recognition memory, executive/problem solving skills and monitoring ability. Strikingly, however, there was no clear relationship between language skill and therapy outcome.

What might be the reasons for the difficulty in relating language profile to the outcome of intervention? Firstly, people with aphasia rarely have a single clearly identifiable level of impairment in language production. For example, the same individual often makes both semantic and phonological errors in word retrieval. Furthermore, individuals' word production is often influenced by variables held to reflect different levels of processing. Secondly, almost all interventions involve participants in producing the target word thereby strengthening links from word meaning to word form (Howard, 2000) and potentially benefiting everyone with difficulty at some stage(s) in word production.

1.3.   Generalisation in word production interventions

The findings from therapy studies for spoken word-production deficits are somewhat mixed with regards to the extent of the effect of treatment.

Limited or no generalisation to untreated items is the result across the majority of intervention studies including those investigating: errorless learning (Fillingham et al., 2006),