

WORD FINDING IN THE DAMAGED BRAIN: PROBING MARSHALL'S CAVEAT

Andrew W. Ellis

(Department of Psychology, University of York, York, UK)

ABSTRACT

Marshall (1977) constructed a plausible simulation of "anomic" speech out of the 100 most common words in the English language. He suggested that impaired access to lower frequency vocabulary might underlie anomic word finding difficulties. But he also noted that another factor, age of acquisition, may exert an influence, with anomic patients experiencing particular difficulty with later acquired vocabulary. A review of research on word-finding in aphasia and other neuropsychological conditions suggests that Marshall (1977) may have been right on both counts, and that in many patients both frequency of use and age of acquisition influence the likelihood that a given word will be able to be accessed and used. Theoretical accounts of why the age of acquisition of words might affect their retention or loss following brain injury in adulthood are considered.

Keywords: aphasia, anomia, age of acquisition, word frequency, familiarity, category specificity

INTRODUCTION

In 1977, John Marshall published a review chapter concerned with patterns of breakdown in aphasic speech production. The review, called *Disorders in the expression of language*, ranged widely from problems initiating speech to problems in stopping speaking, incorporating semantic, syntactic, lexical and phonological difficulties along the way. Those who know John Marshall will not be surprised to learn that both historical and contemporary material were discussed.

In the section I am particularly interested in, Marshall (1977) considered the problems in word retrieval and production experienced by patients with anomic aphasia – patients who show good comprehension of words combined with an reasonable command of sentence construction and articulation, but who struggle to access many of the words they need to use in normal speaking, and perform poorly on naming objects to confrontation. As Marshall (1977) noted, the speech of such patients often seems to be particularly devoid of nouns with specific, precise meanings like *biscuit* or *stool*, as opposed to nouns with very general meanings such as *thing* and *stuff*. This characteristic of anomic speech is illustrated in the speech of patient E.S.T., described by Kay and Ellis (1987). E.S.T. had been rendered anomic by a left temporo-parietal tumour which had been successfully removed. In this extract he is describing the *Cookie theft picture* from the Boston Diagnostic Aphasia Examination (Goodglass and Kaplan, 1972) in which a rather absent-minded young mother, dressed in 1960's clothing, is standing in front of the sink in her kitchen. The taps (faucets) are on, and water is overflowing onto

the floor. Behind her are two children, a boy and a girl. The boy is standing on a stool in order to reach a tin labeled *Cookies*. The stool is about to topple over. Asked to describe this picture, E.S.T. said:

"Er... two children, one girl 'n' one male... The... the girl, they're in a... and their, their mother was behind them in in, they're in the kitchen... in the kitchen. The boy i-is trying to get... a... er, a part of a cooking... jar... He's standing on... the lad, the boy is standing on a... standing on a... standing on a... I'm calling it a seat, I can't... I forget what it's, what the name of it is... It is er a higher, it's a seat, standing on that, he's standing on that... this boy is standing on this... seat... getting some of this er stuff to... biscuit to eat".

The difficulty in accessing specific nouns can be seen in E.S.T.'s failure to retrieve the word "stool". He settles for "seat", acknowledging that it is not quite right. Marshall (1977) offered his own sample of anomic speech, which went as follows:

"I have one or more of them. It's a... I like them. It must be over there in the... by the... but it's not. My... also made one for some... that he had been with in the... as a... it was before he had his... most of them are like that. They can also be had from the... a man has them, many of them, but a new one would be even more of a... Did you have one when you were with them? You said that you had one from the time that you were at... No, if that were so, you could not have made so much... at it all these years. Even then it's not the first new one that I must have been through" (p. 144).

The only specific nouns in this passage are *man*, *dad*, *time* and *years*. Otherwise the "patient" resorts to pronouns like *one*, *them* and *it* to fill the slots where nouns should be. But as Marshall

(1977) immediately confessed, this passage was a fake: "The catch, of course, is that I have made up this passage from the 100 most frequent words in the language... The *appearance* of a noun-deficit could be no more than a reflection of the way in which members of particular syntactic classes are distributed in the word frequency characteristics" (p. 144). As Marshall (1977) acknowledged, other authors had noted that the words that anomic patients remain able to access and use tend to be of higher frequency in the language than the words they have difficulty accessing (e.g., Howes, 1964; Oldfield, 1966; Wepman et al., 1956).

But after constructing his simulated anomic passage and suggesting that a restriction of vocabulary towards higher frequency words might produce the characteristics of aphasic speech, Marshall (1977) entered a caveat. He observed that other factors may be at stake, commenting, "It is also worth noting that the causal status of relative frequency of occurrence is itself subject to doubt. The psychological efficacy of frequency variation may be due to the high correlation of frequency with age of acquisition (Carroll and White, 1973)" (p. 144). The study by Carroll and White (1973) to which Marshall (1977) refers was not concerned with aphasia, but was an investigation of the factors that determine the speed with which healthy adults can name pictures of objects. Carroll and White (1973) had been prompted to carry out their investigation by the earlier study of Oldfield and Wingfield (1965) who had reported an effect of word frequency on object naming speed. But influenced perhaps by John Carroll's involvement in creating a frequency count based on children's reading material (Carroll et al., 1971), Carroll and White (1973) reported becoming aware as they conducted their experiment of the fact that the objects that had higher frequency names also tended to be learned earlier in childhood. In their words, "as data on naming latencies were collected, it became apparent that these were a function not only of word frequency but also of another variable, the age at which a word is typically learned" (p. 85). In a multiple regression analysis, age of acquisition exerted a significant independent effect on naming speed, but the independent effect of the frequency measure they used was not significant. Carroll and White (1973) commented that "the basic finding reached in this study, that the age at which a word was learned in the chief determinant of naming latency, and that word frequency is only incidentally associated with naming latency, promises to be of importance in the study of long-term memory processes. It suggests that memories for words, and possibly for other items, are stored according to a chronological dimension rather than a frequency dimension" (pp. 91-92).

Many subsequent studies have replicated the effect of age of acquisition on object naming speed in healthy adult participants, though recent studies,

which may have had the benefit of better word frequency measures than were available to Carroll and White (1973), have tended to find independent effects of both age of acquisition and word frequency (see Barry et al., 1997; Ghyselinck et al., 2004; Ellis and Morrison, 1998). Like Carroll and White (1973), some of these studies used adult estimates of the age at which words are learned as their measure of age of acquisition, but the effect holds when an objective measure of age of acquisition based on the age at which children can name object pictures is used (Morrison et al., 1997; Ellis and Morrison, 1998). Hence the effect is not an artefact of the use of adult estimates of the age at which words are learned.

#### AGE OF ACQUISITION AND APHASIC WORD RETRIEVAL

Marshall (1977) was suggesting that age of acquisition might also exert an influence on aphasic naming accuracy, with early learned words being more resistant to the brain injury that gives rise to the word finding problems. A potential impact of age of acquisition on aphasic word retrieval had in fact been suggested by Rochford and Williams (1962) who asked 32 aphasic patients (not specifically anomic aphasics) and 120 children aged 2 to 12 years to name 7 common objects (actually 3 common objects and 4 of their component parts). The age of acquisition of each of the object names was taken to be the youngest age at which 80% of the children could name the object correctly. Rochford and Williams (1962) observed quite a close relationship between this objective measure of age of acquisition and aphasic naming accuracy: the earlier the age at which children learned an object name, the better the patients were at naming that object. Rochford and Williams (1962) wrote that "the order of difficulty shows a close relationship with the age of acquisition in children; the names first learned in childhood are those last lost in dysphasia... It almost seems possible to speak of a 'naming age' in nominal aphasia" (p. 227).

Spreeen (1968) described an otherwise unpublished study by himself and Arthur Benton in which they found a correlation of .86 between the number of aphasic patients able to name 40 objects and a measure of the age of acquisition of those object names taken from a group of children aged 2 to 13 years. Spreeen (1968) discussed this finding in relation to 19th century "regression" theories of aphasic language (Kussmaul, 1878; Freud, 1891/1953) and Ribot's (1883) law of memory and amnesia, according to which early memories are better preserved in amnesia than later memories.

The effect of age of acquisition on aphasic naming accuracy has now been replicated several times, in single case studies (Hirsh and Ellis, 1994;

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