Introduction

Deficits in spoken word production can be localized at different stages of the speech production process (e.g. Levelt et al., 1999). Accordingly, a distinction must be drawn between impairments of lexical access to the word form (classical anomia), of phonological encoding (postlexical phonological disorder), and of phonetic encoding (apraxia of speech). These model-based distinctions are also reflected in different approaches to treatment.

In the therapy of aphasic word retrieval deficits partial segmental information (e.g. initial phoneme) is applied to facilitate access to the word form. Although the effectiveness of phonological cueing is frequently described, to date, its underlying mechanism and therefore its relationship with the specific impairment of a patient is not completely resolved (e.g. Nickels & Best, 1996; Nickels, 2002). Mouth-shape is, though more indirectly, also used as a cue, in fact as an inherent part of any natural spoken cue. This cue type provides subsegmental feature information. In the therapy of apraxia of speech mouth-shape information is commonly used in a more direct manner, with the aim of clarifying the configuration of the (visible) articulators (e.g. Square-Storer, 1989). While this technique is likely to belong to the repertoire of every clinician, an objective investigation of the effectiveness and its underlying mechanism is lacking in both patient groups. Even though they presumably affect different stages of the speech production process, segmental and subsegmental therapeutic cues have one thing in common, i.e. they are usually presented in an explicit manner. Although dissociations between explicit and implicit processing abilities have been described in different neuropsychological disorders (e.g. Faulkner & Foster, 2002), a potential impact of the mode of presentation, explicit vs. implicit, is widely neglected in aphasia therapy.

In the current study, the immediate effectiveness of different word form specific cues on picture naming in patients with anomia or apraxia of speech was investigated. The aim was to determine which cue (*segmental*: initial phoneme / *subsegmental*: mouth-shape of the initial phoneme) facilitates word production depending on the mode of presentation (*explicit/implicit*) and the underlying impairment of the patient (*anomia/apraxia of speech*).

Methods

<u>Subjects</u>

To date, the results of a first sample of six left hemisphere damaged patients are available. According to a model-based assessment (Lemo; De Bleser et al., 2004) the primary deficit of three patients was a moderately impaired access to the spoken word form, the other three patients had moderate apraxia of speech with concommitant mild word retrieval deficits.

<u>Design</u>

A spoken naming task was administered in four cueing conditions: ‘segment-explicit’, ‘segment-implicit’, ‘mouth-shape-explicit’ and ‘mouth-shape-implicit’. While the patients were explicitly informed about the presence of a cue in the ‘explicit’ tasks they were not in the ‘implicit’ tasks.

The stimuli consisted of 68 monomorphemic nouns which were controlled for various lingusitic parameters. The corresponding picture set included coloured photographs which were controlled for name agreement.

Patients were required to name the stimuli in the different cueing conditions within a time frame of eight seconds.

Segmental cueing

For the explicit and the implicit segmental cueing task the same 36 items were used. In both conditions the pictures were presented twice, namely in ‘non-similar’ and in ‘similar’ blocks (paradigm adapted from Roelofs, 1999). Within a ‘non-similar’ block the initial phonemes of

the items differed [e.g. ***K**offer* (suitcase), **B**art (beard), **W**ürfel (dice)] whereas in a 'similar' block the words started with the same phoneme [e.g. ***K**offer* (suitcase), **K**atze (cat), **K**ürbis (pumpkin)].
In the 'segment-implicit' condition the phonological similarity in the 'similar' blocks was thought to act as an implicit cue whereas no such cue was available in the 'non-similar' blocks. In the 'explicit' version the spoken initial phoneme of a target word was presented additionally to the patients. Altogether each item was named in four cueing conditions (see Table 1).

Table 1 : Experimental conditions for 'segmental cueing'

	non-similar	***similar***
implicit	no cue	implicit cue (phonological similarity)
explicit	explicit cue (spoken initial phoneme)	explicit and implicit cue (spoken initial phoneme and phonological similarity)

Mouth-shape cueing
The stimulus set for the explicit and the implicit mouth-shape cueing consisted of 32 items. In both experiments the pictures were named twice: either an unrelated mouth-shape (a smiling woman's face) or a related mouth-shape (a woman articulating the initial phoneme of the target item) was followed by the target picture. The explicit vs. implicit processing condition was induced by varying the presentation times of the primes (explicit: 2000ms; implicit: 100ms). On the whole, each item was named in four cueing conditions (see Table 2).

Table 2: Experimental conditions for 'mouth-shape cueing'

	unrelated mouth-shape	***related mouth-shape***
implicit	no cue (short presentation of smiling)	implicit cue (short presentation of mouth-shape)
explicit	no cue (long presentation of smiling)	explicit cue (long presentation of mouth-shape)

Each experiment was controlled by a PC (UDAP; Zierdt, 2005) which allowed presentation of cues and target pictures and recording of the patients' responses as wav-files. Data evaluation included the analysis of naming errors and of reaction times (using PRAAT).

Results
Regarding error rates neither of the four cues (segment or mouth-shape, explicit or implicit each) showed a siginificant effect. The fact that all patients made relatively few errors (15-20%) in general may be an explanation for this pattern. Therefore we analysed the naming latencies to determine changes in performance. For each of the two subgroups (anomic and apraxic speakers) separate analyses of variance were performed for each experiment, with patients as between-subjects factor and cueing condition as within-subjects factor.

Segmental cueing
The effectiveness of segmental cues was analysed by comparing the non-cue condition with the implicit- and the explicit cue-condition. The anomic patients showed no effect of the implicit segmental cue whereas the speech apraxic participants benefited from the phonological similarity of the items. In the explicit segmental cueing condition a different

pattern arose. Both patient groups benefited from the spoken initial target phoneme in terms of shorter naming latencies.

Mouth-shape cueing

To determine the impact of the mouth-shape information the related and the unrelated condition were compared for each experiment. The anomic patients were facilitated neither by the implicit nor by the explicit presentation of the mouth-shape of the initial phoneme of a target word. Whereas the patients with apraxia of speech revealed the same pattern for the implicit condition they were significantly cued in the mouth-shape-explicit naming task.

Discussion

Summarising the first results of the four experiments, the anomic patients only showed a positive effect of the explicit segmental cue whereas the patients with apraxia of speech where facilitated by the explicit and implicit segmental cue, as well as by the explicit mouth-shape cue. This pattern is evidence to suggest that the different cue types affect different stages of the speech production process. For example, the fact that only apraxic speakers were sensitive to the subsegmental mouth-shape information points to an influence of this cue type on the phonetic encoding level. In contrast, the explicit segmental cue seems to facilitate the retrieval of the word form as all patients which had (at least mild) impairments at this processing stage showed an effect for this cue type.

The specific effects of the cues and their relationship with the underlying deficit of a patient will be discussed in the context of a speech production model.

References

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