

Training verb and sentence production in agrammatic Broca's aphasia

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Background: Many aphasic speakers have problems producing verbs at both the word and the sentence level. A treatment programme called ACTION (Bastiaanse, Bunge, & Perk, 2004; Bastiaanse, Jonkers, Quak, & Varela Put, 1997) has been developed to train verb production of both fluent and non-fluent aphasic speakers. It consists of four levels: single verbs, filling in infinitives, filling in finite verbs, and sentence construction. For the present study the efficacy of the programme for agrammatic speakers with Broca's aphasia was tested.

Aims: The aim of the study was to measure the effects of treatment with ACTION on non-trained infinitives and finite verbs, and to analyse the generalisation effects on spontaneous speech and verbal communication in daily life.

Methods & Procedure: ACTION was used to train 11 agrammatic patients with Broca's aphasia, following the multiple baseline across behaviours design. The patients were tested weekly on untreated items. Two follow-up assessments were done, 1 and 3 months post-treatment. Generalisation to related and unrelated materials was measured with subtasks of the Aachen Aphasia Test (AAT). Spontaneous speech was analysed, and verbal communication was measured before and after treatment and 3 months post-treatment by the Amsterdam-Nijmegen Everyday Language Test (ANELT).

Outcomes & Results: There was improvement on the untrained infinitives and finite verbs. The improvement on infinitives was relatively minor; finite verbs, which were more impaired than the infinitives prior to treatment, improved up to the level of the infinitives. The improvement generalised to the related tasks of the AAT, but not to the unrelated task; verbal communication improved significantly. This improvement was reflected in relevant variables of spontaneous speech (mean length of utterances,

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proportion of finite verbs and verb diversity), but not in an unrelated variable (diversity of nouns).

Conclusions: Treatment with ACTION resulted in better production of finite verbs. The effects generalised to spontaneous speech. Most importantly, it was shown that communication in daily life improved.

Keywords: Aphasia treatment; Verb therapy; Agrammatic aphasia; Broca's aphasia; Recovery.

Agrammatic Broca's aphasia is characterised by telegraphic speech. Although telegraphic speech was originally described as the use of mainly content words, and content words were defined as nouns, verbs, and adjectives, it is now generally acknowledged that agrammatic speakers have severe problems with verb production. They use relatively fewer lexical verbs (Saffran, Berndt, & Schwartz, 1989; Thompson, Shapiro, & Schendel, 1994), and/or the diversity of the produced lexical verbs is lower than normal (Bastiaanse & Jonkers, 1998). The verbs that are produced are often uninflected. These problems with verbs are evident in spontaneous speech, and in naming and sentence construction tests (see, e.g., Lee & Thompson, 2004, for English; Bastiaanse, Hugén, Kos, & Van Zonneveld, 2002, for Dutch). Verb problems in aphasia are not just restricted to individuals with agrammatic symptoms; fluent aphasic speakers are often impaired in the production of lexical verbs as well (Bastiaanse & Edwards, 2004; Berndt, Mitchum, Haendiges, & Sandson, 1997; Jonkers & Bastiaanse, 2007).

Data on the effects of verb treatment are relatively scarce. In the 1990s several studies were done to examine the effects of mapping therapy, in which the verb and its argument structure play a central role (e.g., Marshall, 1995; Mitchum & Berndt, 1992; Schwartz, Saffran, Fink, Myers, & Martin, 1994). More recently, several verb treatment studies have been performed, very nicely reviewed by Conroy, Sage, and Lambon Ralph (2006). In some of these studies (Pashek, 1998; Wambaugh, Doyle, Martinez, & Kalinyak-Flishar, 2002) verb retrieval was trained in a similar way to noun retrieval; that is, by using phonological, semantic, and gestural cueing. The researchers found improvement on trained items, but no generalisation to untrained items. Rodriguez, Raymer, and Gonzalez Rothi (2006) and Rose and Sussmilch (2008) also described the effects of semantic, semantic-phonologic, and gesture (plus verbal) treatments on verb production. Rodriguez et al. (2006) found no generalisation to untreated verbs, and modest generalisation was found in the study of Rose and Sussmilch (2008).

The other studies reviewed by Conroy et al. (2006) did not just target verb naming but also examined the effect of therapy on sentence production. Four of them focused on aspects of verb argument structure and sentence production (Fink, Martin, Schwartz, Saffran, & Myers, 1992; Murray & Karchner, 2000; Schneider & Thompson, 2003; Webster, Morris, & Franklin, 2005). In several of these studies better verb retrieval after training was reported. In some participants therapy resulted in a better sentence production, but generalisation to untreated verbs was not always found. Remarkably, generalisation to spontaneous speech and to verbal communication in daily life has been given little attention. Two studies on "constraint-induced aphasia therapy" focused on communicative and behaviourally relevant actions (Pulvermüller & Berthier, 2008) or verb production (Goral & Kempler, 2009) were