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Phases in speech encoding and foreign accent syndrome

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Abstract

This study used perceptual and acoustic analysis to profile the speech characteristics of a single case (SD) of foreign accent syndrome (FAS) and to investigate the effects of conceptual–semantic (imageability), lexical (word frequency), and post-lexical (word length) variables on word production. SD's speech errors were consistent with the reported characteristics of FAS, including vowel lengthening, word stress mis-assignment, consonant cluster lengthening, and consonantal distortion. The following factors contributed to susceptibility to phonetic errors in speech output: low imageability, low frequency when combined with high phonetic complexity, and increasing word length. SD displayed preserved auditory perceptual abilities and a capacity for fluent auditory-to-phonetic conversion in repetition of non-words. We propose that this case of FAS might be best characterised as a disruption to automatised speech control processes but with compensatory mechanisms in place that allow the speaker to maintain some degree of accuracy in speech output.

Keywords: Foreign accent syndrome; Apraxia of speech

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1. Introduction

Foreign accent syndrome (FAS) is an apparently rare neurogenic speech disorder in which an individual produces speech of altered form with the result that the speaker is perceived as having a foreign accent. In common with other acquired neurogenic speech and language disorders, there is considerable variability in the phonetic behaviours demonstrated across individual patients, in the location and extent of brain lesion, and in impairments that may be associated with FAS. There is broad agreement that the phonetic characteristics include segmental changes in both consonant and vowel features, and that prosodic changes are a core characteristic of FAS (Ardila, Rosselli, & Ardila, 1988; Berthier, Ruiz, & Starkstein, 1991; Blumstein, Alexander, Ryalls, Katz, & Dworetzky, 1987; Boatman, Gordon, Stone, & Anderson, 1994; Carbary, Patterson, & Snyder, 2000; Coelho & Robb, 2001; Dankovicova et al., 2001; Graff-Radford, Cooper, Colshier, & Damasio, 1986; Ingram, McCormack, & Kennedy, 1992; Kurowski, Blumstein, & Alexander, 1996; Roth, Fink, Cherney, & Hall, 1997; Takayama, Sugishita, Kido, Ogawa, & Akiguchi, 1993). These changes are generally within the boundaries of permissible phonological and phonetic variants of a language and as a result, the intelligibility of speech remains high and the speaker is perceived as 'foreign' rather than 'disordered'. In terms of the neurobiology of the disorder, speakers often have a lesion in the region of Broca's area and the surrounding sub-cortical white matter of the language-dominant hemisphere (Berthier et al., 1991; Coelho & Robb, 2001). However, there is considerable variability in reports of the size of lesion, and in the particular structures that are damaged. In addition, there are cases of speakers with lesions in these same regions who appear not to display the characteristics of FAS. The disorder may occur in relative isolation, or may be accompanied by aphasia, apraxia of speech (AOS), or dysarthria of varying levels of severity (Aronson, 1985). Mild aphasic impairments such as hesitation associated with lexical retrieval difficulty and syntactic and morphological errors contribute to the perception of 'foreignness'.

The behavioural profile of FAS has been established through a series of single-case studies (e.g., Monrad-Krohn, 1947). These case descriptions have reported the constellation of features of FAS at the level of listeners' perceptions of the type of foreign accent, and also the phonetic characteristics of the disorder at both perceptual and acoustic levels. However, our understanding of the syndrome remains at the level of an astronomer spotting the elements of a constellation rather than a deep understanding of the neurocognitive mechanisms underlying the disorder. There are many intriguing issues surrounding FAS that are of potential importance in understanding both this disorder and the mechanisms of speech movement control and learning throughout the lifespan. One issue is a possible age and gender bias in the disorder. A review of 45 reported cases of FAS (Coelho & Robb, 2001) found that 65% of cases were female, and of the female cases 95% were under the age of 65 years. A second major issue is the relationship of FAS to the more frequently reported syndrome of AOS. A number of authors have suggested that FAS is a sub-type of AOS (Ardila et al., 1988; Aronson, 1985; Berthier et al., 1991; Coelho & Robb, 2001; Ingram et al., 1992; Moen, 2000; Roth et al., 1997; Varley & Whiteside, 2001; Whiteside & Varley, 1998). Alternatively, Kurowski et al. (1996) propose that the speech patterns that characterise FAS are qualitatively different to those of AOS. A third intriguing question is the extent to which the characteristics of FAS directly reflect impairment of an underlying mechanism (e.g., that an altered pattern of stress is a