DIAGNOSING DYSARTHRIA IN ADULTS

BEYOND LANGUAGE

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DIAGNOSING DYSARTHRIA IN ADULTS

A NEW SPEECH ASSESSMENT METHOD FOR POLISH, ENGLISH, AND SPANISH

IZABELA GATKOWSKA

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LIST OF RECORDINGS

Information on all Recordings available at Æ Academic's page:
https://aeacademicpublishing.com/books/diagnosing-dysarthria/

LIST OF ABBREVIATIONS

ASSIDS – Assessment of Intelligibility of Dysarthric Speech
ALS – amyotrophic lateral sclerosis (cf. MND), also: Charcot disease,[1] Lou Gehrig disease
CT – computer tomography
EMG – Electromyography
ET – essential tremor
FDA – Frenchay Dysarthria Assessment
fMRI – functional magnetic resonance imaging
HD – Huntington disease
LD – laryngeal dystonia
MND – motor neuron disease
MRI – magnetic resonance imaging
MS – multiple sclerosis, also: disseminated sclerosis
MSA – multiple-system atrophy
ORL – otorhinolaryngology, also: otolaryngology
PD – Parkinson disease
POS – psychoorganic syndrome
PSP – progressive supranuclear palsy
RDP – Robertson Dysarthria Profile
SAM – Speech Assessment Method
SCA – spinocerebellar ataxia
SN – *substantia nigra*
TBI – traumatic brain injury

[1] [Note: The BL series follows WHO and AMA guidelines, which advocate for the elimination of the possessive in eponymic names of neurological disorders. For details, see, e.g. Michael R. MacAskill, Tim J. Anderson (2013) "Whose name is it anyway? Varying patterns of possessive usage in eponymous neurodegenerative diseases." *PeerJ* 1(e67); DOI: 10.7717/peerj.67—ed.'s note]

LIST OF SELECTED IPA SYMBOLS

æ	open front unrounded oral vowel
β	voiced bilabial fricative
ɕ	voiceless (alveolo)palatal fricative
ð	voiced dental fricative
d͡ʒ	voiced palatoalveolar affricate
ə	mid central unrounded oral vowel (schwa)
ɚ	rhotacized mid central unrounded oral vowel
ɛ	open-mid front unrounded oral vowel
ɛ̃	open-mid front unrounded nasalized vowel
h	voiceless glottal fricative
x	voiceless velar fricative
ɪ	lax close front unrounded oral vowel
ɨ	high central unrounded oral vowel
j	oral palatal approximant
l	voiced alveolar lateral approximant
ɬ	velarized voiced alveolar lateral approximant
ɱ	voiced labiodental nasal stop
ŋ	voiced velar nasal stop
ɲ	voiced palatal nasal stop
ɔ	open-mid back rounded oral vowel
ɔ̃	open-mid back rounded nasalized vowel
ɾ	voiced alveolar tap
ɹ	voiced postalveolar approximant
r	voiced alveolar trill
ʃ	voiceless palatoalveolar fricative
ʂ	voiceless postalveolar fricative
θ	voiceless dental fricative
t͡ʃ	voiceless palatoalveolar affricate
t͡s	voiceless alveolar affricate
ʊ	lax close back rounded oral vowel
ʌ	open-mid back unrounded oral vowel
ɣ	voiced velar fricative
ʒ	voiced palatoalveolar fricative
ʐ	voiced retroflex fricative
ʑ	voiced alveolopalatal fricative
⟨⟩	spelling
//	phonemic transcription
:	long vowel
ˈ	primary stress

INTRODUCTION

D y s a r t h r i a is the name of a class of organic speech sound disorders which impair the executive aspects of human speech, i.e. the function of the articulatory organs, the movements of the tongue, lips, and soft palate. The impairment of specific elements of the speech apparatus gives rise to qualitative changes in the speech sounds, possibly in tandem with shortened phonation duration and prosodic disorders, mainly affecting intonation and word stress. The speaker's voice quality and pace of speech are also altered. This set of dysarthric symptoms in speech may appear secondary to a neurological disease, irrespective of the specific language spoken by the patient. Changes in the clinical picture of speech may sometimes become evident before the full manifestation of the neurological condition, therefore contributing to an earlier diagnosis. When speech changes are audible, professional speech analysis yielding a good and accurate diagnosis of dysarthria may be indicative of a particular neurological disease and thus confirm a neurological diagnosis, or – in the case of an unclear presentation – it may help resolve medical doubts.

From the physiological perspective, human speech organs do not differ substantially, irrespective of a language spoken. Hence, when a dysarthria-causing disease impairs the function of the articulatory organs (mainly the tongue but also the lips and soft palate) and causes the phonation duration to be shortened, the pace of speech to be altered, and qualitative changes to arise in the patient's voice, all these changes occur independently of the patient's native language. We should interpret impaired prosodic elements similarly (mainly utterance intonation and word stress), as these changes are also independent of the language.

Since the human speech apparatus is physiologically roughly the same in speakers of all languages, we may assume that its defects caused by dysarthria will manifest in speech in the same way. Granted, the phonetic systems (systems of speech sounds) of the Indo-European languages differ in terms of their inventory of sounds, sound length, prosody, accentual system, etc. However, speech apparatus defects will most likely manifest in the same speech sound groups produced by identical or similar articulatory processes across languages. The problem that the diagnostician faces, therefore, involves identifying those sounds in various languages and linking them to a specific disorder.

The point of departure for the current study is an analysis of the speech impairments observed in adult neurological patients speaking Polish. First, I analyzed the acoustic (phonetic) defects in order to identify the articulatory processes impaired by a neurological disorder. In the next step, I identified the group of speech sounds that are produced by these same articulatory processes in English and Spanish. This shall allow the diagnostician to focus observation on these specific groups of sounds, since their distortion may indicate impairment of the articulatory apparatus. This original, linguistically-grounded method of diagnosing dysarthric speech disorders, developed and tested in a neurological clinic for Polish-speaking patients, was adapted for the diagnostic needs of English- and Spanish-speaking patients (Gatkowska 2012).

The new speech assessment method (SAM) tests the efficacy of the tongue, lips, and soft palate in speech production by incorporating selected sounds present in the phonetic system of a given language. Other diagnostic tasks to test articulatory organ function can be used irrespective of the patient's language. Diagnostic tests to evaluate the intelligibility of speech, prosodic elements, phonation, and writing ability (distinctively misshapen letters are an indication for neurological diagnosis) have been adapted for individual languages, i.e. Polish, English, and Spanish.

In developing the new SAM, I followed what may be described as a certain "happy medium" methodology, striving to strike an ideal balance between minimizing the number of diagnostic tasks required of the patient and maximizing the informational value of the tasks, in order to facilitate an accurate diagnosis of dysarthria. The discussion of SAM is illustrated with examples of its practical application. The attachment contains 19 recordings that illustrate diagnostic testing of various forms of dysarthria carried out at the Neurology Clinical Department, Collegium Medicum, Jagiellonian University in Kraków, Poland, between 2010 and 2011. The patients are speaking Polish, and so their recordings are subtitled in English. Various forms of dysarthria recorded in the films are described and interpreted in Chapter Five. A full list of diagnostic tasks and instructions given by the diagnostician is provided in the Appendix.

Izabela Gatkowska
Kraków, May 2019