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Diagnosis of the pronunciation norm¹

SUMMARY

The article seeks to define diagnostic criteria regarding the pronunciation norm for the needs of the ongoing research project. The proposed solution should also contribute to standardization of speech therapy management in the field investigated. According to the author, the linguistic norm is directly connected with the biological norm, which comprises the anatomical norm, functional norm, and perceptual norm. Diagnosing of the pronunciation norm will cover recognition of states conforming to the linguistic norm and the biological norm according to the adopted linguistic criteria (phonetic, orthophonic, and sociolinguistic) and biological criteria (anatomical, functional, and perceptual). All the foregoing criteria were characterized in detail.

Keywords: pronunciation norm, linguistic and biological (anatomical, functional, perceptual) diagnostic criteria.

INTRODUCTION

The problem of diagnosis of the pronunciation norm is investigated by speech therapy, in particular by artistic speech therapy, a subdiscipline distinguished by Leon Kaczmarek (1991), which deals with the assessment and improvement of articulation and communication in different aspects: phonetic (segmental and suprasegmental levels, voice), orthophonic (correctness), interpretative, and rhetori-

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cal. Usually, spoken utterances of adult speakers and young people are assessed: those of candidates for university speech therapy studies, for theatrical schools, music academies, and participants in declamation contests, etc. Linguistic correctness, including correct pronunciation, is expected from representatives of some professions and persons exercising public functions: teachers, journalists, lawyers, public relations specialists, managers, politicians, and priests.

Despite the indisputable establishment of artistic speech therapy as a part of speech therapy, it has not yet developed a uniform standard of diagnostic procedures², while the criteria proposed in different publications refer to a selected aspect of assessment (for example the segmental and suprasegmental levels of utterances, cf. B. Kamińska 2012). This is probably due to several causes. It is difficult, or perhaps even impossible, to develop entirely uniform strategies for speech therapy management because of the immensely high subjectivity of the skills assessed (e.g. vocal interpretation of text, emotional prosody) and the subjectivity of those making the assessment. Some of the adopted criteria will certainly have to be individualized, selected or expanded on account of specific needs of a particular diagnosis and the complexity of the phenomena assessed.

The present article seeks to define diagnostic criteria for the pronunciation norm for the purpose of standardizing speech therapy management in this field.

THE CONCEPT OF LINGUISTIC NORM

The concepts of linguistic norm and pronunciation norm have long been the subject of discussion in different approaches. Contemporary linguistics treats a norm as one of the levels of the internal organization of language (apart from the language system understood as a pattern, and apart from speaking, or free communication activity) that differ by the degree of abstractness (cf. Miodek 2001). In light of the functional linguistic theories a norm is the system of a language in action, it is made up of linguistic units and rules of their use that function in a specific period and in a language community. The *Słownik terminologii językoznawczej* [Dictionary of linguistic terminology] (cf. Gołąb, Heine, Polański 1970) defines the linguistic norm as an element of the language system, a rule that defines how to pronounce phonemes, what the meanings of individual signs are, how to combine linguistic units into larger wholes, and how to use language. In the interpretation of D. Buttler, H. Kurkowska, and H. Satkiewicz (1971) the language norm is a set of linguistic units approved by a society (this approval is expressed in the language usage – the social custom of using specific linguistic features), and rules defining the ways of realization of connections between these units in texts.

² Vol. 37 of “Logopedia” (2008), entirely devoted to standards of speech therapy management, does not contain any text on the issues of artistic speech therapy and diagnosis of the pronunciation norm.

Sociolinguistic approaches (cf. Urbańczyk 1991) define the linguistic norm as the only correct, universally approved pattern, a typical use (application) of linguistic forms adopted by society, the rule of utilizing a linguistic feature or a set of features, maintained by a widespread custom, and formulated by linguists. The *Wielki słownik poprawnej polszczyzny* [Great Dictionary of Correct Polish] (Markowski 2012, 1626) defines the term ‘linguistic norm’ as “[...] a set of the elements of the language system, i.e. the inventory of words, their forms and combinations, and the inventory of ways of creating, combining, pronouncing and writing all linguistic means which are recognized at a certain period by a community (usually by the whole society, and first of all by its educated classes) as standard, correct or at least admissible.” These elements are passed on both in spoken and written texts, and in social behaviors. Polish linguistic literature clearly stresses the differentiation of general Polish in its oral variety, and distinguishes in it the following: stage and school pronunciation (Klemensiewicz 1930), a conversation and monologue variety (Klemensiewicz 1961), a colloquial (non-specialized) variety and a specialized variety (Urbańczyk 1979), spoken language: colloquial, literary, scientific and artistic (Furdal 1973), a general-Polish spoken rhetorical style, and a general-Polish colloquial spoken style: familial, professional/occupational, social, and biological (Skubalanka 1976), a formal style, a careful conversational style, and a fast informal style as three basic pronunciation styles, and two intermediate ones: a solemn style and fast conversational (Biedrzycki 1978), a casual variety and a careful variety (Pisarek 1991), an official subtype and a popular (standard) subtype of spoken general Polish (Buttler 1982), official language, cultural language, and colloquial language (Wilkoń 1987), the official variety of spoken language and the informal variety (Dunaj 1981; Ożóg 2001), and careful pronunciation (very careful and careful), and colloquial and careless pronunciation (Lubaś, Urbańczyk 1990).

The official (very careful and careful) oral variety of general Polish is characterized by (as cited in Ożóg 2001): its use in formalized public and social situations, correct and careful language (at the phonetic, morphological, lexical/semantic and syntactic levels), a tendency to observe linguistic norms, and by few variants, limited expressive forms, control and awareness of the linguistic units produced, and similarity to the written variety of general Polish. B. Dunaj (2006) stresses that careful pronunciation is characterized by the slow rate of speech³ (fast speech may be the subject of description and study, but recommendations concerning correct usage are not formulated for it).

³ Similarly, B. Roślowski (1986) makes the correctness of pronunciation conditional on the rate of speech, distinguishing *lento* and *allegro* speech, while L. Biedrzycki (1978) treats the speech rate (*lento*, *moderato*, *allegro*) as the fundamental criterion for division into formal, careful (conversational) pronunciation and quick, casual pronunciation, also distinguishing the styles of utterance on the same grounds.

The informal (colloquial, casual) variant of the oral variety of general Polish is characterized (after Ożóg 2001) by its use in private, informal, daily communication situations, lower correctness and carefulness at all levels of language organization (at the phonetic level it manifests in sound reductions, simplifications of consonant clusters, careless articulation, fast speech rate, differentiated intonation and use of logical accent), by expressiveness, and by the frequent mechanical and unconscious use of particular linguistic units.

On account of the use of the official (careful) and informal (casual) varieties of general Polish in different communication situations, and depending on the cultural/linguistic needs of language users, two levels of the linguistic norm are distinguished: standard and utility norm (Markowski 2012).

”The standard norm comprises the elements of language and utterances that are used consciously, with the sense of their semantic and stylistic value and are in accordance with language tradition, the grammatical and semantic rules of Polish, and with the development tendencies observable in it. Therefore, these are elements accepted by the overwhelming majority of educated Poles, especially by those who learned general Polish at home and completed more than secondary education, treating language as a value, also a value in itself” (Markowski 2012, 1627). The standard norm is comparatively uniform, supracommunal, but somewhat differentiated regionally (for example regional phonetic elements recognized as having equal status), limited in terms of variants of language elements, observed in all official (standard-setting and culture-making) contacts and kinds of utterance.

The utility (colloquial) norm realized in free, informal contacts is distinguished by the comprehensible form, its simplicity and clarity, but not always conforming to the language system. The utility norm contains many jointly functioning elements with different types of variants. The following colloquial norms are distinguished: general, regional, and professional.

Therapeutic management in artistic speech therapy – diagnosis, prevention, programming and conducting therapy – applies to the standard norm of the language.

CRITERIA FOR THE DIAGNOSTIC PRONUNCIATION NORM

Evaluation of the correctness of pronunciation requires clear criteria for assessment. “The assessment criterion for a linguistic form should be understood in terms of a measure whose application permits one to find whether this form is correct or incorrect (erroneous). There is no one universal measure of correctness (conformance with norms) of texts, innovations or elements of the system” (Markowski 2012, 1595).

I adopt S. Grabias's definition (2012, 36) that logopedics is a science of the biological determinants of language and linguistic behaviors. From this perspective the efficiency of realization of the segmental and suprasegmental levels of utterances is closely related to the speaker's biological capabilities and his/her knowledge of the world (cognitive competences), knowledge of production of grammatically correct sentences (linguistic competence) and knowledge of linguistic behavioral patterns utilized in social life (communicative competence).

The author maintains that the pronunciation norm is directly connected with the biological norm, which comprises the anatomical norm, functional norm, and perceptual norm. Diagnosis of the pronunciation norm will involve identification of states consistent with the linguistic norm and the biological norm according to the adopted criteria. The assessment of the phonetic norm should therefore take into account:

- linguistic criteria:
 - phonetic,
 - orthophonic,
 - sociolinguistic,
- biological criteria:
 - anatomical,
 - functional,
 - perceptual.

They originate from linguistic, sociolinguistic, and speech therapy theory and practice but also from orthodontic, phoniatic and audiological. All the criteria were discussed below, with specific problems being distinguished and at the same time limited to the necessary minimum.

LINGUISTIC CRITERIA

Linguistic criteria are indisputably the most significant in diagnosing the pronunciation norm. They comprise the following partial criteria:

1) phonetic – related to the assessment of realization of all vowel and consonant phonemes in the language, assessment of speech prosody and characteristics of the speaker's voice,

2) orthophonic – concerning the correctness of pronunciation in relation to the standard norm,

3) sociolinguistic – associated with the assessment of individual constituents of the speech act, the situation of language use, and social features of participants in the communication act.

PHONETIC CRITERIA

The assessment of pronunciation (subjective – auditory and visual, objectivized by means of acoustic analysis as the need arises) should comprise:

1. The way of realization of all phonemes in the language in accordance with the adopted phonological inventory, including basic and positional variants. The analysis should cover the articulation of all vowels and consonants in all contexts: the neutral one in order to describe basic variants and identify them as normative or as disordered, and in consonant clusters⁴ in order to describe the process of co-articulation⁵, in different combinations (in isolation, in a syllable, in logatomes, in words with different numbers of syllables, in sentences, and in texts) as well as in different positions (inter- and intra-word, taking the initial, medial, and final positions into consideration).

2. Speech prosody, including such phenomena as intonation, lexical and phrasal stress, speech rhythm and speech rate, duration of segmental elements, pauses, and voice pitch and timbre. Consequently, assessment should apply first of all to linguistic prosody, but it can be broadened to cover the realization of emotional prosody and units with extra-linguistic functions, which is essential particularly when assessing stage pronunciation.

3. Voice and its features are realized according to the gender and age of the speaker in neutral utterances: subjective (auditory) features such as pitch, volume and timbre, and the corresponding objective acoustic features: frequency⁶, intensity, and the spectrum structure⁷. The model voice is sonorous, represented by a regular contour connected with the periodic work of vibrating vocal folds, without friction effects. It should be stressed that the term ‘phonation’ as defined by phonetics has a far broader scope than its meaning in phoniatric literature. It is defined as the use of the phonatory apparatus through the airflow produced by the respiratory apparatus in order to generate an audible source of acoustic energy that can be modified using articulatory activities in the remaining parts of the speech apparatus (Laver 1994, 184).

⁴ The description of consonant clusters in Polish is contained in the book by S. Milewski (1999).

⁵ The pronunciation of consonant clusters is broadly commented on in all handbooks of Polish phonetics and in dictionaries of correct Polish pronunciation as well as in articles on the subject and in many publications on artistic speech therapy (some of them have been mentioned while discussing the orthophonic criterion).

⁶ Fundamental frequency F_0 is on average 120 Hz for male voices, 220 Hz for women, and 330 Hz for children aged ca. 10 years; it ranges from 50 Hz to 250 Hz in men, from 120 Hz to 480 Hz in women (figures for European languages, as cited in : Laver 1994, 451).

⁷ The basic types of phonation distinguished in phonetics cover: whispering phonation, voiced phonation (and within it: falsetto, creaky voice, breathy voice and modal voice) and voiceless phonation (exhaling and nil phonation) .(as cited in Laver1994, 198-200).

When assessing stage pronunciation, the diagnosis of speech prosodic features and voice characteristics should be broadened with the interpretation of texts (cf. Michałowska-Rozhin 1991; Kram 1981; Toczyska 2007; 2008, Kotlarczyk 2010).

To objectivize the assessed segmental and suprasegmental speech elements, voice features and to make appropriate conclusions, it is necessary to measure correctly selected acoustic parameters, e.g. e.g. formants F_1 and F_2 applied to vowels, the VOT (*Voice Onset Time*) parameter to assess voicing, the spectrum COG (*center of gravity*) to describe the noise of sibilant consonants, and fundamental frequency F_0 to characterize intonation contours, etc. (cf. Trochymiuk 2008).

Diagnosis using the phonetic criterion should exclude the presence of any articulation disorders (both at the segmental – cf. Ostapiuk 2013a, and suprasegmental levels – cf. Wysocka 2012), and voice disorders (cf. Pruszewicz 1992).

ORTHOPONIC CRITERIA

The codification of the contemporary standard norm and utility norm can be found in the dictionaries of correct Polish⁸: *Nowy słownik poprawnej polszczyzny* [The New Dictionary of Correct Polish] (Markowski 1999) and its modified version – *Wielki słownik poprawnej polszczyzny* [The Great Dictionary of Correct Polish] (Markowski 2012). Many entries and headwords contain essential information about correct pronunciation. Other, larger studies on correct phonetic usage include: *Słownik wymowy polskiej* [Dictionary of Polish Pronunciation], 1977, eds. M. Karaś and M. Madejowa, *Poradnik fonetyczny dla nauczycieli* [Phonetic Guide for Teachers] by B. Ročławski (1986), *Podręczny słownik poprawnej wymowy polskiej* [The Concise Dictionary of Correct Polish Pronunciation] by W. Lubaś and S. Urbańczyk (1990); considerable attention is devoted to pronunciation correctness by A. Markowski in his publication *Język polski. Poradnik* [Pol-

⁸ The problems of the phonetic norm and correct Polish pronunciation were first discussed in the Union of Polish Stage Artists (ZASP), which was occasioned by the report delivered by Tytus Benni in Warsaw in January 1923. The next year (Benni 1924) the first study on correct spoken Polish was published: *Ortofonia polska. Uwagi o wzorowej wymowie dla artystów, nauczycieli i wykształconego ogółu polskiego* [Polish orthophony. Remarks on the standard pronunciation for artists, teachers, and educated Polish people]. On the initiative of ZASP, in December 1924, the so-called “Commission of Six” was appointed, three members having been named by ZASP (Jan Kochanowicz, Mieczysław Limanowski, and Stanisław Stanisławski) and the next three (Tytus Benni, Kazimierz Nitsch, and Stanisław Słoński) by the Main Board of the Society of Lovers of the Polish Language (TMJP). The Commission prepared theses and resolutions about the Polish stage pronunciation and standard school pronunciation. Further studies on the rules of correct Polish pronunciation continued as part of the activities of the TMJP Commission, which culminated in the publication of *Pravidła poprawnej wymowy polskiej* [The rules of correct Polish pronunciation] (1930) edited by Z. Klemensiewicz, and reissued many times.

ish Language. A Guide] (2003). Problems of correct Polish pronunciation are also discussed in articles; more recent ones worth noting are: an article by M. Madejowa (1993) on the pronunciation of nasal vowels and consonant clusters, and one by B. Dunaj (2006), which contains an overview of rules formulated for careful normative speech used in official contacts (cf. Dunaj 2006). There is not enough room to list numerous publications in artistic speech therapy devoted to the issues of pronunciation correctness, but the studies by D. Michałowska (1994), B. Tozcyska (1997, 2000) and by M. Walczak-Deleżyńska (2001) need to be emphasized.

When diagnosing the pronunciation norm, selected criteria for linguistic correctness developed in linguistics should be taken into consideration⁹.

1. The cultural authority criterion

This criterion defines who may determine the correctness of realizations of particular elements of the language system, including phonemes and prosodic features of speech. These persons are recognized cultural, and linguistic, authorities who use correct Polish, and know its history and its present development trends. The practice of approving specific realizations at the standard norm level has always been attributed to the (especially humanistic) intelligentsia with the roots of many generations. The popularization of knowledge about Polish, its varieties, norms, and criteria for use, about proposed language forms appropriate in different situations, and settling of linguistic doubts concerning vocabulary, grammar, pronunciation, spelling and punctuation, as well as about the adequacy of the style of utterances is the responsibility of the Polish Language Council set up by the Presidium of the Polish Academy of Sciences in 1996.

The assessment of pronunciation should, without doubt, be carried out by professional speech therapists¹⁰ and phoneticians, based on codified principles and on their own sense of linguistic correctness.

2. Usage (distribution) criterion

This criterion permits assessment of elements that are becoming part of the norm at a given moment through usage, i.e. linguistic innovations. The common widespread use of new language forms in different types of texts, diverse communicative situations and in different environments, or their high frequency and extensive textual and social use, often decides that they are recognized as correct.

⁹ The first set of such criteria was compiled by W. Doroszewski (1950). Over the last several decades it was modified and enlarged (cf. Walczak 1995; Markowski 2012).

¹⁰ There is no one commonly used word to name a specialist in artistic speech therapy., which is pointed out by B. Kamińska (2012), mentioning the following names: artistic speech therapist, orthologopedist, speech therapist-orthoepicist, media speech therapist. None of the names of this speciality in speech therapy is entered on the list of professions/occupations practiced in Poland.

3. Esthetic criterion

This is evidently one of the most subjective criteria although, A. Markowski (2012, 1596) observes, as far as spoken texts are concerned positive esthetic impressions are always made by those that are carefully articulated. Correct articulation and diction should be transparent –they should not draw the listener’s attention by tense facial expressions or they should not make the impression that the speaker is too focused on these activities, or that s/he uses too much effort.

SOCIOLINGUISTIC CRITERIA

Apart from linguistic criteria, the assessment of the oral variety of the language involves sociolinguistic criteria associated (as cited in: Lubaś 1979; Grabias 1997) with:

1. Components of the speech act (sender/, receiver, type of code – written or spoken, contact, message, and context).

2. The situation of language use (the place and time of conversation, number of interlocutors, subject of utterance, utterance channel, and the genre of the text produced).

3. The social features of participants in a communication act (gender, age, social and regional background, education, profession/occupation, the type of the environment of permanent residence: village, town/city, small town or settlement, types of relationships between partners, and rank relationship (dominance-subordination relationship)).

BIOLOGICAL CRITERIA

The following partial criteria can be distinguished within this heading:

1) anatomical – understood as a set of features that determine the correct structure of the speech organs,

2) functional – a set of features defining the correct functioning of the speech organs and the right course of acts associated with speech such as respiration, mastication, and swallowing,

3) perceptual – seen as a set of features determining the correct reception of sounds, including first of all speech perception.

ANATOMICAL CRITERIA

I assume that one of the conditions for correct pronunciation is the appropriate structure of the mobile and immobile speech organs lying within the resonating cavities, i.e. in the oral, nasal, and pharyngeal cavities. Appropriate data should be found through interview, observation, and possibly, through digital palpation, based on the knowledge of anatomy.

The assessment of the anatomical structure of speech organs presented in speech therapy publications is usually conducted from the perspective of description of various anatomical defects rather than normal features of this structure; moreover, various partial criteria are applied resulting from the adopted research perspective and the range of studies (e.g. on the cleft palate: Pluta-Wojciechowska 2010, on malocclusion: Konopska 2007, on the short tongue frenulum, Ostapiuk 2013b). There is still no closed list of criteria in speech therapy that should be taken into account in diagnosing the anatomical norm of the speech organs. The author believes that diagnosis of the correct anatomical structure, carried out by the speech therapist independently or in consultation with specialists (orthodontists, phoniatrists, and laryngologists) should take the following organs and their features into consideration.

1. Lips

The assessment of the anatomical structure of the lips should cover:

- the shape of the upper and lower lip and their connection on the right and left side by the angles of the mouth, which are the lateral limit of the oral fissure (it extends more or less from the left canine teeth to the right ones),
- the shape of the philtrum which ends with the tubercle of the upper lip at its lower extent,
 - the right coloring and wetness of the lips,
 - the internal surface of the lips characterized by the presence of the mucous membrane extending towards the gums,
 - the frenulum of the upper and lower lip – a visible crescent-shaped fold of the mucous membrane on the median plane, both in the upper and lower lip, where the labial mucous membrane extends into the gums,
 - the pterygomandibular fold which forms when the mouth is open,
 - the position of the lips at rest anteriorly: the lips are joined before the teeth without effort (the distance between the lips longer than 3-4 mm indicates the failure of the lips and the alveolar-process protrusion (Proffit, Fields 2001, 157),
 - the position of the lips at rest in profile: the relation of the upper lip to the vertical line extending along the philtrum, and the relation of the lower lip to the similar line between the concavity of the lower lip and the chin are assessed (the convexity of the lips larger than 2-3 mm indicates alveolar process protrusion Proffit, Fields 2001, 157).

2. Tongue

The elements that make up the anatomical structure of the tongue are:

- color – pale-red, pink in the lower surface; the dorsum of the tongue covered with white, thin coating, somewhat thinner near the root of the tongue; on both sides of the medial line the blue-colored deep lingual vein shows through,

- structure – the mucous membrane of the lower tongue surface is thin and delicate; the upper surface with the groove called the median longitudinal raphe,
- the structure of the tongue body – it is the larger part of the tongue, ca. 2/3 of its length, it narrows anteriorly, turning into the tongue tip without a visible boundary; it has the far longer upper surface (tongue dorsum) and the shorter lower surface, which are joined along the obtuse lateral margins, the lower tongue surface is smooth and divided by the mucous fold, called the tongue frenulum; in the posterior part there is the terminal sulcus, which is the transition of the tongue body into the root of the tongue.,
- the shape of the tongue tip – the apex of the tongue is narrowed and flattened.

3. Mandible

In the mandible there is the massive body from which the mandibular rami extend posteriorly in a symmetrical way. This place is called the gonial angle. The ends of the mandibular rami form the temporomandibular joint together with the temporal bones. In this way the mandible is joined with the cerebral part of the skull. A characteristic feature of the human mandible is the chin, which developed phylogenetically with speech (as cited in: Łabiszewska-Jaruzelska 1995, 52).

When analyzing the anatomical structure of the mandible, the following should be assessed:

- profile – in an adult person at rest, during the occlusion of dental arches it is similar to the orthognathic profile: the profile points are aligned in a straight line (the profile of a small child has the characteristics similar to distoclusion),
- the angle of the mandible, whose normal value, developing between 7–16 years of age, is 120-130°; its value changes in different anomalies, inter alia occlusal ones (after Łabiszewska-Jaruzelska 1995, 63).

Examination should exclude the existence of inter alia (as cited in: Łabiszewska-Jaruzelska 1995, 142):

- macrogenia characterized by the excessive growth of the mandible in all three dimensions, enlargement of the width between the gonial angles, lengthening of the maxillary section of the face and the protrusion of the chin and the lower lips in front of the biometric field; inside the mouth there is total mesiocclusion and lateral crossbite on both sides,
- microgenia, - hypognathia in all three dimensions, in which the gonial angle is too obtuse, the jaw appears to be protruding, the facial features exhibit the so-called “bird-like” profile, in the contact of teeth there is total distoclusion.

4. Occlusion and teeth

During examination the features of the correct mutual position of dental arches (*eugnathia*) in the permanent dentition consisting of 28 teeth or 32 with

wisdom teeth are assessed. The following should be excluded in the dentition (Karłowska 2008, 92–100):

- crowding of teeth ,
- disorders of dental structure (megalodontia, microdontia, fused teeth, and connate teeth),
- irregular number of teeth (hyperdontia and hypodontia)
- abnormal positions of teeth (inclinations, distancing from the occlusal plane, rotations, and diastema),
- anomalies in the time of teeth eruption.

The parameters that constitute the physiological norm of central occlusion in permanent dentition are as follows (Grosfeld 1981; Karłowska 2008; Proffit, Fields 2001; Rokitiańska 2004):

- a)** the position of dental arches relative to the sagittal (median) plane:
- the upper dental arch is semi-elliptical in shape,
 - the lower dental arch is parabolic in shape,
 - the symmetry line of the upper dental arch coincides with the symmetry line of the lower dental arch,
 - the median line of both the dental arches running between medial incisors coincides with the median line of the face,
 - teeth contact the adjacent teeth in the same arch at contact points (this does not apply to the final teeth present in the arch i.e. the third molars).

Examination should exclude cross-bite, lingual occlusion, and lateral mandibular displacement:

- b)** the position of dental arches relative to the frontal plane:
- overjet – the distance from the incisive margin of the upper medial incisor to its projection onto the vestibular (labial) surface of the lower medial incisor is ca. 2-3mm (cf. A in Fig. 1).

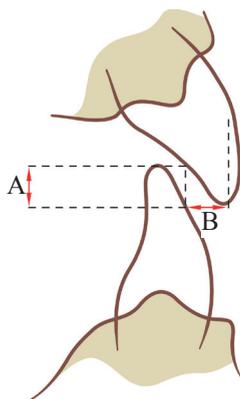


Fig 1. Schema of the relation between lower and upper incisors. A – vertical incisive overlap , B – horizontal occlusion field. Source: Majewski 2009, 101

- Angle's class I – the anterior buccal cusp of the first upper permanent molar tooth touches the intertubercular groove of the first permanent lower molar tooth (cf. Fig. 2); assessment should be made bilaterally,

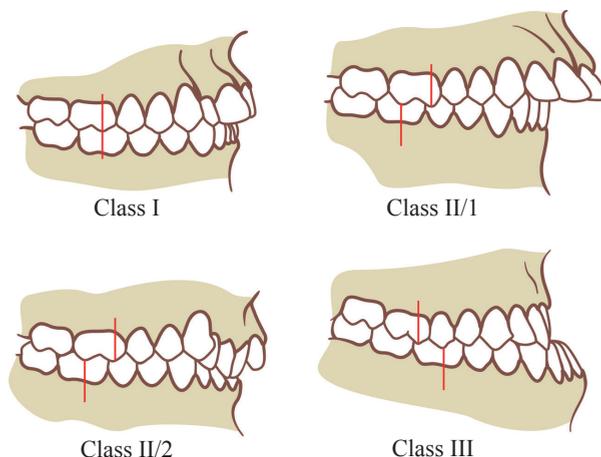


Fig. 2. Angle's classes – schema of occlusal relationships . Source: Majewski 2009, 100

- canine tooth class I – the masticatory tubercle of the upper canine tooth overlaps downwards on the contact point of the lower canine tooth and the lower first premolar.

Displacements relative to the frontal plane are the result of distocclusion, mesiocclusion, maxillary prognathism or inferior prognathism:

c) the position of dental arches relative to the horizontal plane:

- overbite – the distance from the incisive margin of the lower medial incisor to the incisive margin of the upper medial incisor is ca. 3-4mm (1/2–1/3 of the height of lower incisor crowns , cf. B in Fig. 1),

- contact of teeth in the occlusion plane – the teeth of the upper arch cover the vestibular surfaces of the lower arch (buccal cusps of the upper lateral teeth cover/overlap the buccal cusps of the lower lateral teeth),

- the principle of the dental triad is preserved – in occlusion each tooth touches two opposing teeth of the second arch (except for the lower medial incisors and final upper molars, which touch one tooth).

The correct testing excludes the occurrence of supraocclusion, open bite, and centric occlusion, which is regarded as functionally efficient in medical terms.

5. Palate

It is the upper roof of the oral cavity. Two sections are distinguished in it: anterior, with the bony base – the hard palate, and posterior, which is a fold formed by the mucous membrane and muscles: the soft palate ending with the uvula.

The anatomical features of the normally built hard palate are:

- the bony stroma, covered with the mucous membrane, is the vault of the front part of the oral cavity proper, formed by the palatine processes of both jaws, and by the horizontal plates of the palatine bones,
- in the front of the hard palate the mucous membrane is tightly grown together with the periosteum, in the back of the hard palate it is hard, insusceptible, and thick,
- in the central line of the hard palate there is a connective tissue band, the palatine raphe; in the front part the folds of mucous membrane (which disappear with age) branch off from it (the transverse palatine folds, two to four).

In the soft palate these features are:

- the soft palate at resting position (while breathing through the nose) hangs curving posteriorly and downwards away from the hard palate,
- a conical extension is visible in its back margin: the uvula,
- from the uvular base to the edge of the tongue root runs the palatoglossal arch, and to the side-wall of the throat runs the palatopharyngeal arch (visible as the soft palate folds at the sides of the back of the oral cavity); between these folds there are the palatal tonsils, one on each side.

6. Tonsils

In anatomical terms, the following are distinguished: paired tonsils – palatine and tubal, and unpaired tonsils: the lingual tonsil and pharyngeal tonsil (the so-called third tonsil), which make up Waldeyer's pharyngeal lymphoid ring.

The palatine tonsils should be examined with the mouth wide open, after pressing the tongue root downwards with a tongue depressor, because the pharyngeal muscular membrane pushes it out towards the isthmus of the fauces.

The essential features of the normal anatomical structure of the palatine tonsils are:

- egg-like shape,
- cherry -sized (it is ca. 20-25 mm in diameter).

In medical conditions, the palatine tonsils may grow considerably, close the isthmus of the fauces, and make breathing and swallowing difficult.

7. Nasal cavity

As the possibilities of speech therapy examination of the nasal cavity are limited¹¹, interviews should exclude the existence of such anomalous features of the anatomical structure as might have an adverse effect on articulation. These are:

- the deviation of the nasal septum,
- polyps.

¹¹ This type of examination is performed by the laryngologist using a rhinoscope.

One can make indirect inferences about the correct anatomical structure of the nasal cavity by making a test for the regular airflow through the nasal passage (as cited in: Karłowska 2008, 125):

- during expiration a small mirror is put to the upper lip perpendicularly to the nose septum; the steam in the expired air should leave symmetric traces on the mirror that resemble butterfly wings.

The symptoms suggesting the presence of anomalies in the anatomical structure of the nasal cavity include *inter alia* (cf. Durko et al. 2008): breathing through the mouth, speaking with constant nasal resonance, sleep apnea and snoring, persistent sneezing, nose deformities – e.g. wide nose. Impeded air passage through the nose changes the respiratory pattern into the oral one, weakening ventilation of the sinuses and Eustachian tubes, thereby causing not only infections of the upper respiratory tract and the middle ear, but also voice disorders.

8. Larynx

The correct anatomical structure of the larynx is characterized by symmetry, the vocal folds are smooth – without polyps, papillomas or tubercles, the abductor, adductor and tensor muscles of the vocal folds are working efficiently. Professional assessment of the laryngeal structure is the task of phoniatriy. Differences in the laryngeal structure observable in visual examination are related to age. The most rapid development of the larynx (especially noticeable in boys) associated with its enlargement can be observed between 12–16 years of age. An average increase in size can be observed until the age of 21; at that period of life the laryngeal development should be regarded as completed (Łasiński 1993, 237).

FUNCTIONAL CRITERIA

I assume that one of the conditions for normal pronunciation is the proper functioning of the respiratory, phonatory and articulatory apparatus (within it: full mobility of the tongue, lips, mandible and the soft palate ending with the uvula) while the mutual position of individual speech organs is determined by the ability to perform appropriate movements, which in turn develops as part of anatomically determined capabilities. The assessment of the work of the speech apparatus should be broadened by analysis of such functions as chewing and swallowing, which directly influence the structure and functioning of the articulatory organs, thereby also indirectly influencing speech. For the same reasons the presence of parafuncions and other harmful habits should also be excluded¹².

¹² The author does not know any studies in speech therapy that would take into account such a broad range of functions and be associated with the description of their normal course at the same time. The most extensive set of tests is contained in the sheet for the assessment of motor functioning of the speech organs compiled by Z.M. Kurkowski (1996, 119–201). It consists of 35 instructions,

As part of the functional criterion I therefore suggest assessing the following speech organs and selected functions, taking first of all their importance for articulation in Polish into consideration, at the same time trying to reduce the number of tests to the minimum.

1. Lips

The lip movements that are important while pronouncing Polish sounds are: protruding and rounding, flattening, pursing and compressing (important in the case of plosive consonants, especially phonetically strong or voiceless). The size of the lip aperture, essential in articulating vowels, is modified by the movements of mandibular abduction and adduction, tested in the functional test of the mandibulo-temporal joint.

Examination should start by assessing the resting position of the lips while breathing through the nasal tract¹³. The lips should be freely joined together, and the surrounding muscles relaxed. The lips joined without any visible tension should be regarded as efficient in the free formation of the so-called oral seal, while the joining of lips by tensing muscles shows their insufficiency, often consequent upon habitual respiration through the mouth. In order to exclude occlusion defects, it is important in further examination to assess the covering of incisors by the lips at rest. To this end, the upper lip is gently raised, to assess the position of the lower lip relative to the four upper incisors. The covering of the upper incisors by the lower lip at 1/3 of their height (this not observable in distocclusion and in the open bite) should be regarded as regular. Pulling the lower lip aside at resting position enables assessment of the length of the upper lip, which should cover 2/3 of length of the upper incisor crowns (one of the forms of its shortening is the exposure of the gums while smiling; the shortening of the upper lip may cause partial recurrence of the protrusion of incisors from before treatment).

From the standpoint of articulation, the following lip movements should be regarded as significant:

- compression of the lips with simultaneously pressing them to the teeth,
- protrusion and rounding of the lips,
- protrusion of the lips, at the same time raising the upper lip (the nasolabial sulcus then assumes the shape of a convex line) and pulling it down and

“[...] enabling assessment of the possibility of purposively executing movements with the tongue, typical of articulation (18 tests), with the lips (11 test), and with the mandible (4 tests) as well as assessment of the soft palate movements (2 tests) [...]” (*ibid.*, 86). Some of the proposed movements appear to be identical or even undesirable from the articulatory perspective, but discussion on them would be outside of the scope of this study.

¹³ Examination of the lips at resting position was prepared based on: I. Karłowska 2008, 127–128.

sidewise, with the eversion of the lower lip; the upper and lower incisors are exposed¹⁴,

- after inhaling a large amount of air, blowing it out from the mouth in the intended direction (as if blowing out a candle), mouth angles drawn to the sides widen the mouth slit,
- wide smile exposing the upper teeth (the levator of the angle of the mouth); the mouth pulled upwards and laterally; the nasolabial sulcus characteristically S-shaped,
- rapid alternating protrusion and flattening of the lips.

The proposed tests focus on assessing the configuration of the lips characteristic of articulation, the last of them additionally defines the fluidity and efficiency of the movements performed. The correctly performed movements should be characterized by symmetry.

2. Tongue

The essential tongue movements from the standpoint of articulation in Polish are: the movement of its body to the front of the mouth (in connection with front articulations), connected in the case of some consonants with its elevation (postalveolar articulations) or with the raising of its dorsum (palatal articulations), simultaneous movement back and raising of the tongue body (in connection with back articulations), lowering of the tongue body (in connection with low articulations). Additionally, when producing front articulations, the efficiency and precision of the movements of the front and apex of the tongue is essential.

The functioning of the tongue can be assessed based on the following tests:

- the raising of the wide-formed front margin of the tongue behind the upper gums with the maximum abduction of the mandible,
- elevation of the tongue dorsum towards the hard palate with the maximum abduction of the mandible (at this time one can try to pronounce one of the palatal consonants, e.g. [ɲ]), and lowering of the tongue body – return to the resting position at the oral cavity floor,
- retraction and raising of the tongue body with the maximum abduction of the mandible (at this moment one can try to pronounce one of velar consonants [k],[g] or [x]),
- touching f the upper teeth with the tongue apex, including those furthestmost in the dental arch, with the maximum abduction of the mandible.

The first three tests are directly connected with articulatory movements. The last one indirectly informs about the shape of the tongue body, the range of its movements, their precision and fluidity. The execution of all tests requires coordination of the work of the tongue and mandible. An important component of

¹⁴ The presented shape of the lips is characteristic of realizations of postalveolar sibilants.

assessment is also the shape of the tongue, which should be wide from its root to the front margin (see Ostapiuk 2013b). The first and the last test can serve the observation of the tongue frenulum¹⁵.

3. Soft palate ending with the uvula

The correct functioning of these articulatory organs can be checked in the following tests:

- breathing through the mouth or prolonged pronunciation of the vowel [a] with the maximum abduction of the mandible, at the same time the tongue is stuck out of the mouth, over the chin, or its front is held with a tongue depressor – the soft palate is raised, positioned horizontally and tense, the palatine arches come close to one another, the uvula is raised and shortened; the asymmetrical position of the uvula and its deflection to the side is proof of the one-sided action of the uvular muscle,
- breathing through the nose with the maximum abduction of the mandible – the soft palate and the uvula are freely lowered.

4. Mandibulo-temporal joints

The function tests of mandibulo-temporal joints comprise (Łabiszewska-Jaruzelska 1995; Karłowska 2008):

- a)** the evaluation of mandibular kinetics in order to establish the symmetry and range of free mandibular movements and to assess its route from the moment of the first teeth contacts to the position of habitual occlusion,
- the movement of abduction and adduction of the mandible – the path marked by the mandible remains on the sagittal plane and is single-tracked (rather than zigzag-shaped, it shows no traits of deviation), especially important is the final stage of adduction of the mandible – the path from the resting position to the habitual one; moreover, observations are made to check if the heads of the mandible do not bulge while it lowers; the execution of these movements in an alternate way informs about the fluid work of the organ assessed,
 - free side-to-side movements of the mandible – the symmetry of the movements and their range to the right and the left is thus determined (they should range within 10-14 mm, as cited in: Karłowska 2008, 121),
 - the movement of protruding the mandible – it is assessed for symmetry relative to the sagittal plane of the face, and for the range, with the mandible being

¹⁵ In her book *Dyslalia ankyloglosyjna. O krótkim wędzidelku języka, wadliwej wymowie i skuteczności terapii* [Ankyloglossal dyslalia. On the short frenulum, impaired pronunciation and efficiency of therapy] (2013b) B. Ostapiuk proposed extremely valuable diagnostic tests for tongue mobility serving to diagnose the short frenulum. The author reduced them to five single movements of the tongue, basing the rules of their execution on transparent criteria supported by a detailed description of correct execution.

1 cm distant from the upper jaw (the movement range should be within from 7 to 10 mm, as cited in: Karłowska 2008, 21).

In the testing of pronunciation, the most important is the movement of mandibular abduction and adduction because it is used during articulation. The lateral movements of the mandible and the movement of protruding it do not participate in the realization of speech sounds but they are important for the functions of swallowing and chewing, which influence pronunciation and occlusal conditions.

b) the measuring of the vertical slit with the maximum mandibular abduction – the range of free opening of the mandible (measured from the margins of the upper incisors to the margins of the lower incisors in the median line) is 40-52 mm in young people and adults (as cited in: Karłowska 2008, 121).

c) extraoral palpation of the mandibulo-temporal joints – it is carried out on both sides during the closing and opening of the dental arches: the synchronicity, evenness and symmetry of movement of articular heads as well as pressure and pain sensitivity during movement and at rest are assessed.

d) auscultatory examination of the mandibulo-temporal joints – carried out by a doctor with a stethoscope, each joint being examined separately during the movements of mandibular abduction and adduction. During an interview, the speech therapist can find out if the patient, apart from hearing physiological tones associated with the start of lowering the mandible and the end of its adduction (tones of opening and closing), can also hear pathological sounds: cracking, crunching, friction, or creaking.

5. Vocal folds

The normal phonatory function that can be inferred about from laryngological and phoniatic examinations is characterized by the regularity of vibrations of the vocal folds with right amplitude, in which both the folds vibrate, the movements being identical and simultaneous.

A speech therapist can indirectly infer about the normal function of the vocal folds from:

- the subjective auditory assessment of the function's product: the voice, which can be diagnosed as a model one, with soft vocal attack,
- objective acoustic analysis, in which the periodic work of the vocal folds is characterized by: a regular contour with the mean F_0 value corresponding to the speaker's age and gender (cf. footnote 7 above), mean phonation time being ca. 20-25 seconds (as cited in: Pruszewicz 1992, 113) and by parameters associated with voice volume, ability to increase it (dynamic modulation) and its range.

6. Respiration

The correct pattern of breathing in respiration at rest is characterized by:

- inhalation and exhalation through the nose,

- regular breathing, without effort, deep,
- arms are not raised while inhaling.

Habitual breathing through the mouth impairs the development of the chest, the circulatory and respiratory system, the masticatory organ and the facial part of the skull. Its most frequent causes include: nasal blockage, usually partial, caused by inflammatory conditions of the nasal mucous membrane, of the pharynx, and the upper respiratory tract, by allergic diseases, the deviation of the nasal septum, inflammatory conditions and hypertrophy of the palatine tonsils and the pharyngeal tonsil, and by polyps (Łabiszewska-Jaruzelska 1995, 179–180).

The correct respiratory pattern in dynamic (speech) breathing is characterized by the following

- inhalation through the nose and the mouth at the same time,
- inhalation is deep,
- arms are not raised while breathing,
- while inhaling, the lower ribs widen, and the abdomen moves forward.

The normal respiratory-phonatory coordination is characterized by:

- the amount of inhaled air appropriate to the vocal task,
- utterances are not interrupted by additional inhalations,
- no speaking on inhalation or on the remains of respiratory air.

7. Chewing

The assessment of chewing functions complements the information about occlusion, teeth and the functions of the mandibulo-temporal joint. The medical history should confirm whether the patient:

- does not avoid food that is difficult to bite and chew,
- does not bite the lips and cheeks while chewing,
- does not put too much effort in the act of chewing.

8. Swallowing

The incorrect function of swallowing causes occlusal defects (mostly open bite and mesiocclusion), protrusion of incisors, inferior prognathism, and a tendency for articulation to be dorsal and interdental.

The correct (adult) way of swallowing consists in that:

- dental arches are closed,
- the front part of the tongue clings to the alveolar ridge and the front part of the hard palate,
- during swallowing of food, the tension of the lip, cheek and chin muscles is not observable.

Examination should exclude the presence of:

- pathological tongue and teeth fusion, swallowing in which the tongue is between the alveolar ridges in contact with tense lips and cheeks or is pressed between the front teeth (Mackiewicz 2002),
- infantile swallowing caused mainly by the hereditary apraxia of the tongue apex, in which the tongue rests on the mouth floor.

To establish the type of swallowing it is sometimes enough to observe the execution of this act, and sometimes it is necessary to part the patient's lips fast to check the position of the tongue.

9. Parafunctions and other habits

Speech therapy examination should exclude the presence of harmful habits, frequently repeated stereotyped actions, unintentional and performed unconsciously, yet usually resulting in various maxillary-occlusal-dental abnormalities. Oral habits comprise sucking and biting the teat, finger, lips, tongue, the mucous membrane of the cheek, biting nails, pencils or other objects, pushing pencils or matches between the teeth, gnashing of teeth resulting in their attrition (bruxism), tightening the masseter muscles, persistent supporting of the chin or the angle of the mandible with a hand. Articulation can also be considerably influenced by a tendency to constantly protrude lips (often present with mandibular retroposition), and flatten or tighten one or both corners of the lips.

PERCEPTUAL CRITERIA

I adopt the distinction between physiological and functional hearing.

Physiological hearing is commonly termed "hearing". It is associated with the biological function – the work of the auditory analyzer involving the lower brain. Physiological hearing is often identified with the fundamental auditory function – reception of sounds consisting in the perception of the action of a stimulus or its absence. The result of the functioning of physiological hearing is the production of auditory sensations.

Functional hearing is commonly termed "listening". It involves mental activities associated with auditory perception which are defined in audiology as "higher auditory functions", "central auditory processes", "central processes of auditory processing", whereas psychological literature uses the terms "auditory functions", "perception of sounds", or "auditory perception". Depending on the type of sounds received, the following are distinguished: objective (physical) hearing, musical hearing, and speech hearing. According to Z.M. Kurkowski (2013, 25) the hearing functions essential for speech perception are: reception of speech sounds, selection – singling out of distinctive features of speech sounds, distinguishing (discriminating between) speech sounds, auditory memory of ut-

terances, semantization of speech sounds, auditory control of utterances, auditory lateralization, localization, and auditory attention.

1. Physiological hearing

One of the most common and at the same time most precise tests, in which the auditory threshold in adults is determined¹⁶, is pure tone audiometry, a part of subjective auditory tests.

In accordance with the recommendations of the International Bureau for Audiophonology (BIAP) the auditory norm is the auditory threshold ranging from 10 dB to 20 dB (as cited in: Mueller-Malesińska; Skarżyński 2012) located in the band of frequencies essential for speech reception¹⁷. Some studies adopt the lower range of the normal auditory threshold as 15 dB (cf. Tronczyńska 1965), while in Polish certifications concerning incapacity for work caused by hearing impairments this value is 25 dB (as cited in: Mueller-Malesińska; Skarżyński 2012, 115).

2. Functional hearing

From the standpoint of the perception of segmental and suprasegmental speech features it is particularly important to identify (selection and segmentation of phones, syllables, and prosodic elements) and discriminate between them, which is effected through¹⁸:

- phonemic hearing,
- prosodic phonological hearing,
- segmental (phonic) phonetic hearing,
- prosodic phonetic hearing.

Phonemic hearing and prosodic phonological hearing concern the phonological subsystem, its segmental units (phonemes) and suprasegmental phenomena of phonological significance for a language (in Polish this will be lexical and sentence stress and intonation contours characteristic of particular types of utterances: declarative, interrogative or imperative cf. Wysocka 2012, 178).

Segmental (phonic) phonetic hearing is responsible for the perception of segmental non-system features that distinguish phones belonging to the same phoneme (e.g. different ways of realization of the /r/ phoneme as: linguolabial trills [r̥], linguolabial flaps [r̥], alveolar-laminal flaps [r̥], alveolar-apical flaps [r̥],

¹⁶ The acouesthesia threshold, the auditory threshold curve, represents the quietest sounds with the lowest volume to which the patient responds. Sounds used in pure tone audiometry are simple tones (simple contours) with a sinusoid shape of wave, consisting of one isolated frequency.

¹⁷ For the full reception of speech the frequency range from ca. 50 Hz (lowest male voices) to 10 000 Hz (the upper range of noise of sibilant consonants) is used. Frequencies assessed in pure tone audiometry usually range from 250 Hz to 8000/10 000 Hz.

¹⁸ Division of speech hearing after: A. Domagała, U. Mirecka (2012, 131).

alveolar-apical approximant [ɹ], alveolar-laminal approximant [ɹ̥], uvular trills [ʀ], uvular fricatives [ʁ] etc.).

Prosodic phonetic hearing is in turn responsible for the perception of non-systemic features or prosodic phenomena (e.g. different ways of lexical and sentence stress realization as dynamic, melodic or quantitative; pitch, volume and color, range of intonation contour, and speech rate)¹⁹.

SUMMING UP

The proposed diagnosis of the pronunciation norm defined within the adopted linguistic and biological criteria does not, without doubt, exhaust the possibilities for assessment. There are certainly other additional parameters that might be included in the presented procedure or those that should be excluded from it in individual and specific cases. However, the defined range of diagnostic measures should contribute to standardizing speech therapy management in the field in question.

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¹⁹ Description of prosodic phonetic hearing after: M. Wysocka 2012, 178.

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