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Communication of the Person with Cerebral Palsy in the Light of Longitudinal Studies

SUMMARY

The article presents the issue of logopaedic diagnostic treatment which was conducted on the patient with cerebral palsy her late childhood and early adulthood. The authors carried out the evaluation of the language acquisition level (both oral and written) and the assessment of non-verbal communication. Types of deficits in communication and their determinants were identified, which constituted the basis of logopaedic diagnosis. Referring to the results of their own studies, the authors indicated the need of conducting longitudinal studies in logopaedics in case of patients with coupled disorders as well as creating and standardizing techniques and diagnostic tools that could be applied to carry out longitudinal studies on the groups of patients.

Key words: cerebral palsy, dysarthria, oligophasia, dysphagia, developmental nonspecific difficulties in reading and writing, longitudinal studies

INTRODUCTION

Communication disorders in persons with cerebral palsy (CP) still pose a difficult problem to logopedists both in practice, in diagnostic-therapeutic management, and in research, first of all because of the complex pathomechanism (or to be precise – many pathomechanisms) of these disorders that is a component of the clinical picture of the syndrome in question. The symptoms recognized as dominant in the clinical picture of CP that “indicate the injury of: the central motor neuron (pareses of the limbs), subcortical nuclei (involuntary movements), cerebel-

lum (disequilibria and incoordination of movements)” (Kułak and Sobaniec 2006, 442), are interpreted as permanent disorders of motor development and posture caused by non-progressive brain disturbances that occur during the fetal period or infancy (Gajewska 2009). Disorders in the motor skills diagnosed in persons with CP “are often accompanied by sensory, perceptual, cognitive, communication and behavior disorders, epilepsy and secondary muscular-skeletal problems” (Gajewska 2009, 68). Among the so-called co-morbid (concurrent) disorders in CP, speech disorders are some of the most frequent – their percentage reported in literature ranges from 50% to 85% (Mierzejewska and Przybysz-Piwkowa 1997; Michałowicz 2001; Mirecka and Gustaw 2005). Problems in communicating in the ethnic language in its basic version (spoken language) and secondary version (written language) affect most patients with this syndrome (Mirecka 2013). In persons with CP various types of speech disorders are diagnosed: dysarthria, oligophasia, alalia, limited speech development caused by hearing loss or deafness, as well as dyslalia, stuttering, dysglossia, and delayed speech development (Obębowski and Woźnica 1997; Otapowicz, Kułak and Sobaniec 2002; Mirecka i Gustaw 2005). Problems with acquisition of reading and writing abilities in the case of CP, which can be termed developmental non-specific reading and writing difficulties (Mirecka 2017), result from diverse, often coupled disorders (in motor, especially manual skills, mental development, speech, visual and hearing functions, and lateralization) (Loska 2005; Peeters et al., 2008 and 2009). When analyzing communication between persons with CP it is necessary to also take account of nonverbal aspects – especially behaviors described as part of kinesics (manifestations of bodily motor activity: facial expressions, visual behaviors, gestures, touching, posture), proxemics (the use of distance and spatial relationships between interaction partners), and vocalics (voice features, ways of speaking, non-linguistic sounds); the use of extra-linguistic ways of information transmission and reception is often made difficult and sometimes even impossible, first of all because of motor and sensory dysfunctions resulting from neurological damage (cf. Pennington 2008; Michalik 2015a and 2015b).

In order to investigate pathomechanisms of communication disorders in persons with cerebral palsy it is essential to conduct different types of studies: longitudinal and cross-sectional, covering specific studied groups and individuals. In Polish logopedics (including its interdisciplinary aspects), in the area in question, cross-sectional studies were conducted with children’s groups (e.g. Mirecka and Gustaw 2005; Otapowicz et al. 2010; Mirecka 2013; Michalik 2015a) and case-study investigations with regard to children with coupled disorders (e.g. Bielak 2000; Michalik 2015b). Worth noting is the lack of longitudinal studies (both on groups and individual patients) that would permit investigation of the dynamics of changes in communication between persons with CP over a longer period (sev-

eral, over a dozen or even several dozen years) at different stages of individual development.

The article presents the problems of diagnostic logopedic management conducted in the case of a female patient with cerebral palsy in her late childhood and early adulthood. The assessment of the level of language acquisition (its spoken and written version) and nonverbal communication, presentation of the kinds of deficits in communication and their determinants, is the basis for logopedic diagnosis; follow-up examinations permit obtaining information on the possibilities and limitations in communication in the context of the carried-out therapeutic and educational measures and changes connected with adolescence.

THE PATIENT. LOGOPEDIC DIAGNOSIS

Logopedic diagnosis was carried out by the authors two times: during the subject's late childhood (in 2003 at the age of 10.4, by U. Mirecka) and in early adulthood (in 2014 at the age of 21.9, by E. Kowal).

In the patient's medical documentation (relevant at both stages of examination) the neurological diagnosis is: cerebral palsy of spastic tetraparesis type, athetosis. The patient had a paresis of all four limbs, high spasticity of the whole body and exhibited athetotic movements. Both as a girl and a young woman the patient could not walk, moved on a wheelchair, and sat with a support. Additionally, concurrent disorders were diagnosed: a vision defect (myopia) and intellectual disability. In the psychological examination in 2003, a mild mental disability was diagnosed, while the assessment of the teenager's level of intellectual development indicated that she functioned at the level of moderate intellectual disability.

At the time of the first examination the girl received individual instruction in accordance with the special needs school program at the level of the primary-school third grade. At the age of 22 she had finished the third grade of junior high school, and her education ended at this stage. From the age of 6 she was provided with care at the rehabilitation and therapy center, where the two examinations were held. In her childhood and adolescence she regularly attended various therapy classes, such as logopedic, pedagogical and physical activities. As an adult, she attended motor rehabilitation classes and took part in many sociotherapeutic activities, usually consisting in arts and crafts classes, watching films and fairy stories.

The conducted diagnostic tests enabled gathering information essential in the descriptive part of logopedic diagnosing; the analysis of the collected data and their interpretation, taking into account the results of specialist examinations (data from medical, psychological and pedagogical documentation), was the founda-

tion of logopedic diagnosis, which comprised: moderate dyskinetic-spastic dysarthria, oligophasia, developmental non-specific difficulties in reading and writing, and dysphagia.

Assessment of Dysarthric Disorders

Both examinations used the *Dysarthria Scale* (Mirecka, Gustaw 2006), which is an estimation scale based on the observation of how a patient performs individual tasks involving the speech apparatus. It consists of 70 tasks divided into nine spheres. The tasks are assessed on a five-grade scale (0 – no disorders, 1 – slight disorders, 2 – moderate disorders, 3 – severe disorders, 4 – profound disorders), which makes it possible to determine the degree of intensity of dysfunctions in the work of the breathing, phonatory and articulatory apparatus that occur during experimental tests, and the disorders manifested at the segmental and suprasegmental level of utterances. In addition to assessments by points, the researcher also enters in the testing record the descriptive information on the way the subject performs particular tasks, and indicates pathological/non-normative phenomena.

The result of the testing by the *Dysarthria Scale* are contained in Table 1–9, the score of the first examination (in 2003) being marked with black, and the score of the second examination being marked with red; the phenomena observed in examination One were underlined, and those occurring in the other examination were marked with red (consequently, if a task contains an item of information highlighted in red and underlined at the same time, this means that a given phenomenon was observed in both examinations, e.g. in Table 3, with task 1. *Vowels in words* we have **distortions**, which means that distortions of vowels occurred during the first and the second examinations).

The first sphere tested was the patient's own assessment concerning such aspects as intelligibility of her own utterances, her fatigability while speaking, breathing problems and vocal difficulties, of which we learn from the subject's perspective. The absence in Table 1 of the data relating to the first examination arises from the fact that the girl found it too difficult to make an assessment according to the specified criteria¹. Twelve years later she carried out this assessment, informing the researcher that she experienced no difficulties in speaking (she was not tired while speaking, had no problems with breathing and uttering sounds), and her utterances were intelligible to others.

¹ As shown by the testing conducted in the group of children with CP (Mirecka 2013), the inability to perform these tasks involves failure to understand an instruction and/or problems with own assessment of one's own performance, which in turn depends on the level of the mental (chiefly conceptual) development of the subjects.

Table 1. Results of the assessment: sphere I. Self-Assessment

TASK	GRADE				
	0	1	2	3	4
1. Assessment of intelligibility of patient's own utterances	x				
2. Fatigability during speech	x				
3. Respiration problems	x				
4. Vocal difficulties	x				

Source: original research

The intelligibility of the patient's utterance² was assessed by the researchers as limited, with the better results of the second examination (Table 2) showing that the intelligibility of articulation improved; more incomprehensibilities were recorded in repetitions of sentences and in free utterances, fewer word repetition trials.

The comparison of the subjective assessment of intelligibility of utterances (Table 1: task 1) with the objective assessment made by the logopedists (Table 2) indicates the patient's own disproportionate, higher assessment of her performance. Failure to notice difficulties of other persons in understanding her utterances is a consequence of the patient's problems with interpreting the behavior of interaction partners.

Table 2. Results of the assessment: sphere II. Intelligibility

TASK	GRADE				
	0	1	2	3	4
1. Intelligibility of one-word utterances while patient repeats words		x	x		
2. Intelligibility of one-sentence utterances while patient repeats sentences			x	x	
3. Intelligibility of patient's free utterances			x	x	

Source: original research

A very important aspect that impacts the reception of the sender's message in accordance with his/her intention is the correct articulation of speech sounds.

² In the *Dysarthria Scale* the assessment of utterance intelligibility refers to the intelligibility of articulation.

Table 3 shows the character of difficulties and depth of the existing disorders, comparing their condition in childhood and adulthood.

Table 3. Results of the assessment: sphere III. Articulation

TASK	GRADE				
	0	1	2	3	4
1. Vowels in words (substitutions, <u>distortions</u> , elisions)		xx			
2. Consonants in words (<u>substitutions</u> , <u>distortions</u> , elisions)			x	x	
3. Consonant clusters in words (<u>simplification of consonant groups</u> , <u>assimilations</u>)		x	x		
4. Polysyllabic words (<u>reductions in the word structure</u> , metatheses, assimilations)		xx			
5. Sentences (<u>substitutions</u> , <u>distortions</u> , elisions, <u>reductions in the word structure</u> , metatheses, <u>assimilations</u>)			x	x	
6. Articulation in free utterances (<u>substitutions</u> , <u>distortions</u> , elisions, <u>reductions in the word structure</u> , metatheses, <u>assimilations</u>)			x	x	

Source: original research

With regard to articulation, the results in two tests remained at the same level – vowel articulation in words and articulation of words made up of many syllables. The intensity of disorders decreased in the articulation of consonants, consonant groups, whole sentences, and during free utterances. The dominant phenomena whose intensity was reduced were: consonant substitution and simplification of consonant groups. This fact can be linked to developmental processes, as well as with the woman's attention to articulation.

As shown by the data in Table 4, the slight abnormalities of the nasal resonance in the word and sentence repetition tasks observed in the first examination remained at the same level, while some improvement in this area was noted in the adult patient's free utterances; the character of the phenomenon did not change: it was unstable resonance regardless of the type of utterances.

Table 4. Results of the assessment: sphere IV. Resonance

TASK	GRADE				
	0	1	2	3	4
1. Resonance realization in words (hypernasality, hyponasality, <u>unstable resonance</u>)		xx			
2. Resonance realization in sentences (hypernasality, hyponasality, <u>unstable resonance</u>)		xx			
3. Resonance realization in free utterances (hypernasality, hyponasality, <u>unstable resonance</u>)		x	x		

Source: original research

Considerable differences between the results of the first and second examination can be observed regarding prosody (Table 5) – many abilities regressed during the patient's adulthood, in particular: the ability to imitate intonation, maintain the rhythm and pace of speech, and to intentionally speed up and slow down the rate of speech. This may result from the increased muscle tension of the whole body that appeared in experimental tests, in which the subject performed worse.

Table 5. Results of the assessment: sphere V. Prosody

TASK	GRADE				
	0	1	2	3	4
1. Imitation of intonation			x		x
2. Intonation in free utterances (monotonous, <u>unstable</u>)		x x			
3. Imitation of different stress patterns					xx
4. Maintain appropriate rhythm in sentences (scanning, <i>staccato</i> , <u>prolongation of sounds, inappropriate stress, pauses</u>)		x		x	
5. Maintain appropriate rhythm in free utterances (scanning, <i>staccato</i> , <u>prolongation of sounds, inappropriate stress, pauses</u>)		x		x	
6. Maintain appropriate rate of speech in sentences (speech rate: too slow, too fast, accelerate, <u>slowed down, unstable</u>)		x		x	
7. Maintain appropriate rate of speech in free utterances (speech rate: too slow, too fast, accelerate, <u>slowed down, unstable</u>)		x	x		
8. Ability to accelerate rate of speech			x		x
9. Ability to slow down rate of speech			x		x
10. Length of phrases in sentences		x		x	
11. Length of phrases in free utterances			x x		

Ciąg dalszy tabeli 5. Wyniki badań: sfera IV. REZONANS

12. Synchronization of respiration, phonation and articulation in words (<u>speaking on residual air</u> , <u>speaking on inhalation</u>)		x x			
13. Synchronization of respiration, phonation and articulation in sentences (<u>speaking on residual air</u> , <u>speaking on inhalation</u>)			x	x	
14. Synchronization of respiration, phonation and articulation in spontaneous utterances (<u>speaking on residual air</u> , <u>speaking on inhalation</u>)			x	x	

Source: original research

The results of phonation tests (Table 6) indicate an improvement in three tests: the instability of voice volume decreased, and the patient also used her voice's pitch better (tests 7 and 8). However, the ability to intentionally decrease/heighten voice pitch deteriorated. In the adult patient, previously unnoticed phenomena also appeared: breathy vocal attack, instability of voice pitch, and loss of voice – they are a worrying symptom of phonation disorders.

Table 6. Results of the assessment: sphere VI. Phonation

TASK	GRADE				
	0	1	2	3	4
1. Vocal attack – /a/ (<u>hard</u> , <u>breathy</u>)			xx		
2. Maximum phonation time of /a/				xx	
3. Voice volume during speech (too loud, low voice, <u>unstable in volume</u>)		x	x		
4. Raise voice volume /a/				x	x
5. Lower voice volume /a/				x	x
6. Pitch of voice (too low /too high voice, <u>instability of voice pitch</u>)	x	x			
7. Raise pitch /a/				x	x
8. Lower pitch /a/				x	x
9. Quality of voice (<u>hypophonia</u> , weakened sonority, <u>breaks in phonation</u> , <u>tense voice</u> , hoarse voice, <u>loss of voice</u>)			xx		

Source: original research

The aspects related to breathing also deteriorated (Table 7) – respiration was even shallower at rest and during speech, the expiration phase also became shorter (test 3), and there was still an abnormal respiratory pattern (costal-clavicular).

Table 7. Results of the assessment: sphere VII. Respiration

TASK	GRADE				
	0	1	2	3	4
1. Respiration at rest (<u>shallow</u> , too fast, too slow, <u>irregular</u>)		x	x		
2. Respiration during speech (<u>shallow</u> , too fast, too slow, <u>irregular</u> , <u>short expiratory phase</u> , <u>costal-clavicular respiratory pattern</u>)			x	x	
3. Length of exhalation during emission of /s/			x	x	
4. Length of exhalation during emission of a series of /s/				xx	

Source: original research

In most diadochokinetic tests the results of the second examination were weaker (Table 8); this particularly concerns the movements occurring during the pronunciation of articulatorily contrastive sounds and syllables (tests 6–8). Because of increased muscle tension, also within the articulatory apparatus, the woman had problems with quickly passing from one articulation setting to the next one. The ability to perform alternate mandibular movements vertically and alternate lip and tongue movements horizontally and vertically somewhat deteriorated or remained at the same lower level.

Table 8. Results of the assessment: sphere VIII. Alternating movements (diadochokinesis)

TASK	GRADE				
	0	1	2	3	4
1. Open and close mouth rapidly within full range of mandibular movement			x	x	
2. Purse and stretch lips rapidly				xx	
3. Protrude and retract tongue rapidly		x	x		
4. Raise and lower tongue rapidly outside of the oral cavity				xx	
5. Move tongue rapidly to the right and left lip corner					xx
6. Repeat rapidly /u – i/		x		x	
7. Repeat rapidly /a – y/			x	x	
8. Repeat rapidly /pa – ta – ka/		x		x	

Source: original research

With regard to the assessment of the functional condition of the articulatory apparatus muscles (Table 9), the results of examination I and II were identical for ten tasks, and for eight tasks the results of examination II were poorer, the improvement of the function was indicated by the results of one task only (tightening of the lips). A matter of concern is the increased frequency of occurrence of involuntary movements, growing difficulties with swallowing of saliva at rest and while sleeping, and increased instability of tongue tension.

Table 9. Results of the assessment: sphere IX. Functional condition of musculature of the articulatory apparatus

TASK	GRADE				
	0	1	2	3	4
1. Purse lips	x	x			
2. Stretch lips			x	x	
3. Tone of lips (<u>increased tone</u> , decreased tone, <u>unstable tone</u>)			xx		
4. Tongue protrusion			xx		
5. Tongue retraction			x	x	
6. Tongue appearance (<u>spastic</u>)		xx			
7. Tongue tip into right cheek					xx
8. Tongue tip into left cheek					xx
9. Move tongue tip to right lip corner					xx
10. Move tongue tip to left lip corner					xx
11. Raise tongue tip inside the oral cavity – to the upper gums					xx
12. Raise tongue tip outside of the oral cavity – to the upper lip				xx	
13. Tone of tongue (<u>increased tone</u> , decreased tone, <u>unstable tone</u>)			x	x	
14. Elevation of soft palate during emission of /a/		x	x		
15. Elevation of soft palate during emission of a series of /a/			x	x	
16. Swallowing saliva at rest (<u>infantile type of swallowing</u>)		x	x		
17. Swallowing saliva during speech			x	x	
18. Involuntary movements			x	x	
19. Facial symmetry at rest		xx			

Source: original research

The results of the first and second examination using the *Dysarthria Scale* enabled the diagnosis of dyskinetic-spastic dysarthria with a moderate intensity of symptoms. As analysis showed, the kind dysfunctions, observed in both examinations, in the operation of the respiratory, phonatory and articulatory apparatus, manifesting themselves in experimental tests and at the segmental and supra-segmental level of the patient's utterances, was essentially unchanging: if certain symptoms waned or appeared, they still formed the syndrome of dyskinetic-spastic dysarthria (cf. Mirecka 2013). The severity of dysarthric disorders also oscillated to a small extent, which can be noticed when comparing the task results within the spheres assessed and when comparing the results of successive spheres. Special attention should be drawn to some (slight) improvement in utterance intelligibility, which was the effect of the improved condition of articulation, as well as to the regression of certain prosodic skills and primary functions (breathing, swallowing) and to increased involuntary movements and the appearance of increased muscle tension in situations perceived by the patient as difficult.

Dysphagia

In examination I and II, dysphagia symptoms were found in the patient. An infantile type of swallowing persists, while in the second examination, increased difficulties in swallowing saliva at rest and while speaking were observed (dribbling occurs: saliva gathers in the corners of the mouth, it is not swallowed, its excess is leaking from the oral cavity)³.

Oligophasia

Another diagnosed entity of speech pathology is oligophasia⁴. On the basis of the analysis of the subject's narrative and dialogue utterances⁵, it is possible to find the lowered level of linguistic and communicative competence and skills manifested in:

- deficits in lexical and semantic skills,

³ The frequency of dysphagia occurrence in children with CP is estimated at ca. 40% (Mielnik-Niedzielska 2016), and the frequency of salivation (regarded as a significant symptom of dysphagia) at 58% (Boksa 2016).

⁴ Oligophasia is regarded as a speech disorder whose essence is the problem with mastering the language system and rules of language use, which impedes or prevents both constructing and understanding utterances; the cause of oligophasia is first of all global cognitive deficits found in intellectually disabled persons, a negative role being also played by dysfunctional relationships with the social environment (Mirecka 2013).

⁵ Analysis of the way a person constructs narrative utterances is, according to S. Grabias, a major element in diagnosing a human's cognitive capabilities, and the assessment of dialogic skills "may provide knowledge on the mental and social development of an individual, as well as on the degree of language acquisition"; dialog is recognized as "the most important form of human linguistic activity", "the fabric of socialization process" (Grabias 2015, 26–27).

- deficits in narrative and dialogic skills – problems with the organization of utterance (particularly narrative utterance), its coherence, grammatical correctness (dysgrammatisms, simplified sentence constructions),
- difficulties in understanding and realizing communicative intentions,
- problems with socially and situationally appropriate use of language.

When comparing the patient's utterances (as a 10-year-old girl and a 21-year-old woman) we find that her linguistic and communicative competence and skills somewhat developed, particularly in the area of lexis and syntax (her vocabulary expanded, and longer and more complex sentence constructions appeared). The lack of standardized tools for studying linguistic and communicative behaviors of intellectually disabled persons of different ages makes it difficult to more accurately diagnose this sphere of development.

Developmental Non-Specific Reading and Writing Difficulties

The level of having learnt the reading and writing abilities was assessed by means of experimental tests, the interview with the subject and her guardians, and analysis of documentation. The first examination (carried out when the girl was taught according to the curriculum of the primary-school third grade) showed that she had learned to recognize letters (over a dozen) and to read out short words (known, and previously read out). Attempts to learn to write were not made at school because of the paralysis of the upper limbs. The second examination provided information about the level of acquisition of the skills in question in adulthood, which is as follows:

- reading: the prevailing one is the spelling technique combined with synthesis (shorter words are read out without errors, longer ones – with errors), there is high fatigability while reading out the texts, and problems with understanding them,
- the patient does not by herself try to read newspapers and books in paper or electronic version, and does not use the phone/computer keyboard to write messages,
- no independent attempts are made to write in hand.

The low level of the subject's reading ability and practically no writing ability (not only handwriting but also use of a keyboard) is caused by deficits in intellectual development⁶, motor and postural disorders caused by paralysis, as well as by the low level of linguistic competence and skills. Other factors may include inadequate teaching methods, and failure to apply new technologies to enable the subject to use the computer keyboard or the touch screen of mobile devices.

⁶ The disturbed course of cognitive processes in intellectually disabled persons, such as: perception, attention, remembering and thinking, determines a weaker ability to process and organize information; consequently, it significantly influences the process of learning, also to read and write (see Kaczorowska-Bray 2017; Zasepa 2016).

Nonverbal Communication

Due to the disorders of motor and posture developments induced by neurological damage (tetraparesis, spasticity within the whole body, and athetotic movements caused the patient to be unable to walk but to move on a wheelchair, and be able to sit only with a support), the possibility of active use of nonverbal codes in communication was also limited. The following difficulties were observed:

- in the area of kinesics
 - facial expressions – often inappropriate, “overstated” (because of spasticity and involuntary movements);
 - problems with maintaining eye contact (due to difficulties in maintaining the position of the head);
 - limited or too rapid gestures;
 - rare use of touch;
 - body posture – the position and movements of the trunk (forward bending of the trunk, turning to the sides, bending backward), the position and movements of the upper limbs (covering the mouth with the hand/hands, raising arms up, and maintaining of raised forearms), the position and movements of the head(bending the head forward, turning to the side, bending backwards);
- in the area of proxemics
 - reduction of distance only by bending the trunk, increase of distance by bending backwards;
 - limited possibility of changing the positioning of the body in relation to the interlocutor (only in the sitting position);
- in the area of vocalics
 - limited use of the timbre, pitch, and speech rate in emotional prosody;
 - non-lingual sounds related to dribbling and difficulties in swallowing saliva.

The comparison of nonverbal behaviors shows that they did not essentially change in respect of their kinds and nature. However, the aggravation of the problem with maintaining eye contact while speaking was observed, which negatively affects the intelligibility of utterances, and greater postural variability was reported (due to an increased intensity of involuntary movements).

SUMMARY AND CONCLUSIONS

Theoretical and practical problems related to communication deficits in the case of coupled disorders can be shown from a broader perspective in longitudinal studies when particular skills are periodically assessed for their dynamics.

The second diagnosis (i.e. examination) enables obtaining information on changes in communication that occur through therapeutic measures or due to abandonment of therapy, and changes in the health condition in the context of changes related to the process of adolescence⁷. Discontinuation of logopedic treatment in speech disorders related to coupled disability often results in the lack of progress or sometimes even regression of previously acquired abilities. Therapy in cases of dysarthria or oligophasia is usually a long-term process, and during its course it is necessary to modify the program of logopedic management – changes may refer inter alia to the objectives of treatment, methods used in working with the patient, frequency of therapy sessions, and ways of cooperation with the parents/guardians. A multifaceted diagnosis makes it possible to assess the efficacy of previous measures, verify earlier objectives, to indicate new areas of therapeutic work and new methods of treatment. It is advisable to introduce new technologies facilitating or enabling the persons with coupled disability to learn to read and write. The use of writing diminishes the communication barrier and enables contact with the environment.

We see the need to conduct longitudinal studies in logopedics – studies that can show development tendencies in cases of neurologically-induced coupled disorders, and thereby contribute to programming more effective therapeutic measures. We suggest that work be started on devising and standardizing diagnostic techniques by which it would be possible to conduct longitudinal studies with the participation of patients' groups. Such studies usually require substantial expenditure and collaboration in a multi-specialist team, but they also provide an opportunity to create knowledge needed in practice.

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⁷ The advisability of assessing the effects of logopedic treatment of dysarthric patients in the long term is highlighted by O. Jauer-Niworowska (2018), signaling the problem of realization variability occurring in dysarthric speech.

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