REVIEW

of the dissertation on:

"INFLUENCE OF PHONOLOGICAL PROCESSING ON ORAL AND WRITTEN LANGUAGE IN APHASIA"

for the acquisition the degree of Doctor of Education and Science
in professional field 1.2. Pedagogy, Doctoral Programme "Logopedics"

Doctoral student: Emanuela Hraber Shtika

Research supervisor: Prof. Dr. Katerina Atanasova Shtereva
Sofia University "St. Kl. Ohridski",
Faculty of Education Sciences and Arts,
Speech Therapy Department

Reviewer: Prof. Neli Tsvetanova Vasileva, DSc
Sofia University "St. Kl. Ohridski"
Faculty of Education Sciences and Arts,
Speech Therapy Department

The review was prepared in accordance with the Law for the Development of Academic Staff in the Republic of Bulgaria, the Regulations for its Implementation and the Regulations for the Conditions and Procedures for the Acquisition of Scientific Degrees and the Occupation of Academic Positions at Sofia University. The Regulations and Procedures for the Academic Degrees of the Sofia University „St. Kliment Ohridski".

The doctoral candidate has submitted all the necessary documents for the dissertation defence procedure: curriculum vitae, dissertation and abstract to it, declaration of originality and reliability of the results and a reference for the fulfilment of the scientific metrics according to the minimum national requirements, with 4 publications and a total of 90 points.

1. General biographical introduction of the candidate

In 2017 Emanuela Shtika graduated with a Bachelor's degree in Speech Therapy from St. Kl. Ohridski", and in 2019 a Master's degree in "Communicative Developmental Disorders". During her studies, she showed high motivation and interest in speech therapy and as a student (2014-2016) she worked as a volunteer in a support center for children with SEN and as a therapist in a group at ElBo Speech Therapy Center. After graduating as a Master's student and currently working as a speech therapist at Speak to Me Speech Therapy Center. In the period 2017-2019 she participated in a large number of trainings in the field of speech therapy theory and practice. After successfully passing the competition, in 2020 Emanuela Shchika was enrolled as a full-time PhD student in the PhD program "Speech Therapy", with scientific supervisor Assoc. Prof. Dr. Katerina Shchereva. During his PhD studies, he has shown a high research commitment and actively participates in the project activities of the department and the administrative life of the faculty.

2. **Relevance and structure of the dissertation**

Language and speech disorders in adults are the least developed area in Bulgarian speech therapy, despite the tendency towards increasing cases of various brain pathologies with comorbid aphasic symptomatology, in particular, post insult aphasia in young age. It is known that the specific organization of each particular spoken language influences the nature of the symptoms observed in the clinical picture of aphasia (phonological, morphosyntactic, semantic), which is why the same brain deficit may have different surface manifestations in different languages. That is, the structure of language is determinant of the types of errors that can and are expected to occur in patients' speech (Paradis M., 2001).

This confirms the need for in-depth research of aphasic symptomatology in the Bulgarian language and proves the theoretical and practical relevance of the dissertation. The development is the first attempt in the field of Bulgarian speech therapy for a psycholinguistic approach to the manifestations of language symptomatology in patients with aphasia. From the point of view of scientific correctness, I would recommend refining the title by specifying the target form of aphasia.

The submitted dissertation has a total length of 231 pages, of which 170 pages are actual text. The content is composed in an introduction (introduction to the problem) and three chapters, finalized by summaries and conclusions, recommendations, limitations and contributions of the dissertation. The reference list comprises 116 sources - 26 in Cyrillic and 90 in Latin. Evidence of the objective nature of the study is provided by 78 appendices, including: an informed consent form of the study participants, a research form of the test "Standardized Assessment of Phonology in Aphasia" and 76 tables with the results of statistical data processing.

3. Content analysis of the dissertation

In its conception and execution, the dissertation of Emanuela Shtika is an example of a serious scientific work. The introductory part of the thesis outlines its aims and justifies the necessity of evaluating and analysing phonology in patients with aphasia as a poorly studied problem and a condition for full-fledged speech therapy.

The theoretical review is 78 pages long and, in accordance with the topic of the paper, is composed in three logically connected paragraphs. The first paragraph presents data on the historical development of aphasiology and an analysis of classical and contemporary classifications, as well as a detailed description of the symptomatology of the main forms of aphasia. The types of acquired reading and writing disorders as part of the clinical picture of aphasia and their differentiation into central (language) and peripheral are commented on separately. Within the outlined framework, phonological alexia and agraphia are defined as isolated forms of central non-aphasic disorders.

I consider the detailed description of peripheral forms of alexia and agraphia to be superfluous, as it has no bearing on the problem at hand.

The focus of the theoretical review is the paragraph devoted to the relationship of phonology and aphasia and, more specifically, to disorders of phonological operations in cases of aphasia. The place of phonological processing in the realization of spoken and written

language is presented in turn, with an emphasis on its metalinguistic nature. From the position of the realized research the analysis of the peculiarities of the Bulgarian phonological system is also made. Particular attention should be paid to the detailed description of the main theoretical models explaining the place of phonological processing within oral and written language - cognitive, neurolinguistic, connectionist (of parallel distributed processing) and the related primary systems hypothesis. Giving preference to the latter two models, the PhD student presents a detailed literature review and evidence for the relationship of phonological processing to oral and written language in aphasia. Although sub-paragraph 2.3. refers to this relationship, the information in it refers only to reading processes within written language.

A special place in the theoretical analysis is occupied by the description of phonological disorders in aphasia, emphasizing that these can arise from both paradigmatic and syntagmatic errors (p. 59). This naturally raises the question of both the nature of the causal relationship between phonological and paradigmatic deficits and the mechanism by which syntagmatic errors give rise to phonological disorders. For the purposes of the analysis, the above claim should be commented on separately.

The sections on phonological deficits in speech production and speech perception in major forms of aphasia are directly relevant to the topic. Of interest are the data on the dissociation between the stages of phonological planning and articulatory realization, the mechanisms of which are different in different forms of aphasia: in motor forms, disorders of articulatory performance predominate, in sensory forms - disorders of lexical selection and, to a lesser extent, of phonological operations, and in conduction aphasia, disorders of phonological planning take centre stage. Undoubtedly relevant to the interpretation of the results of the dissertation are the data presented on the specificity and differences of phonological and phonological disorders in patients with motor and sensory forms of aphasia in the conditions of the Bulgarian language.

The last part of the literature review presents an analysis of existing diagnostic approaches to aphasia, in which the psycholinguistic approach is wrongly identified with the cognitive-neuropsychological approach. One of the few specialized tests for assessing phonological ability in aphasia of English language material based on the connectionist model of parallel distributed processing is presented in detail. The conclusions of the theoretical analysis point to the necessity of adapting such a diagnostic tool to the Bulgarian phonological system and its application in speech therapy practice.

In relation to the theoretical review I have the following comments: 1. The term "automatic speech" (pp. 22 and 23) should be replaced by the well-established "automated speech queues"/"speech automatisms"; 2. To correct some technical errors: lack of a cited source in the reference - Assenova, 2012 (p. 11) and punctuation and syntax inaccuracies present in the text; 3. Avoid self-citation of publications mentioned in the doctoral reference (p. 27); 4. Correct the wording of sub-paragraph 1.5. "Predictors of aphasia" (p. 30) given that the independent variable "predictor" has the meaning of cause and the stated severity of the pathology cannot be a predictor of the pathology itself; 5. Avoid conflating the terms "aphasic" and "aphasic patients, "communicative" and "communication" disorders.

Chapter two is devoted to the methodology of the study. Its aim, objectives and stages are presented and the purpose of the study should be more clearly stated. Two (2) main

hypotheses with corresponding sub-hypotheses are derived: two to the first and three to the second. The main hypotheses sound too general and should be replaced by specifically formulated sub-hypotheses.

The present study contingent includes a total of 60 individuals - 40 men and 20 women. The age range of the participants is wide - from 23 to 89 years, mean age 64.8 years. They were all native speakers of Bulgarian and were divided into 2 groups - experimental and control, mirrored in number, age and demographic factors. Ischemic stroke in the left middle cerebral artery basin was mentioned as the etiological factor for aphasia in most patients. Exclusion criteria for the selection of individuals from the EG included cases of sensory aphasia, severe dysarthria and apraxia. Considering the title of the paper, I consider it inappropriate to exclude patients with sensory aphasia, since in them phonological disorders are among the leading ones in the clinical picture of speech. The experimental group presented includes: 15 persons with motor aphasia, 13 persons with sensorimotor aphasia, 1 person with conduction aphasia and 1 person with primary progressive aphasia. I have a comment in relation to the heterogeneous composition of the group, which does not allow the derivation of general patterns concerning deficits in phonological operations. The diagnoses "partial motor" and "partial sensorimotor aphasia" need clarification, and the case of primary progressive aphasia should be excluded.

The ethical norms in this kind of research for informed consent of the families and relatives of the patients were respected. An individual form of assessment of patients was applied, tailored to their needs and conditions.

The study toolkit includes two diagnostic tests: 1. 1. Diagnostic battery "Standardized test for the assessment of phonology in aphasia" - translated version adapted to the specificity of the Bulgarian language and applied to all subjects.

It should be noted that the diagnostic battery is a psycholinguistic tool, theoretically based on the Parallel Distributed Processing Model, and the work on its substantive adaptation to the specifics of the Bulgarian language is undoubtedly the doctoral student's merit. The battery includes three subtests: 'reading aloud', 'auditory phonological processing', 'repetition, segmentation and fusion'. These are presented in detail in the text and in Appendix 78. The linguistic material is composed entirely of nouns, with high and low frequency words contained in each sample. The pseudowords included in the samples were generated using a specialized computer program, follow the structure of the real ones and are in a 1:1 ratio with them. In order to unify the conditions of the study, the instructions and verbal samples were submitted both orally (via audio recording) and in written form. Scoring is on a true-false basis, with a phonological or semantic error being considered incorrect. There is no explanation of the specifics of the two types of errors and the difference between them.

Subtest 1 - "Reading aloud", includes 4 reading tasks: real words, pseudowords, words with non-standard orthography and pseudowords (phonetically spelled real words). Subtest 2 – ‘Auditory Phonological Processing’, includes the same number of tasks for: rhyming real words, rhyming pseudowords, lexical decision, and minimal (oppositional) pairs. Subtest 3 - 'Repetition, fusion and segmentation' consists of 6 tasks divided into three analogous pairs, respectively: repetition of real words and repetition of pseudowords; fusion of real words and fusion of pseudowords; segmentation of real words and segmentation of pseudowords. The last two samples of Subtest 2 ("lexical decision" and "minimal pairs") are not classical examples

of phonology assessment: the former is related to the semantics of language, while the latter assesses the instrumental gnosis level of speech.

The primary quantitative data of the study were subjected to a serious processing with a large number of statistical methods: descriptive statistics, Cronbach's alpha, correlation, variance, factor and regression analysis.

Chapter three presents a detailed analysis of the results obtained. It runs to 58 pages and, in accordance with the hypotheses put forward, is composed in three parts: descriptive statistics of the results of the Boston Test of individuals with aphasia; analysis of the internal consistency of the samples used; analysis of the relationships between phonological processing, oral and written language parameters and a number of complementary factors (demographic conditions, duration and severity of aphasia).

The statistics from the Boston test study, applied only to the EG subjects, showed a large variability of results on all parameters except for the automated line and singing samples. The mean final values for oral and written speech defined the degree of aphasia as moderate to severe. It is noteworthy that within oral speech, scores on comprehension tasks were better than those for speaking, and within written speech, reading skills were better preserved than those for writing. These are important correlations that should be particularly commented on from the position of general language assessment.

Of particular interest are the results on the three subtests assessing phonology, on each of which the differences between groups are statistically significant. I believe that the comparative benchmarking would benefit more if descriptive statistics were also applied to the scores of the CG individuals, similar to those reported in Table 13.

The data from the comparative analysis on Subtest 1 show an interesting trend related to poorer reading of pseudowords and pseudowords by both the aphasia patients and the control group. Although the correlation in question is not commented on, I recommend its further analysis in connection with the standardization of the test for the Bulgarian population. This is justified by the difficulties of the control group subjects in the pseudoword samples of Subtest 3. The prevalence of errors at the phonetic level among native speakers of Bulgarian is also worth commenting on (p. 119).

The descriptive statistics of the SOFA test results of the aphasia patients present the results on each of the parameters examined, objectively supported by specific examples of the symptoms observed. The detailed analysis and the data in Table 13 again show maximum difficulties in phonological processing of pseudo linguistic units. The summarized results confirm the hypotheses of a disorder of phonological processing within the oral and written speech of patients with aphasia, with a predominant influence on the condition of the forms of written speech. It is noteworthy that the quantitative analysis of the results prevails over attempts to interpret them qualitatively and to infer significant trends.

Statistical processing with Cronbach's alpha coefficient proves the objective nature of the test batteries used and the high internal reliability of both diagnostic tools. The data from the correlation analysis support the hypothesis of a direct relationship of phonological processing with the oral and written language status of patients with aphasia. Spearman's coefficient values showed a high degree of correlation between the scores of all sections of the Boston test and the phonology subtests.

Additionally, the conducted regression analysis supports the thesis of the influence of phonological processing on oral and written language in aphasia. Factor analysis of the phonology subtests with the individual parameters of the Boston test indicated the greatest influence of the scores on Subtest 3 ("repetition, fusion, and segmentation") on both the receptive and expressive aspects of oral speech and on the forms of written speech. This gives the PhD student reason to consider the stimulation of phonological abilities as a basis for the recovery of reading and writing disorders in patients with aphasia.

The final section of chapter three presents statistical analysis to support one of the sub-hypotheses about the relationship of phonology, oral and written language in aphasia and a range of demographic factors such as gender, age, level of education, place of residence and birth. Additionally, the correlation with severity and duration of language impairment was also investigated. I believe that, unlike place of residence, birthplace is a relative factor and should not be commented on in relation to language.

Data from the analysis showed no significant effect of gender on phonological status and general language ability in aphasia. The conclusion cannot be considered conclusive against the background of the existing literature data on differences in cerebral specialization for language in both sexes and the small sample of subjects (20 males and 10 females).

The age factor also did not have a significant effect on oral and written speech and phonological abilities in aphasia, except for the results on the samples of Subtest 3. The difference between scores on individual subtests within the overall phonology assessment battery is a fact that needs separate analysis. The results of the analysis also highlight a lack of significant influence of education on the aspects of patients' speech that were examined. This is inconsistent with long-established evidence in the literature of the impact of learning and education on the brain organization of language networks and should be accepted as valid for the sample studied.

Despite the better performance of urban dwellers on some of the parameters, the final result on the factor "place of residence" does not support its statistical influence on different aspects of speech in aphasia.

Of interest is the further examination of the relationship between phonological status with the age and severity of aphasia. In contrast to age, which does not appear to be a predictor of phonological status, severity of aphasia has significant and prognostic implications for the nature of phonological processing in patients.

The summary of the results obtained in the study is presented in the form of 7 conclusions. They emphasize the effectiveness of the diagnostic tools used, highlight the disorders of phonological processing in aphasia as an important predictor of the state of oral and written language of patients and the need to evaluate phonological operations in the process of speech therapy diagnosis. Based on the formulated conclusions, relevant recommendations for improving the diagnosis and therapy of aphasia are also derived. The conclusion highlights the available evidence to support the hypotheses put forward about impaired phonological processing in aphasia and its impact on the oral and written language status of patients.

4. Scientific-theoretical and practical-applied contributions

The contributions of the thesis are divided into 7 categories. The requirement for separating two groups of contributions - of scientific-theoretical and practical-applied character has not been observed. I recommend merging the first three contributions into the group of "scientific-theoretical contributions". The contributions formulated as "methodological" and "social" should be dropped, and the last one, which is not a contribution, should be included as a request for future research on the problem.

5. Abstract

The abstract is 54 pages long and reflects objectively the structure and content of the thesis. Selectively cited authors are correctly formatted in a separate reference list.

6. Publications

On the topic of the dissertation, the PhD student presents a list of 9 publications, which significantly exceeds the required minimum. Of these, 4 are independent and 7 are co-authored with the supervisor. Three of the joint publications are in Web of Science refereed journals.

7. Personal impressions

I have known Emanuela Shtika since her studies at Bachelor and Master level in Speech Therapy, and later on as a full-time PhD student at the Department of Speech Therapy. My impressions of her are of an intelligent young person with high professional responsibility, interest in science and desire for development, which she confirms with the submitted dissertation and the serious number of publications to it.

8. Notes, recommendations and questions:

1. According to the cited literature data (p. 60), errors in speech production in cases of aphasia in frontal lesions are mainly due to impaired motor realization, not to impaired phonological planning. Since the study mainly involved patients with motor aphasia, can it be argued that the symptoms observed in them are the result of impaired phonological operations?
2. How do you explain that patients with aphasia have an easier time with the tasks of merging and segmenting syllables into words, as opposed to the same operations at the phonemic level?
3. What is the purpose and place of phonological processing of pseudowords in speech therapy for native speakers?

Conclusion

The presented dissertation is the first attempt for this kind of research in Bulgarian speech therapy. The structural and substantive execution of the work show the high scientific competence of Emanuela Shtika. Her theoretical knowledge of the researched problem, her

ability to analyze and interpret scientific information, to plan and implement independent research are worthy of admiration. In spite of the critical remarks and comments, the reviewed dissertation has high scientific qualities and applied significance, which enrich the field of diagnostics and therapy in aphasia.

In view of the above, I give a positive evaluation of the presented dissertation and I confidently propose to the esteemed Scientific Jury that Emmanuela Hrabar Shtika be awarded the degree of Doctor of Education in the field of higher education 1. Pedagogical Sciences, professional field 1.2. Pedagogy (Logopedics).

24.04.2024

Reviewer:
prof. Neli Vasileva, DSc