Researchers develop first standardized Russian-language test for aphasia-related disorders

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Researchers from the HSE University Centre for Language and Brain have created and standardized a new test battery for diagnosing

language disorders in people with brain damage. The test is the first standardized assessment tool in Russian in the field. The paper, entitled "The Russian Aphasia Test: The first comprehensive, quantitative, standardized, and computerized aphasia language battery in Russian," has just been published in the *PLOS ONE* journal.

Historically, clinicians in Russia have used qualitative methods to diagnose speech and language disorders. These tools require a high level of skill from the specialists using them, and it is difficult to compare assessment results to each other or use them in research. The small number of quantitative surveys used to assess speech were developed quite a long time ago, and often do not meet modern standards for assessment instruments.

Aphasia is one of the language disorders that lacks a standardized Russian test. People with aphasia can have difficulty understanding others' speech, producing words and sentences, and writing. Aphasia is most often caused by a stroke or a brain injury.

A team of researchers from HSE University has addressed this lack of a valid Russian methodology for evaluating and diagnosing aphasia by developing and testing the Russian Aphasia Test (RAT). This new tool utilizes modern neurolinguistic models and has been designed in accordance with psychometric requirements for this type of diagnostic batteries.

The test was validated in a group of 106 healthy participants and 85 individuals with aphasia. Each participant was assessed with the new test on a tablet. As expected, the healthy subjects had no difficulties with the test. The results of patients with aphasia accurately reflected their diagnoses, as well as specific linguistic deficits identified using qualitative methods in a clinical setting. These and other statistical tests conducted by the team of researchers demonstrate the validity and

reliability of the test. The results obtained from the test subjects were also used to standardize the tool.

A validated test accurately measures what it intends to measure. Its results are consistent over time and vary among subjects exhibiting different levels of the parameter measured. Standardization is a separate procedure for identifying the test's assessment norms based on the results of subjects from different groups. This makes it possible to compare each patient's results to the same standard.

The fully developed version of the test allows specialists to assess aphasia in terms of three language functions: Auditory language comprehension, repetition, and language production. Each of these functions is assessed at various linguistic levels, from the processing of individual sounds (phonemes), single words and sentences to the understanding and production of discourse. For example, in order to assess auditory language comprehension, subjects are asked to match the word or sentence they hear to a picture. The tasks to assess repetition involve repeating a nonword, word, or a sentence. Language production is assessed by asking participants to provide a verbal description of pictures. The test contains a total of 13 different subtests, each comprising of 8–24 items. On average, someone with aphasia takes 60–90 minutes to complete the whole test.

This kind of differential assessment affords a detailed profile of the patient's linguistic deficits, consequently enabling the clinician to select the most optimal and effective course of treatment. The test is the first Russian diagnostic tool to be standardized in accordance with modern psychometric standards. The Russian Aphasia Test can be used both in clinical practice and in neurolinguistic studies of language.

In another first (both in Russia and the world), the test automates the assessment of aphasia. The test can be administered to patients using an

app on a tablet, which then automatically scores performance on some of the subtests. The test examiner can use the device to assess the accuracy of completion of the remaining subtests, and the program will then specify the level of disorder severity for each language function.

"The publication of this test is a landmark event in Russian aphasiology," explains Maria Ivanova, the head of the team behind the test, a research scientist at the Aphasia Recovery Lab at the University of California Berkeley, and a former research fellow of the HSE University Centre for Language and Brain. "We spent almost ten years working on this project. First, we developed the tasks and tested them on a small number of subjects. We selected the best of them and conducted large-scale data collection to validate and standardize the test. Alongside this, we developed an app capable of automating the presentation and scoring procedures. The last few years have been devoted to processing data and preparing the test materials for publication. The use of the test in clinical and research settings will take Russian aphasiology to a new level."

Olga Dragoy, Director of the Centre for Language and Brain and co-author of the project, said, "The Russian Aphasia test is the most outstanding clinical application created at the HSE University Centre for Language and Brain. It represents the latest in neurolinguistic knowledge, the best traditions of psychometrics, and modern technology. We believe that our tremendous effort will be of benefit to the field of speech-language disorders in Russia and set a global trend for language assessment tools."

More information: Maria V. Ivanova et al, The Russian Aphasia Test: The first comprehensive, quantitative, standardized, and computerized aphasia language battery in Russian, *PLOS ONE* (2021). DOI: 10.1371/journal.pone.0258946