RUSSIAN PHONOLOGICAL BATTERY FOR THE ASSESSMENT OF LANGUAGE DEVELOPMENT

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This work is supported by Russian Foundation for Basic Research (grant No. 17-29-09122)

NATIONAL RESEARCH UNIVERSITY

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BACKGROUND

Phonological processing is one of the central components of language comprehension and production and is an essential predictor of language acquisition and reading development (Debska, 2016, Torgesen et al., 1994, Ehri et al., 2001). Early detection of phonological deficit is essential for an appropriate assistance to children with language developmental disorders (Wagner & Torgesen, 1987). For that, fine and accurate diagnostic tools are required (Ramus et al., 2013).
For languages like English, there are test batteries measuring phonological skills both for children and adults (Frederickson et al., 1997, Gardner et al., 2006, Warmington, 2012), but for Russian no standardized phonological test was available.

RESEARCH OBJECTIVE

Our goal was to develop diagnostic tool for assessing the profile of phonological processing in Russian-speaking children and to standardize it in the group of 100 children with normal reading acquisition.

LINGUISTICALLY-BASED APPROACH

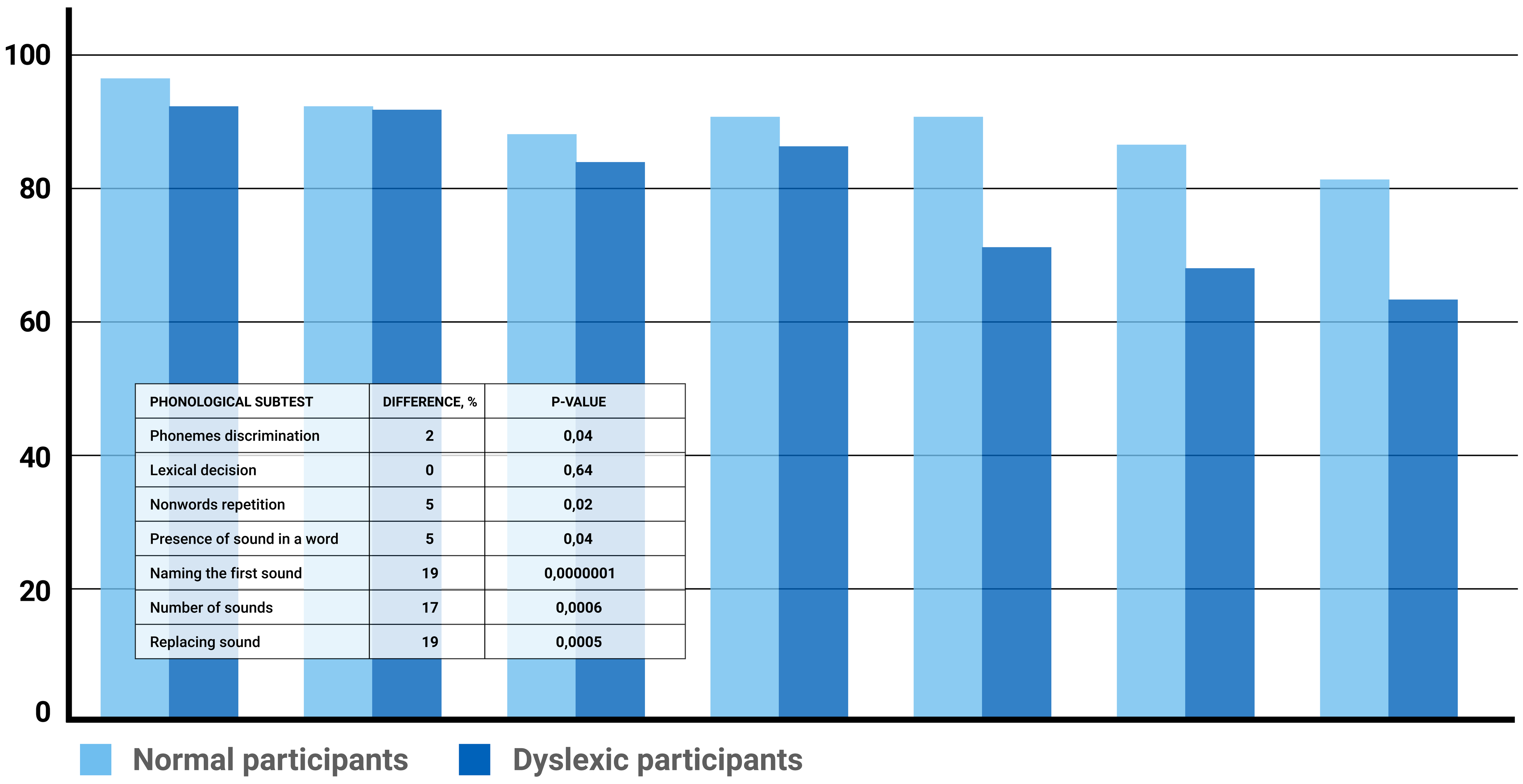
We have developed comprehensive phonological battery for Russian children. It measures phonological processing ability at several levels. Important distinctive feature of our test is a linguistically-based approach. We have selected a stimulus material for our test, taking into account a number of psycholinguistic parameters:
• age of acquisition of words
• word length
• syllabic structure
• frequency of use
• articulatory features
Visual stimulus material and relevant psycholinguistic parameters were taken from the databases (Akinina et al. 2015, Akinina et al. 2014). We have chosen the types of tasks with due regard to the experience of speech therapists and neuropsycologists, including their observations about the types of errors characteristic of children with learning difficulties and dyslexia.

METHOD

· Screening for primary auditory impairments (using the program Audiogramm ver. 4.6.1.3, Professional Audiometric System; audiometry headphones Sennheiser HDA 280)
· Screening for non-verbal intelligence (Raven's Colored Progressive Matrixes)
· Assessment of reading fluency and reading comprehension by the standardized test of reading in Russian (Kornev & Ishimova, 2010).
· Assessment of phonological processing using the 7 subtests of developed test battery.

STANDARDIZED FORM

The phonological battery was programmed using Java SE 8 as an application for an Android tablet.
All audio stimuli were pre-recorded by a professional Russian speaker in a recording studio. In the comprehension tasks (subtests 1, 2, 4) accuracy and reaction times of participants' responses were registered automatically. In the production tasks (subtests 3, 5, 6, 7) participants' vocal responses were automatically recorded by the same program and analyzed off-line later.



PHONOLOGICAL SUBTEST	DIFFERENCE, %	P-VALUE
Phonemes discrimination	2	0,04
Lexical decision	0	0,64
Nonwords repetition	5	0,02
Presence of sound in a word	5	0,04
Naming the first sound	19	0,0000001
Number of sounds	17	0,0006
Replacing sound	19	0,0005

PHONOLOGICAL SUBTESTS

1. **Phonemes discrimination** (auditory differentiation of pairs of sounds, presented in minimal contexts; *iva-yva, vom-fom*)
2. **Lexical decision** (differentiation of words and nonwords, specifically designed with phonotactic rules of Russian language and types of errors typical for children with dyslexia; *sOmtse, bAlets, telefIn*)
3. **Nonwords repetition** (*kadrAt, pUlitsa, ferjOvka*)
4. **Detection the presence of sound in a word** (*g – kit, ch – vrach, y – kartIna*)
5. **Naming the first sound in a word** (*lev => [l'], igla => [i], dvornik => [d]*)
6. **Counting the number of sounds in a word** (*slon => 4, nosok => 5, lampochka => 8*)
7. **Replacing sound in pseudoword** (to successfully accomplish this task a child needs to have complex skills: to hear and retain the sounds, to hold in memory the sequence of sounds in nonword, to find the target sound mentally, to make a replacement, to pronounce the final nonword aloud; *replace the sound [b] on [p] – ba, replace the sound [k] at [k'] – nu-ka, replace the sound [l] to [v] – mi-mi-la*).

PHONOLOGICAL PROCESSING, READING AND READING COMPREHENSION

Pearson correlation		PhonDiscr	LexDec	NWR	SoundPres	FirstSound	NumberOfSounds	ChangingSound
Reading Fluency	Pearson correlation	,086	,222*	,076	,095	,269*	,441**	,511**
Text 1	p-value	,421	,036	,474	,374	,010	,000	,000
	N	90	90	90	90	90	90	90
Reading	Pearson correlation	,350**	,241*	,217*	,092	,121	,222*	,298**
Comprehension	p-value	,001	,022	,040	,389	,257	,035	,004
Text 1	N	90	90	90	90	90	90	90
Reading Fluency	Pearson correlation	,052	,182	,020	,105	,237*	,394**	,458**
Text 2	p-value	,629	,087	,851	,325	,025	,000	,000
	N	90	90	90	90	90	90	90
Reading	Pearson correlation	,452**	,306**	,328**	,264*	,069	,215*	,453**
Comprehension	p-value	,000	,003	,002	,012	,519	,042	,000
Text 2	N	90	90	90	90	90	90	90

PARTICIPANTS

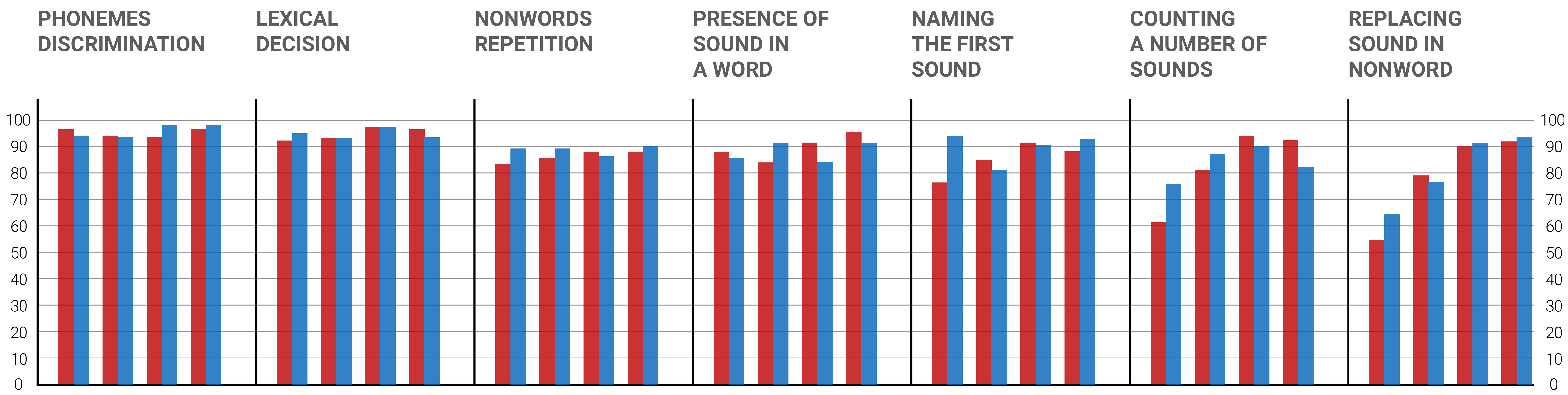
Normal readers: 108 normally acquiring reading children 7-to-11 years of age.
The participants had no history of diagnosed neurological and/or psychiatric disorders. Screening for primary auditory impairments and for non-verbal intelligence resulted in exclusion of 18 children. The remaining 90 children included 18 first graders, 27 second graders, 26 third graders and 19 fourth graders (42 boys and 48 girls; 7 left-handed). All had normal or corrected-to-normal vision.
Group of children with dyslexia: 60 children with dyslexia 7-to-11 years (work in progress, currently processed and presented data for 38 participants).

DISCUSSION

The study showed that normally acquiring the reading children already to first grade have formed phonemic perception skills at a high level. Subtest 1-2 can be recommended for the research of phonemic perception skills in preschool children (4-to-6 years old).

We find an interesting correlation between the ability to discriminate phonemes and the level of reading comprehension. The correlation with the understanding of simple text was at the level of 0.350 (with the significance of p=0.001), and in the case of more complex text, this figure increases to 0.452 (while the significance also increases, p=0.000).

Comparison of the performance on standardized tests for reading and reading comprehension with the results of tests for phonological analysis (subtests 4-7) showed the importance of developing the skills of complex phonological analysis in primary school children. The evolution of these skills is shown at the diagrams (see below).



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