Auditory Processing and Verbal Factors Predicting Reading Skills in First Graders: Longitudinal Study Data

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What predicts reading?

Phonological abilities are suggested to be a primary source of variability in reading skills among children mastering alphabetic scripts (Meng et al., 2005).

The three most widely studied phonological processes related to reading (Torgesen & Burgess, 1998):

1. **Phonological awareness** (Gedutienė, 2008 – Lithuanian);
2. **Rapid automatized naming (RAN);**
3. **Short-term verbal memory.**

What causes deficits in phonological skills?

While the importance of phonological abilities for understanding reading acquisition and impairment across orthographies is well documented, **what underlies deficits in phonological abilities is not well understood** (Zhang & McBride-Chang, 2010).

The idea that there may be a **low-level auditory perceptual basis** for phonological deficits:

- First explored by Tallal and Piercy (1973);
- Ongoing debate in research on causes of reading differences, including reading disability (McBride, 2016).

Links between Auditory Processing and Reading

A series of studies across alphabetic languages has demonstrated that variability in **auditory processing is associated with reading** variability:

Goswami et al., 2002; Goswami, Gerson, & Astruc, 2010 – English; Hämäläinen, Leppänen, Torppa, Müller, & Lyytinen, 2005 – Finnish; Muneaux, Ziegler, Truc, Thomson, & Goswami, 2004 – French; Talcott et al., 2003 – Norwegian; Chung, McBride-Chang, Cheung & Wong, 2013 – Cantonese (Chinese dialect).

Even when phonological abilities are also included in the study:

Meng et al., 2005; Boets et al., 2008, 2011; Zhang & McBride-Chang, 2014.

What else predicts reading?

Some studies suggest that the source of reading variation in early development may not be phonological processing only.

Early language skills:

- expressive language and **vocabulary** skills (Snowling et al., 2003);
- morphological awareness and **vocabulary** knowledge (Zhou et al., 2014).

The aim of this study

This study examines which factors (auditory processing, phonological, language abilities) in pre-school age are best predictors of reading skills (reading speed, reading accuracy, text comprehension) in Lithuanian language in the first class.

Subjects and Procedure

96 children (59 boys, 37 girls) participated in the study.

Stage I (pre-primary education group). During 2 individual meetings, the tasks of rapid naming (objects, colors), phonological awareness, short-term auditory memory, vocabulary and auditory processing were performed with the subjects.

Stage II (1st grade). During individual meeting, the tasks of reading skills were performed with the subjects.

Auditory processing tasks

5 different tasks (Brain-Boy® Main Manual, 2015):

1. Auditory order threshold;
2. Spatial/directional hearing;
3. Pitch discrimination;
4. Auditory frequency-pattern discrimination;
5. Auditory duration-pattern discrimination.

Tasks of reading skills

1. Speed of reading real words
2. Speed of reading non-words (pseudo-words)
3. Accuracy of reading (reading without errors)
4. Text comprehension

Prediction of real words reading speed

Linear regression

Independent variable	R^2	F	p	β	p
Rapid objects naming	0,39	58,20	0,000	0,63	0,000
Rapid colors naming	0,38	52,46	0,000	0,62	0,000
Auditory frequency-pattern discrimination	0,27	16,63	0,000	-0,52	0,000
Short-term auditory memory	0,23	26,29	0,000	0,48	0,000

Multiple regression

Significant independent variable	ΔR^2	F	p	β	p	n
Rapid objects naming	0,47	38,52	0,000	0,69	0,000	92

Prediction of non-words reading speed

Linear regression

Independent variable	R^2	F	p	β	p
Rapid objects naming	0,32	42,28	0,000	0,57	0,000
Rapid colors naming	0,32	40,65	0,000	0,57	0,000
Auditory frequency-pattern discrimination	0,30	19,11	0,000	-0,55	0,000
Auditory order threshold	0,19	18,78	0,000	-0,44	0,000
Short-term auditory memory	0,19	20,75	0,000	0,44	0,000

Multiple regression

Significant independent variable	ΔR^2	F	p	β	p	n
Auditory frequency-pattern discrimination	0,32	14,55	0,000	-0,38	0,010	46
Rapid objects naming	0,09			0,36	0,014	

Prediction of reading accuracy

Linear regression

Independent variable	R^2	F	p	β	p
Rapid colors naming	0,28	33,12	0,000	-0,53	0,000
Phonological awareness	0,25	29,63	0,000	-0,50	0,000
Rapid objects naming	0,22	24,77	0,000	-0,47	0,000
Short-term auditory memory	0,22	24,31	0,000	-0,47	0,000
Auditory frequency-pattern discrimination	0,22	12,10	0,001	0,46	0,001
Auditory order threshold	0,19	18,65	0,000	0,44	0,000

Multiple regression

Significant independent variable	ΔR^2	F	p	β	p	n
Auditory frequency-pattern discrimination	0,27	10,07	0,000	0,47	0,001	45
Phonological awareness	0,07			-0,27	0,048	

Prediction of text comprehension

Linear regression

Independent variable	R^2	F	p	β	p
Vocabulary	0,32	38,47	0,000	0,57	0,000
Rapid colors naming	0,21	20,75	0,000	0,45	0,000

Multiple regression

Significant independent variable	ΔR^2	F	p	β	p	n
Vocabulary	0,30	24,38	0,000	0,45	0,000	81
Rapid colors naming	0,08			0,31	0,002	

Thank you for your attention!