NON-COGNITIVE DEVELOPMENT OF FIRST GRADERS AND THEIR COGNITIVE PROGRESS

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Non-cognitive development and life outcomes: evidence from literature

- Children who have good inter-personal skills and can self-regulate their behavior and emotions are more likely to associate well with their peers and their teachers, and to reap the benefits of their education (Merrell, Bailey, 2008)
- Students, parents and teachers who navigate these social and emotional processes can have powerful influence on a multitude of important life outcomes (e.g., Kautz, et.al, 2014; OECD, 2015):
  - *mental health problems (Tackett, 2006; De Bolle, Beyers, De Clercq, and De Fruyt, 2012)*
  - *Civic engagement and environmental awareness (Omoto, Snyder and Hackett, 2010; Milfont and Sibley, 2012)*
  - *Crime / safety issues (Furnham and Taylor, 2004)*

Research questions

- Can we define meaningful patterns of cognitive, personal, social and emotional development in the early years of schooling?
- Are these patterns related to the cognitive progress during the first year of school?
- What contextual factors (family, demographic, etc.) are important for kids in each group?

Methodology

Instrument: The International Performance Indicators in Primary Schools (iPIPS) – PSED questionnaire, math and reading scales: baseline and follow-up assessment.

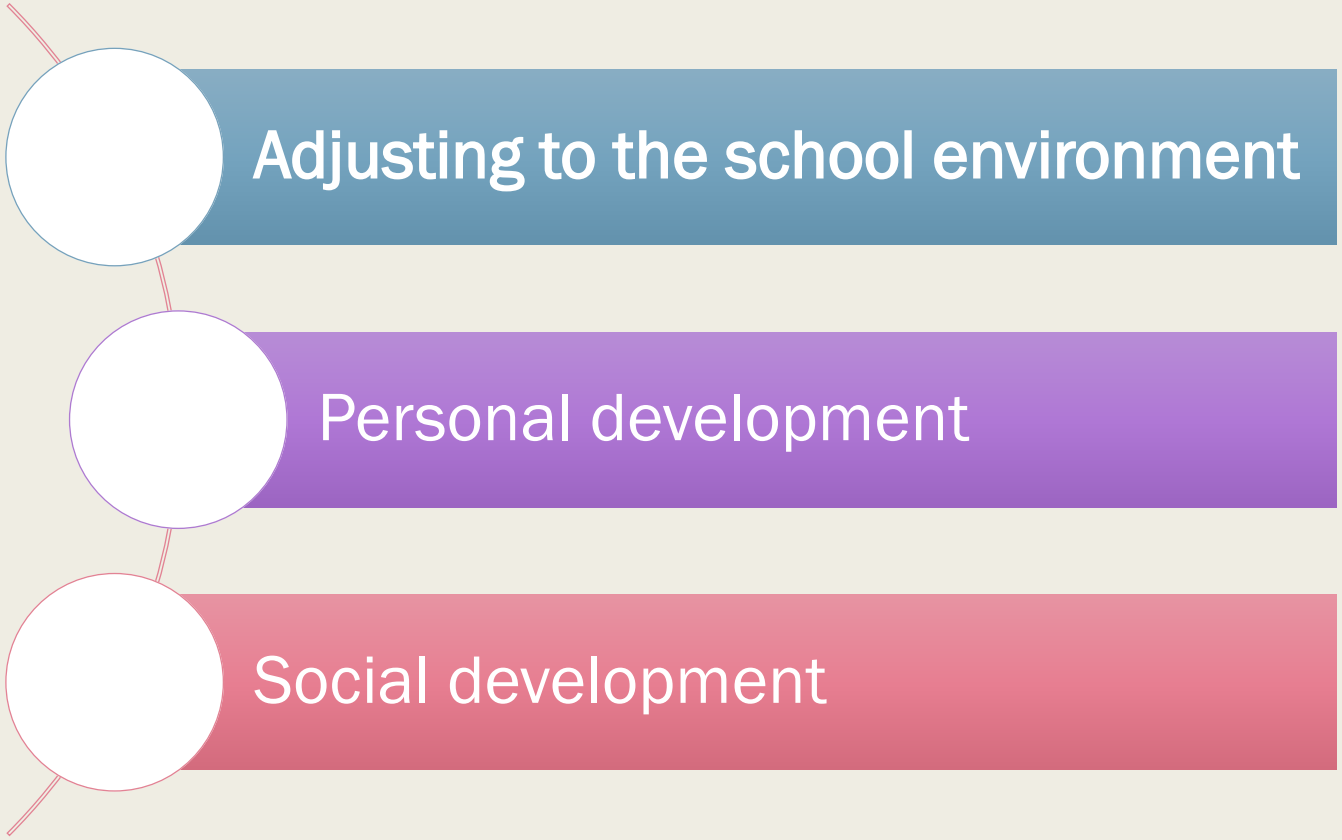
Participants: Children enrolled in the 1st grade of school on the 1st of September 2014. Russian sample consists of 1202 children recruited from of 29 schools in one of the Russian regions located in the central part of Russia.

The capital	Kazan
Area	67 847 km²
Population	3 855 037 (2015)
Density	56.82 pers./km²

Russian system of primary education

- 7 year old children
- 1 teacher
- 4 years (grades 1-4)
- No marks during the first year
- No selection on the entrance

Personal, social and emotional development in iPIPS study



- ✓11 scales, 5 carefully described grades
- ✓Filled by teacher
- ✓Teacher assesses child's behavior
- ✓Adjusted to Russian educational environment

Analyses

- Principal component analysis for PSED scales;
- IRT modeling for item analysis, dimensionality and reliability study, scale construction for cognitive and non-cognitive data, as well as for students' estimation for all scales. Vertical equating is used to place the results from baseline and follow-up assessments on the common scale;
- Hierarchical cluster analysis (k-means) – to define different groups of children based on their cognitive and non-cognitive development;
- ANOVA – to estimate the differences in progress during the first year of schooling;
- Regression analysis – to estimate the input of selected context variables.

Results 1: PSED dimensions

PSED dimensions	PSED factors (loadings)
Classroom behavior - refers to the skills which helps child to maintain concentration and ability to follow school rules and timetable.	Concentration 1: Teacher-directed activities (0.80) Concentration 2: Self-directed activities (0.79) Actions (0.85) Rules (0.83) Cultural awareness (0.56)
Communication - describes child's social skills and ability to maintain relationships with peers and adults within the school and broader community.	Comfortable (0.73) Independence (0.64) Confidence (0.82) Relationship to peers (0.56) Relationship to adults (0.62) Communication (0.52)

Results 2: IRT analysis

- Rating Scale Model

1) Dimensionality study for 2 scales: PCA
2) Model fit analysis for each item
3) Quality of the response categories
4) Reliability study

	α	Rasch
Communication	0.80	0.73
Classroom behavior	0.86	0.82

- Students' measures

	mean	SD
Communication	1.26	1.31
Classroom behavior	0.67	1.93

Results 3: developmental patterns

	Clusters				
	1 (N = 214)	2 (N = 403)	3 (N = 270)	4 (N = 164)	5 (N = 151)
Math	51.07	52.32	43.49	39.09	65.47
Reading	53.06	54.22	42.82	37.66	62.79
Communications	3.68	0.88	1.31	-0.19	2.05
Classroom Behavior	2.61	-0.17	0.89	-1.34	1.53

Cluster 2:

- ✓ [illegible] don't feel
- ✓ [illegible]
- ✓ moderately good in class

iPIPS: cognitive scales and context

Cognitive measurements

(baseline and follow-up data)

- Mathematics
- Reading

Context (parents' questionnaire)

- ***Child:*** age (0.092), gender (0.28)
- ***Family:*** mother's education (0.15), age at birth (0.12), income (0.11), number of books (0.16)
- ***Life:*** time to bed (0.0098), special training (0.17), nurcery the year before school (0.11)

Context variables were selected according to $\chi 2$ and Cramer's V

Progress during the first year: descriptions for clusters

	Cluster				
	1	2	3	4	5
Math progress	9.97	10.68	10.91	9.32	10.66
Reading progress	8,67	7.14	11.6	11.19	10.9
Math follow-up	61.55	62.95	53.98	48.29	75.53
Reading follow-up	61.94	61.33	53.96	48.30	72.39

Progress:

- ✓ No significant differences in progress in math at all
- ✓ Clusters 1 & 2 significantly differ in Reading

Follow-up results:

Math:

- ✓ Cluster 5 – best in Math
- ✓ Cluster 4 – lowest results

Reading:

- ✓ Cluster 3, 4, 5 – significant differences
- ✓ No differences between clusters 1 & 2

Relationships between cluster membership and background information

		Cluster, % of cases				
		1	2	3	4	5
Socio-demographical	Gender (male)	27.4	57.0	38.1	67.7	60.0
	Number of Books at home (more than 100)	24.1	31.4	16.8	18.2	43.0
	Mother's education (higher)	58.4	62.8	50.0	32.8	68.7
Economical	Income (more than 20,000 rub per month)	83.8	85.3	77.2	69.5	81.1
Pre-school related	Nursery the year before school (yes)	91.3	87.4	86.6	79.3	92.0
	Special training before school (yes)	24.1	31.4	16.8	18.2	43.0

Significant predictors for Follow-up Scores

Cluster	Cognitive domain	Predictors	R^2
1	Math	Income	0.44
	Reading	Gender	0.28
2	Math	Gender, Mother's Education	0.39
	Reading	Mother's Education	0.27
3	Math	Mother's Education	0.33
	Reading	Gender, Income	0.17
4	Math	-	0.4
	Reading	-	0.24
5	Math	Number of books, Mother's Education	0.58
	Reading	Income, Mother's Education	0.56

- ✓ Baseline scores significantly predict success for all groups
- ✓ Variance explained by predictors is lower for Reading
- ✓ No significant predictors found for students from 4th cluster
- ✓ The model predicts best follow-up scores for the 5th cluster

Linear regression,, Sig.0.05

What is going on with clusters 4 and 5?

4th Cluster

Math F = 18.71 + 0.76****Math B*** + e

Reading F = 24.33 + 0.65****Reading B*** + e

5th Cluster

Math F = 2.94****Books*** + 1.02****Education M*** + 1.14****Math B*** + e

Reading F = -2.63****Income*** + 1.95****Education M*** + 1.19****Reading B*** + e

Math F – follow-up Math score
Math B – base-line assessment score

Conclusion

- 2 scales were developed based on PSED: classroom behavior and communication.
- 5 groups of children were distinguished based on their baseline assessment and non-cognitive scales:

	Cluster				
	1	2	3	4	5
Cognitive development	medium	medium	low	low	high
PSED	high	medium	medium	low	high

- These groups differ by their follow-up scores: 3rd , 4th and 5th Cluster differ amongst themselves and from 1st and 2nd cluster in reading.
- No connection was found between non-cognitive development, contextual information and children's progress during first year of school.

Thank you!

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Discussion

- Why there is no connection between cognitive progress during first year and non-cognitive development?
- Why there are no significant predictors for children from 4^{th} cluster?

Limitations:

- Sample size

1st Cluster

Math F = 9.95 + 2.42**Income* + 0.90**Math B* + e

Reading F= 21.45 + 3.35**Sex* + 0.71**Reading B*+ e

2nd Cluster

Math F=19.76 – 1.63**Sex* + 0.76**Education M* + 0.78**Math B* + e

Reading F= 14.27 + 0.94**Education M* + 0.79**Reading B* + e

3rd Cluster

Math F=21.67 +0.97* *Education M* + 0.65* *Math B* + e

Reading F= 32.6 + 2.38**Income* + 3.4**Sex* +0.35**Reading B*+ e