Article

Domain-specific stimulation of executive functioning in low-preforming students with a Roma background: cognitive potential of mathematics

Iveta Kovalčíková [1], Jochanan Veerbeek [2] , Bart Vogelaar [3], Alena Prídavková [4, *], Ján Ferjenčík [5], Edita Šimčíková [6] and Blanka Tomková [7]

[1] University of Presov in Presov, Faculty of Education, Research Center of Cognitive Education, Slovakia; iveta.kovalcikova@unipo.sk
[2] Education and Child Studies, Leiden University, Netherlands; j.veerbeek@fsw.leidenuniv.nl
[3] Developmental and Educational Psychology, Leiden University, Netherlands; b.vogelaar@fsw.leidenuniv.nl
[4] University of Presov in Presov, Faculty of Education, Department of Mathematic Education; Slovakia; alena.pridavkova@unipo.sk
[5] Pavol Jozef Safarik University in Kosice, Faculty of Arts, Department of Psychology, Slovakia; jan.ferjencik@upjs.sk
[6] University of Presov in Presov, Faculty of Education, Department of Mathematic Education; Slovakia; edita.simcikova@unipo.sk
[7] University of Presov in Presov, Faculty of Education, Department of Mathematic Education; Slovakia; blanka.tomkova@unipo.sk

* Correspondence: alena.pridavkova@unipo.sk; Tel.: +421 517470542

Abstract: The current study investigated whether a domain-specific intervention targeting maths and executive functions of primary school children with a Roma background would be effective in improving their scholastic performance and executive functioning. In total, 122 students attending Grade 4 of elementary school took part in the project. The study concerned a pretest-intervention-training experimental design with three conditions: the experimental condition, an active and a passive control group. The results suggested that both maths performance and executive functions improved over time, with no significant differences between the three conditions. An additional correlational analysis indicated that pretest performance was not related to posttest performance for the children in the experimental and active control group.

Keywords: executive functioning; domain-specific cognitive stimulation; math; low-performing student; Roma ethnic group.

1. Introduction

In many countries, poor mathematics achievement is often seen in students from low income and ethnic minority backgrounds [1; 2; 3]. One of these groups in the Slovak Republic concerns the Roma. Roma are “an extraterritorial ethnic group living in the ethnic environment in the form of an intra-differentiated diaspora” [4]. The Roma originated from the Indian subcontinent. The oldest known written reference to the Roma in Europe dates back to 1068. The oldest known reports of the Roma in Slovakia are from the second half of the 14th century [5]. In this context, it is important to note that the Roma ethnic minority in Slovakia is highly structured and heterogeneous in terms of ethnic subgroups and dialects (e.g. Rumunger, Olas, Valachrom), but also in terms of their social integration, economic status and education [6].

In the Slovak Republic, levels of mathematical achievement tend to be much lower in Roma children than in the general school population [7; 8]. Moreover, failure rates amongst the Roma are higher than among the general school population, and they are often placed in special education programs [9; 10; 11].

In general, performing well in mathematics seems to be related to various external factors, such as the education system, school, teacher, and family, as well as internal factors, such as the child's personality traits, motivation, attitude, and math anxiety [12]. One important internal factor influencing mathematics achievement concerns the child's executive functioning (e.g., [13]). Several studies suggest that children with weaker executive functions tend to perform poorly on mathematics, at the preschool age [14], in primary [15], as well as in secondary education [16]. A study [17] suggested that children with a Roma background in Slovakia did indeed score significantly lower on executive functions than children with a majority background. However, to date it has not been researched yet whether an intervention targeting executive functioning would also be effective for the mathematics performance of children with a Roma background. Therefore, the current study aimed to investigate whether a newly developed intervention stimulating executive functioning, ExeFun-Mat (executive functioning stimulation via mathematics), would be beneficial in improving Roma children's executive functioning and scholastic performance in the field of maths.

2. Theoretical framework

2.1. The influence of executive functioning on achievement in mathematics

The term "executive functioning" refers to the mechanism by which performance is optimized in situations requiring the operation of a number of cognitive processes [18]. The term is generally used to represent an umbrella construct that includes a collection of interrelated functions that are responsible for purposeful, goal-directed, problem-solving behavior [19].

Research on the impact of executive functions in relation to school performance shows that they are a better predictor than IQ scores, mathematical skill, or level of reading literacy (e.g., [20]; [21]). Specific executive functions found to influence mathematics performance include working memory [22], inhibition [23], cognitive flexibility [24], as well as the higher-order function attention [25; 26]. Moreover, a meta-analysis by Cragg and Gilmore [27] further showed that skills linked to executive functions, such as monitoring and manipulating information in the mind (working memory), suppressing unwanted stimuli (inhibition) and flexible thinking (cognitive flexibility), played an important role in the development of mathematical knowledge and skills.

2.2. Executive function training

In recent studies, it was found that executive functioning can be strengthened as a consequence of intervention [28; 27; 29; 30; 31]. In general, two types of interventions are distinguished when it comes to executive function interventions: domain-general and domain-specific interventions. Several studies indicated that interventions aimed at strengthening executive functioning have a positive effect on children's mathematical performance [32; 33; 34]. In a study by Goldin and colleagues [35] it was further found that a computer-based intervention targeting executive functioning had an equalizing effect on the academic and mathematics achievement of children from lower social-economic backgrounds.

In coherence with this opinion group the current study sought to investigate whether ExeFun-Mat, a newly developed domain-specific intervention for mathematics, could stimulate math performance and executive functioning of low performing students with a Roma background.

3. The current study

Building on previous research, utilizing a pretest-training-posttest design with an experimental condition, and active control and a passive control condition, the current study aimed to investigate whether the ExeFun-Mat (executive functioning stimulation via mathematics) intervention had an effect on Roma children's executive functioning and scholastic performance.

The first research question concerned the potential effect of the ExeFun-Mat program on children's executive functioning. It was hypothesized that those children who were administered the ExeFun-Mat intervention would show more improvement in their executive functions, specifically inhibition, cognitive flexibility, self-regulation, attention control, and planning, than those in the two control conditions [27; 28; 36; 29].

The second research question concerned the potential effect of the ExeFun-Mat program on children's mathematical performance. In accordance with previous studies, it was expected that the children who received the ExeFun-Mat program would show more improvement in their mathematics performance than those in the two control conditions [37; 32; 33; 34].

The third research question concerned the potential effect of the ExeFun-Mat programme on the relationship between children's executive functioning, math abilities and math performance in school. Based on several studies [38; 39; 40], it was expected that the relationship between executive functioning and math performance in school would become weaker for children who received the ExeFun-Mat program from pretest to posttest, but not for those in the two control conditions. Similarly, it was explored whether the relationship between children's mathematical abilities and math performance in school would become weaker for children who received the ExeFun-Mat program from pretest to posttest, but not for those in the two control conditions.

3. 1. Materials and Methods

3.1.1. Participants

The participants were low-performing students from segregated Roma communities in Slovakia, attending Grade 4 of mainstream elementary schools in rural areas of Slovakia. Students were selected if, according to their teachers, they had achieved below average results on Math tests in the three years prior to the intervention (performance was below average, mark 3 and lower). Three elementary schools were involved in the project, all of which were located in segregated Roma communities located on the outskirts of a town or settlement. None of the students in any of the schools spoke Slovakian as their first language. The students' home language was Romani. All the students attending Grade 4 took part in the project – 122 students in total once parental consent for the child's participation in the project had been obtained. The research sample consisted of (very) low achievers in Math, many of them with (1) a history of a grade repetition, (2) low conduct of the language of instruction, (3) observed low level of motivation. The Cognitive Ability Numerical Battery [41] was used at the pretest to objectify mathematical performance, consisting of three subtests: numerical relations, series of numbers, and compilation of equations. These measures offer an overview of the child's basic quantitative concepts and ability to see relationships between them. The results showed an average result of 21.33 (SD = 9.4), which represents 80 points of the weighted score and points to the mathematical abilities of the observed group at average and below average performance levels. In the frequency analysis, up to 60% of students showed a deficit result ($z = -2$). The 122 children were then randomly divided into three groups (the experimental group and two control groups – active and passive). A mixture of equalization and random selection was used, based on the child's characteristics (sex, place of birth/type of settlement, and mathematics grade, pretest data). Following pretest data, children with equal scores were randomly allocated to one of the three conditions. The division of participants can be found in Table 1.

Table 1. Number of children by group and sex

Condition	Boy	Girl	Total

experimental	19	21	40
(active) control 1	19	23	42
(passive) control 2	19	21	40
total	57	65	122

Children's executive functions and maths abilities were tested twice - before the experiment (pretests) and two weeks after the experiment to assess short-term transfer of the experimental effect (posttests). There was a 3.5-month interval between the pretest and posttest. The tests were clinically administered: individually and during lesson-time at the student's school and took approximately 60 minutes. Ten trained data collectors (school psychologists) participated in the project.

3.1.2. Design and procedure

The study utilized a pretest-intervention-posttest experimental design with three conditions: experimental group (EG), active control group (C1G), and passive control group (C2G). The EG was administered the original domain-specific intervention program. The intervention consisted of 30 units, and each unit took 45 minutes. The intervention was conducted in the school during school time, and was administered twice per a week. The active control group was given 30 extra hours of mathematics education in addition to the compulsory school curriculum. The teacher, employed at the project school, worked with a regular mathematics textbook. In the active control group, there was no specific stimulation of executive functioning. The C2G (passive control/contrast group) did not perform any additional tasks.

3.1.3. Materials

Executive functioning (EF). To assess the children's level of EF, the Delis–Kaplan Executive Function System [42] D-KEFS test battery was used. The D-KEFS test battery was adapted for use with the Slovak population, and the psychometric characteristics were tested and described by [43]. The internal consistency was below 0.70 in the individual indicators of all battery tests, which from a psychometric point of view tends to be considered as the lower limit of "good" reliability. The individual D-KEFS battery indicators showed moderately high correlations with the W-J battery indicators. In this study, the following subtests from the D-KEFS battery were used: (1) D-KEFS Trail Making Test – a test of attention organization and flexibility in five test conditions, capable of abstracting interference factors of visual searching and motor speed; (2) D-KEFS Verbal Fluency, which measures the ability to fluently generate verbal responses to letter prompts and categories within 60 seconds; (3) D-KEFS Design Fluency Test, a test of figural fluency (in three control conditions) in the visual domain; (4) D-KEFS Color–Word Interference Test, a version of the Stroop test in four test conditions that measures the ability to inhibit "learnt" behavioral responses.

Mathematical achievement. To assess children's mathematical achievement, the following instruments were used: 1. Cognitive Abilities Test (CogAT) [41] – the numeracy battery (quantitative relations, number series, equation building, pictures). Reliability of the Cognitive Abilities Test numeracy battery is 0.85 [44]; 2. ZAREKI [45; 46] – a neuropsychological test battery for numerical processing and calculation that provides information on deficits in mathematical ability. ZAREKI has 11 subtests containing 59 tasks in total. These map the basic mathematical skills: perceptual, memory, spatial, verbal, operational as well as mathematical reasoning factors. Internal consistency of ZAREKI test in a normative sample is 0.90 as recorded in [47].

Exefun-Mat stimulation program in the mathematical domain. The Exefun-Mat program consisted of an intervention, in which one trained administrator worked with two students. The intervention was based on the principles of the reciprocal teaching approach

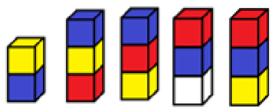
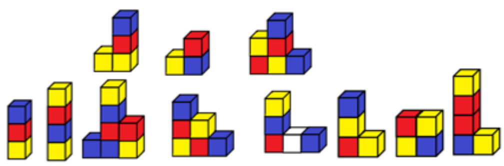
[48; 49; 50], scaffolding and self-questioning. This included (1) focusing on the student´s ability to generate questions, (2) clarifying and summarizing the information they have read, (3) moving from being passive observers of learning to active teachers, (4) becoming involved in the learning experience as peer tutors.

For the content of the intervention program, the Slovak national mathematics curriculum was used as a source. The program consisted of: (1) *Application of tasks and tasks for developing mathematical thinking* (sequences, combinatorics, propositional logic); (2) *Numbers and operations involving natural numbers;* (3) *Geometry* (basic geometric shapes, two-dimensional and three-dimensional orientation).

According to [51], two key content areas for younger children in learning mathematics are *numbers* (numbers, operations, relationships) and *geometry* (spatial perception and thinking, measurement). Based on these criteria, 25 items were constructed. For the selection of the items, 25 expert teachers scored the pool of items based on (1) *importance* (with regard to national academic standards in Math); (2) *difficulty to teach* (perceived methodological problems to deliver this part of curriculum); (3) *difficulty to learn* (observed difficulties in students to reach the standard in this area). The 10 highest scoring items were selected.

The domain-specific content was divided into modules. Each module consisted of a set of graded tasks. The criteria for the grading and hierarchical organization of the tasks were based on (1) *level of cognitive difficulty* [52] and (2) *type of representation* - enactive, iconic and symbolic modes [53]. The way the items were structured is shown in Table 2.

Table 2. Level of difficulty - example of items structure

	Level of difficulty 1 **Three elements, enactive mode**
Item 1	We built three-color towers of three cubes (red, yellow and blue). Check that all solutions are correct. (Towers build as the illustration shows). 
	[…] 2nd and 3th level of difficulty
Item 4	Level of difficulty 4 Four elements, iconic mode
	Check which buildings in the picture are built according to this rule: The building has three floors and cubes of three colors - red, blue and yellow. 
Item 5	Level of difficulty 5 Three elements, enactive mode
	You have a green, yellow and purple square. Draw all the ways you can order them side by side.
Item 6	Level of difficulty 6 Three elements, symbolic mode
	Three children Janka, Adam and Beata went to the cinema. They sat side by side in one row. Write down all the options/combination how they could sit down.
	[…] 7th level of difficulty
Item 8	Level of difficulty 8 Three elements, symbolic mode
	Make all three digits number from digits 4, 7, 5.

	[…]

The intervention was conducted by trained university students studying for a Master's degree in teacher training. The students were supervised by the members of the research team. Training of administrators consisted of 30 hours, it was organized in several recursive cycles while reflecting on the intervention issues and unexpected problems that arose.

3. 2. Results

3.2.1. Effects of training on executive functions

Initially, the effects of the intervention on children's executive functioning were investigated. A Repeated Measures MANOVA was conducted, with one within factor: Time (pretest and posttest) and one between factor: Condition (experimental condition, control condition 1, and control condition 2). Dependent variables were TMT Motor Speed Time, Letter Fluency Total Correct, Category Fluency Total Correct, Switching Fluency Total Accuracy, Design Fluency Total Correct, and Stroop Interference Time of the Delis Kaplan tests. The results of the RM MANOVA were presented in Table 3. The multivariate main-effect of Time was significant (Wilks' λ =.40, $F(6,110) = 27.26$, p <.001, η_p^2 = .60), indicating that overall all children showed gains on the measurements from pretest to posttest. However, the multivariate interaction effect of Time x Condition was nonsignificant (Wilks' λ =.89, $F(12,220) = 1.12$, $p = .346$, η_p^2 = .06), indicating that overall the conditions did not differ regarding progression from pretest to posttest.

Follow-up univariate analyses (see Table 3) revealed that overall children showed significant differences from pretest to posttest on most measures, namely TMT Motor Speed (p <.001), Letter Fluency (p <.001), Category Fluency (p <.001), Switching Fluency (p = .005), Design Fluency (p <.001), Stroop Interference (p <.001). When inspecting the means and SDs, it can be seen that overall children showed a reduction from pretest to posttest on TMT Motor Speed (ΔM = -13.7) and Stroop Interference (ΔM = -13.1), which indicates that children needed less time to complete these tasks. It can also be seen that overall children showed an increase from pretest to posttest on Letter Fluency (ΔM = 1.5), Category Fluency (ΔM = 2.1), Switching Fluency (ΔM = 0.7), Design Fluency (ΔM = 4.5).

Table 3. Results of the repeated measures MANOVA for executive functioning.

	Wilks' λ	F	p	η_p^2
Multivariate effects				
Time	.40	27.26	<.001	.60
Time x Condition	.89	1.12	.346	.06
Univariate effects (Time)				
TMT Motor Speed		18.24	<.001	.14
Letter Fluency		15.13	<.001	.12
Category Fluency		39.89	<.001	.26
Switching Fluency		8.25	.005	.07
Design Fluency		80.17	<.001	.41
Stroop Interference		36.45	<.001	.24

Table 4. Means and standard deviations for the measures of executive functioning and math abilities.

	Pretest			Posttest		
	Experimental M (SD)	Active control M (SD)	Passive control M (SD)	Experimental M (SD)	Active control M (SD)	Passive control M (SD)

Executive functions						
TMT Motor Speed	73.15(30.51)	74.40(33.07)	75.20(33.19)	57.82(25.90)	64.41(34.86)	60.42(30.50)
Letter Fluency	8.77(4.07)	8.18(4.83)	6.57(4.28)	10.00(4.65)	10.08(4.64)	7.82(4.74)
Category Fluency	17.38(4.07)	18.31(4.61)	14.90(5.23)	20.25(5.36)	19.77(4.87)	16.80(4.14)
Switching Fluency	6.57(2.22)	5.79(2.46)	5.62(1.93)	7.32(2.07)	6.08(2.36)	6.22(2.11)
Design Fluency	3.35(1.87)	3.59(2.01)	2.28(1.59)	4.55(1.97)	3.79(1.98)	3.22(2.07)
Stroop Interference	106.18(23.54)	109.92(30.78)	110.79(25.75)	93.70(22.65)	95.28(24.30)	98.10(20.56)
Math Abilities						
Quantitative Reasoning	12.08(4.31)	11.00(4.56)	9.75(4.72)	13.82(4.53)	12.25(3.93)	10.42(5.03)
Inductive Reasoning	6.92(4.38)	7.08(4.60)	4.16(2.83)	9.27(4.64)	7.55(4.91)	5.63(3.20)
Arithmetical Ability Total	5.38(2.95)	4.20(2.51)	2.61(1.64)	6.25(3.25)	4.92(3.15)	3.21(2.59)
Enumeration	1.71(.57)	1.77(.60)	1.83(.38)	1.92(.27)	1.89(.40)	1.69(.67)
Counting Backward	1.45(.80)	1.58(.77)	1.50(.62)	1.58(.79)	1.56(.81)	1.65(.70)
Writing Numbers	9.42(2.97)	9.08(3.33)	9.41(3.03)	8.82(3.23)	8.61(3.42)	8.37(3.61)
Mental Calculation	8.45(3.09)	8.11(3.29)	8.37(3.57)	8.82(3.23)	8.61(3.42)	8.37(3.61)
Mental Calculation Deduction	5.68(3.92)	7.11(3.86)	6.44(3.60)	6.47(3.90)	6.53(4.02)	7.28(4.36)
Reading Numbers	10.16(2.52)	10.39(2.85)	10.53(2.24)	11.00(2.36)	10.61(2.53)	10.53(2.35)
Number Line Estimation	5.74(2.42)	6.50(2.88)	5.25(2.82)	7.16(2.89)	7.56(2.49)	5.88(2.92)
Magnitude Words	10.84(4.15)	12.22(2.83)	12.12(2.14)	11.95(3.46)	12.44(2.69)	12.56(1.81)
Perception Quantity	3.11(1.52)	2.94(1.31)	1.75(1.81)	3.05(1.29)	3.28(2.40)	2.25(1.59)
Context Magnitude	5.47(3.80)	4.89(2.81)	3.75(2.63)	6.42(3.89)	5.39(3.48)	4.25(2.77)
Problem-Solving	1.74(1.69)	1.78(1.84)	2.12(1.61)	2.34(2.07)	2.25(1.75)	2.22(1.34)
Magnitude Arabic Numbers	12.95(3.34)	13.11(3.56)	12.87(2.92)	13.53(2.52)	13.17(3.33)	13.06(2.73)

3.2.2. Effects of training on math performance

In order to investigate the effects of the intervention on math abilities, a Repeated Measures MANOVA was conducted. The RM MANOVA had one within factor: Time (pretest and posttest) and one between factor: Condition (experimental condition, control condition 1, and control condition 2). Dependent variables of the Cogat test were Quantitative Reasoning Total Correct and Inductive Reasoning Condition 3 Total Correct. Dependent variables of Arithmetical Ability were Arithmetical Ability Total, Enumeration, Counting Backward, Writing Numbers, Mental calculation, Mental Calculation Deduction, Reading Numbers, Number Line Estimation, Magnitude Words, Perception Quantity, Context Magnitude, Problem-Solving, and Magnitude Arabic Numbers.

The results of the RM MANOVA are presented in Table 5. The multivariate main-effect of Time was significant (Wilks' λ =.57, $F(15,86) = 4.40$, p <.001, η_p^2 = .43), indicating that overall all children showed gains on the measurements from pretest to posttest. However, the multivariate interaction effect of Time x Condition was nonsignificant (Wilks' λ =.75, $F(30,172) = .88$, $p = .657$, η_p^2 = .13), indicating that overall the conditions did not differ regarding progression from pretest to posttest.

Follow-up univariate analyses (see Table 5) revealed that overall children showed significant differences from pretest to posttest on most measures, namely Quantitative Reasoning (p <.001), Arithmetical Ability Total (p <.001), Enumeration ($p = .022$), Writing Numbers ($p = .006$), Reading Numbers ($p = .015$), Number Line Estimation ($p = .001$), Magnitude Words ($p = .039$), and Problem-Solving ($p = .032$). However, children showed no significant differences from pretest to posttest on Inductive Reasoning ($p = .054$), Counting

Backward (p = .325), Mental Calculation (p = .322), Mental Calculation Deduction (p = .434), Perception Quantity (p = .288), Context Magnitude (p = .056) and Magnitude Arabic Numbers (p = .127). Overall children showed an increase from pretest to posttest on Quantitative Reasoning (ΔM = 3.4), Arithmetical Ability Total (ΔM = 5.2), Enumeration (ΔM = .1), Writing Numbers (ΔM = .6), Reading Numbers (ΔM = .4), Number line Estimation (ΔM = 1.0), Magnitude Words (ΔM = .6), and, Problem-Solving (ΔM = .4). These findings indicate that children had more items correct at the posttest compared to the pretest.

Table 5. Results of the repeated measures MANOVA for math abilities.

	Wilks' λ	F	p	η_p^2
Multivariate effects				
Time	.57	4.40	<.001	.43
Time x Condition	.75	.88	.657	.13
Univariate effects (Time)				
Quantitative Reasoning		22.28	<.001	.18
Inductive Reasoning		3.79	.054	.04
Arithmetical Ability Total		30.92	<.001	.24
Enumeration		5.42	.022	.05
Counting Backward		.98	.325	.01
Writing Numbers		7.97	.006	.07
Mental Calculation		.99	.322	.01
Mental Calculation Deduction		.62	.434	.01
Reading Numbers		6.10	.015	.06
Number Line Estimation		11.83	.001	.11
Magnitude Words		4.39	.039	.04
Perception Quantity		1.14	.288	.01
Context Magnitude		3.74	.056	.04
Problem-Solving		4.73	.032	.05
Magnitude Arabic Numbers		2.37	.127	.02

3.2.3. Effects of training on relations with math school results

Correlations were used to test the relationship between children's executive functions and their math results in school, and changes in this relationship as a result of training. TMT Motor Speed, Letter Fluency, Category Fluency, Switching Fluency, and Stroop Interference were used as measures of executive functions. The results are displayed in Table 6. On the pretest, only Design Fluency (r = -.29), and Stroop Interference (r = .23) were significantly related to school results in math. Posttest measures for executive functions were split by condition, to test whether different patterns of relationships emerged as a result of training. Here, the only significant correlation was found between Design Fluency and math results for the experimental condition (r = -.48). No other correlations were found between the measures of executive functions on the posttest and math results, for any of the conditions.

Additionally, correlations were used to test the relationship between children's math abilities and their math results in school, and changes in this relationship as a result of training. Quantitative Reasoning, Inductive Reasoning, Arithmetical Ability Total, Enumeration, Counting Backward, Writing Numbers, Mental calculation, Mental Calculation Deduction, Reading Numbers, Number Line Estimation, Magnitude Words, Perception Quantity, Context Magnitude, Problem-Solving, and Magnitude Arabic Numbers were used in the correlation analysis. On the pretest, Inductive Reasoning and Counting Backward were weakly (both r = -.27) related to math results, Quantitative Reasoning, Mental

Calculation Deduction, Reading Numbers, Number Line Estimation, Magnitude Comparison Words, Problem Solving, and Magnitude Arabic Numbers all showed moderate relationships with math results (between r = -.32 and r = -.41). Arithmetical Ability, Writing Numbers, and Mental Calculations showed strong relationships with math results (ranging from r = -.50 to r = -.55). No relationships were found between Enumeration, Perceptual Quantity and Context Magnitude, and math results.

Next, the participants were split by condition to investigate the posttest relations with the same variables. For the experimental conditions, moderate correlations between posttest measures of math ability and math results in school were found for Arithmetical Ability and Mental Calculation Deduction (r = -.36 and r = -.39 respectively). The other relationships were not significant. For the control 1 condition, moderate correlations (between r = -.41 and r = -.50) were found for Enumeration, Counting Bakcward, Mental Calculation Deduction, Magnitude Comparison Word, and Perceptual Quantity. Strong correlations (ranging between r = -.56 and r = -.68) were found for Quantitative Reasoning, Arithmetical Ability, Writing Numbers, Mental Calculation, Reading Numbers, Problem Solving, and Magnitude Arabic Numbers. Inductive Reasoning, Number Line Estimation, and Context Magnitude were not related to math results. For the control 2 condition, only Arithmetical Ability, and Magnitude Arabic Numbers showed significant moderate correlations with math results (r = -.37 and r = -.40 respectively). The other measures were not significantly related to math results. Overall, the control 1 condition appeared to show a similar pattern of relations between math abilities and math results on the posttest, as was found on the pretest. For both the experimental and control 2 condition, considerably fewer and weaker correlations were found on the posttest.

Interestingly, and in contrast with other studies [25; 26; 22; 23; 24]only few executive functions were (moderately) correlated with maths performance.

Table 6. Correlations between pretest and posttest measures and school results on math.

	Correlation pretest x school result	**Correlation posttest x school result**		
	Total (N = 102)	Experimental condition (N = 38)	Control condition 1 (N = 35)	Control condition 2 (N = 29)
Executive functions				
TMT Motor Speed	-.01	-.02	-.06	.08
Letter Fluency	-.02	-.08	-.27	.05
Category Fluency	-.07	-.17	-.17	.02
Switching Fluency	-.08	-.07	-.30	-.02
Design Fluency	-.29**	-.48**	-.10	-.28
Stroop Interference	-.23*	-.03	-.13	.08
Math abilities				
Quantitative Reasoning	-.38***	-.25	-.68***	-.16
Inductive Reasoning	-.26**	-.23	-.09	-.21
Arithmetical Ability	-.52***	-.36*	-.67***	-.37*
Enumeration	-.16	-.05	-.41*	-.23
Counting Backward	-.27**	.08	-.47**	-.19
Writing Numbers	-.50***	-.26	-.63***	-.33
Mental Calculation	-.55***	-.30	-.66***	-.30
Mental Calculation Deduction	-.38***	-.39*	-.48**	-.33
Reading Numbers	-.41***	-.24	-.65***	-.17

Number line Estimation	-.32**	-.24	-.20	-.30
Magnitude Words	-.37***	-.32	-.50**	-.35
Perception Quantity	-.13	-.29	-.50**	-.04
Context Magnitude	.09	.09	-.10	.35
Problem-Solving	-.33**	-.22	-.58***	-.04
Magnitude Arabic Numbers	-.40***	-.31	-.55**	-.40*

Note: * = $p < .05$. ** = $p < .01$. *** = $p < .001$

4. Discussion

The current study sought to investigate whether ExeFun-Mat, a newly developed domain-specific intervention for mathematics, could stimulate math performance and executive functioning of low performing students with a Roma background. In accordance with [54] it was considered that high quality mathematics education may have the dual benefit of on the one hand teaching Math and on the other hand facilitating executive function stimulation. Regarding the effect of the ExeFun-Mat program on executive functioning, it was found that executive functions improved over time, but there were no differences between conditions. These findings indicated that in all groups of children, both for those who received the ExeFun-Mat program, and those in the control conditions, executive functions seemed to improve over time, but the experimental condition did not bring about significant improvement. This finding was not in line with studies conducted by [55; 56; 57; 58; 59] who studied the potential influence of math domain-specific experimental interventions targeting executive functioning in students and found a positive effect of their interventions on the participants' executive functioning.

Potential explanations for this finding could lie in [60] Jacob and Parkinson's observation that although the literature demonstrates a strong correlation between executive function and achievement, the two may not be causally related. In the current study, it was even found that most executive functions were not, and some only weakly related to mathematical performance in school. This finding was unexpected; however it corresponds with previous findings children from special populations such as those with learning problems, severe difficulties in arithmetic or language difficulties [61; 62], with math anxiety problem [63; 64] or children from disadvantaged backgrounds [65]. Our findings are in line with Blakey et al. [66] who found that executive functions mediated the relation between socioeconomic status and mathematical skills. Children improved over training, but this did not transfer to untrained executive functions or mathematics. Executive functions may explain socioeconomic attainment gaps, but cognitive training directly targeting executive functions is not an effective way to narrow this gap. Executive functions could simply be a proxy for other background characteristics of the child, such as socioeconomic status or a parent's level of education, each of which is highly correlated with both achievement and executive functions. Moreover, researchers have found evidence that both socioeconomic status and family factors are associated with the development of executive functions [67; 68; 69] which may have played a role in the current study as well.

With regard to findings of the current study in the domain of mathematics performance, it was found that all groups of children demonstrated an improvement over time, but no differences were found between the conditions. Although Naglieri and Johnson's [70] findings indicate that students with learning disabilities and mild mental impairments, in particular, could benefit from verbalizing and reflecting on their strategies on arithmetic computation, this was not observed in the current study, in spite of the fact that the ExeFunMat program includes extensive verbalizing, thinking aloud and metacognitive monitoring.

A possible explanation regarding this finding concerns the notion that the program was too limited in time to bring about changes in mathematics performance. The research sample consisted of 4th graders who were (very) low achievers in Maths, many of whom who were associated with either (1) a history of a grade repetition, (2) low mastery of the language of instruction, (3) low levels of motivation. When problems accumulate over several years, a 30-hour program probably does not have the capacity to change both the executive functioning and math skills. Perhaps the results demonstrated a bottom effect; as language issues and deficiencies in basic mathematical concepts could act as barriers to benefit from metacognitive instructions. More importantly, it cannot be disregarded that the participating children live in conditions of severe poverty. Their living conditions are exacerbated in the winter months, when they suffer from the cold, sleeping problems and malnutrition. In other words, the basic living conditions to facilitate learning may have been absent, nullifying any potential effects a training program might have. It is a known fact that in the case of former travelers and nomads, the school is perceived as a foreign institution, far removed from their needs [4; 71]. Considering that the intervention was semi-structured, it was not possible to tailor to the individual needs of the participating Roma pupils. Although this warrants further research, it seemed as if these were so significant that the current competencies of the intervention administrators (trained Master students) did not allow for a flexible response to problematic behavioral manifestations related to students' mathematical abilities (eg. in task administration: place a square between 2 triangles, the administrator found that the student did not have a developed spatial concept for "between"). A program that connects more closely to the Roma culture and language might be more suited to remediate such issues. Additionally, future programs might try to actively determine children's ability level and adaptively provide the program to connect more closely to children's individual instructional needs, for example by incorporating a dynamic testing procedure at the start of the program in order to tap into the children's potential for learning and zone of proximal development [72]. Possible inspiration could serve the ideas based on OPEN-MATH project, a conceptual framework for inclusion in mathematics. At the core of the inclusive frameworks lies the dialectics between two facets: social interaction and individual self-determination [73].

The intervention was provided relatively late, as the children already had significant delay in mathematical skills compared to their peers. Devoting extra opportunities to teaching and learning could seem promising, but the timing is very important. As mathematics becomes increasingly difficult in school, the deficits in certain areas become more obvious and, without early diagnosis and stimulation of the relevant processes, the ability to correct and compensate these deficits declines. In future research it seems worthwhile to implement a training intervention such as Exefun-Mat in a much earlier stage.

The relationships between the different measures and measurement moments, showed that the factors related to the performance of the passive control group had not changed from pretest to posttest. In contrast, for both the group that had received the training and the active control group past performance was no longer related to or predictive of arithmetical performance after training. The fact that the trained children did not seem to differ substantially from the active control group could be explained by a ceiling effect in progress (i.e. the program offered for the active control group was sufficient to "saturate" their instructional needs and provide maximal growth). Taken together, it seems that intervention of some shape or form does "defeat prediction" based on their previous, static results. However, these changes did not lead to improved performance on any of the posttest measures.

In conclusion, the current research found that the ExeFun-Mat program that was implemented among children from Roma backgrounds in grade 4 did not lead to substantial improvements in their executive functions, nor their math abilities, over and beyond those brought about by an alternative educational program. Although previous research has shown that executive functions and math performance were closely related, this finding was not replicated amongst this specific population of children, calling to question whether the relationship between EF and math performance develops in the same way as for children from other populations, or whether this was related to the instruments and program chosen. Additional research is required to investigate this further. In addition, providing an intervention program, did appear to defeat prediction based on prior math performance only, indicating that children from Roma backgrounds are susceptible to interventions to improve their maths abilities. This finding suggests that a different or modified intervention program, perhaps delivered at a different age, might be helpful for these children's to unfold their potential in maths.

Author Contributions: Conceptualization, I.K.; methodology, I.K. and A.P.; software, J.F. and J.V.; validation, I.K. and A.P.; formal analysis, J.F., J.V. and B.V.; investigation, A.P., E.S. and B.T.; resources, I.K. and A.P.; data curation, J.F., J.V. and B.V.; writing—original draft preparation, I.K., and A.P.; writing—review and editing, J.F.; visualization, I.K.; supervision, I.K.; project administration, I.K.; funding acquisition, I.K. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by (1) APVV (Slovak Research Agency of Ministry of Education, under the contract APVV-15-0273); (2) ISPA (Proposals to the International School Psychology Research Initiative) and (3) VEGA (Scientific Grant Agency of Ministry of Education and National Academy of Science under the contract 1/0254/20).

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to the confidential information.

Conflicts of Interest: The authors declare no conflict of interest.

References

.

1. Grigorenko, E.; O'Keefe, P. What Do Children Do When They Cannot Go to School?. In *Culture and competence: Contexts of life success*; Sternberg, R., Grigorenko, E., eds.; American Psychological Association: Washington, 2004; pp. 23-53.
2. Foster, M.; Anthony, J.; Clements, D.; Sarama, J.; Williams, J. Improving Mathematics Learning of Kindergarten Students Through Computer-Assisted Instruction. *Journal for Research in Mathematics Education* **2016**, 47, 206-232.
3. Jordan, N.; Kaplan, D.; Ramineni, C.; Locuniak, M. Early math matters: Kindergarten number competence and later mathematics outcomes. *Developmental Psychology* **2009**, 45, 850-867.
4. Dubayová, M. *Rómovia v procesoch kultúrnej zmeny [Roma in the processes of a cultural change]*; Filozofická fakulta Prešovskej univerzity: Prešov, 2001.
5. https://archiv.vlada.gov.sk/romovia/*3632/dejiny-romov.html.*
6. Kovalčíková, I.; Sternberg, R. *Kultúra a kompetencie: adaptívne schopnosti rómskych žiakov* [Culture and competence: adaptive skills in Roma pupils*]*; Prešovská univerzita v Prešove: Prešov, 2009.
7. Ferjenčík, J. Diagnostika rómskych detí zo sociálne znevýhodňujúceho prostredia. [Diagnosis of Roma children from socially disadvantaged environment]. *Psychológia a patopsychológia dieťaťa* **2018**, *52*, 127–139.
8. Kovalčíková, I. Záverečná správa z riešenie projektu APVV-15-0273 *Experimentálne overovanie programov na stimuláciu exekutívnych funkcií slaboprospievajúceho žiaka – kognitívny stimulačný potenciál matematiky a slovenského jazyka* [The final report of the APVV-15-0273 project Experimental verification of the programs for stimulation of low performing pupils executive functioning – cognitive stimulation potential of math and Slovak language] 2019.
9. Horňák, L. Individuálny vzdelávací program ako prostriedok akcelerácie kognitívneho vývinu rómskych žiakov na špeciálnych základných školách [Individual education program as a means of accelerating the cognitive development of Roma pupils in special primary schools]. In *Rómske etnikum v systéme multikultúrnej edukácie*. [Roma ethnicity in the system of multicultural education]; Pedagogická fakulta Prešovskej univerzity v Prešove: Prešov, 2001; pp. 37-50.

10. Kovalčíková, I. Diagnostikovanie schopnosti kognitívneho plánovania u detí zo sociálne znevýhodňujúceho prostredia [Assessment of cognitive planning ability in the children from low income setting]. In *Proceedings of the Acta Paedagogicae Presoves – Nova Sandes. Annus VIII*; Prešovská univerzita v Prešove: Prešov, 2012; pp. 68–77.
11. Zelina, M. Možnosti akcelerácie rómskych žiakov [Possibilities of acceleration of Roma pupils]. In *Proceedings of the Rómske etnikum v systéme multikultúrnej edukácie. [Roma ethnicity in the system of multicultural education]*; Pedagogická fakulta Prešovskej univerzity v Prešove: Prešov, 2001; pp. 10-21.
12. Jameel, H.; Ali, H. Causes of poor performance in Mathematics from the perspective of students, teachers and parents. *American Scientific Research Journal for Engineering, Technology, and Sciences* **2016**, *15*, 122–136.
13. Bull, R.; Lee, K. Executive Functioning and Mathematics Achievement. *Child Development Perspectives* **2014**, *8*, 36-41.
14. Verdine, B.; Irwin, C.; Golinkoff, R.; Hirsh-Pasek, K. Contributions of executive function and spatial skills to preschool mathematics achievement. *Journal of Experimental Child Psychology* **2014**, *126*, 37-51.
15. Bull, R.; Espy, K.; Wiebe, S. Short-Term Memory, Working Memory, and Executive Functioning in Preschoolers: Longitudinal Predictors of Mathematical Achievement at Age 7 Years. *Developmental Neuropsychology* **2008**, *33*, 205-228.
16. Samuels, W.; Tournaki, N.; Blackman, S.; Zilinski, C. Executive functioning predicts academic achievement in middle school: A four-year longitudinal study. *The Journal of Educational Research* **2016**, 109, 478-490.
17. Ferjenčík, J.; Slavkovská, M.; Kresila, J. Executive functioning in three groups of pupils in D-KEFS: Selected issues in adapting the test battery for Slovakia. *Journal of Pedagogy* **2015**, *6*, 73-92.
18. Baddeley, A. *Working memory*; Oxford University Press: New York, 1986.
19. Diamond, A. Executive Functions. *Annual Review of Psychology* **2013**, 64, 135-168.
20. Blair, C. How similar are fluid cognition and general intelligence? A developmental neuroscience perspective on fluid cognition as an aspect of human cognitive ability. *Behavioral and Brain Sciences* **2006**, 29, 109-125.
21. Duckworth, A.; Seligman, M. Self-Discipline Outdoes IQ in Predicting Academic Performance of Adolescents. *Psychological Science* **2005**, *16*, 939-944.
22. Andersson, U.; Lyxell, B. Working memory deficit in children with mathematical difficulties: A general or specific deficit?. *Journal of Experimental Child Psychology* **2007**, *96*, 197-228.
23. Cragg, L.; Keeble, S.; Richardson, S.; Roome, H.; Gilmore, C. Direct and indirect influences of executive functions on mathematics achievement. *Cognition* **2017**, 162, 12-26.
24. Magalhães, S.; Carneiro, L.; Limpo, T.; Filipe, M. Executive functions predict literacy and mathematics achievements: The unique contribution of cognitive flexibility in grades 2, 4, and 6. *Child Neuropsychology* **2020**, *26*, 934-952.
25. Fuchs, L.; Compton, D.; Fuchs, D.; Paulsen, K.; Bryant, J.; Hamlett, C. The Prevention, Identification, and Cognitive Determinants of Math Difficulty. *Journal of Educational Psychology* **2005**, 97, 493-513.
26. Fuchs, L.; Geary, D.; Compton, D.; Fuchs, D.; Schatschneider, C.; Hamlett, C.; DeSelms, J.; Seethaler, P.; Wilson, J.; Craddock, C. et al. Effects of first-grade number knowledge tutoring with contrasting forms of practice. *Journal of Educational Psychology* **2013**, *105*, 58-77.
27. Cragg, L.; Gilmore, C. Skills underlying mathematics: The role of executive function in the development of mathematics proficiency. *Trends in Neuroscience and Education* **2014**, *3*, 63-68.
28. Diamond, A. Activities and Programs That Improve Children's Executive Functions. *Current Directions in Psychological Science* **2012**, *21*, 335-341.

29. Diamond, A.; Lee, K. Interventions Shown to Aid Executive Function Development in Children 4 to 12 Years Old. *Science* **2011**, *333*, 959-964.
30. Posner, M.; Rothbart, M.; Tang, Y. Developing self-regulation in early childhood. *Trends in Neuroscience and Education* **2013**, *2*, 107-110.
31. Rueda, M.; Checa, P.; Cómbita, L. Enhanced efficiency of the executive attention network after training in preschool children: Immediate changes and effects after two months. *Developmental Cognitive Neuroscience* **2012**, *2*, 192-204.
32. Ríos Cruz, S.; Olivares Pérez, T.; Hernández Expósito, S.; Bolívar Barón, H.; Gillon Dowens, M.; Betancort Montesinos, M. Efficacy of a computer-based cognitive training program to enhance planning skills in 5 to 7-year-old normally-developing children. *Applied Neuropsychology: Child* **2020**, *9*, 21-30.
33. Dias, N.; Seabra, A. Intervention for executive functions development in early elementary school children: effects on learning and behaviour, and follow-up maintenance. *Educational Psychology* **2016**, *37*, 468-486.
34. Pennequin, V.; Sorel, O.; Mainguy, M. Metacognition, Executive Functions and Aging: The Effect of Training in the Use of Metacognitive Skills to Solve Mathematical Word Problems. *Journal of Adult Development* **2010**, *17*, 168-176.
35. Goldin, A.; Hermida, M.; Shalom, D.; Elias Costa, M.; Lopez-Rosenfeld, M.; Segretin, M.; Fernandez-Slezak, D.; Lipina, S.; Sigman, M. Far transfer to language and math of a short software-based gaming intervention. *Proceedings of the National Academy of Sciences* **2014**, *111*, 6443-6448.
36. Diamond, A.; Barnett, W.; Thomas, J.; Munro, S. THE EARLY YEARS: Preschool Program Improves Cognitive Control. *Science* **2007**, *318*, 1387-1388.
37. Kroesbergen, E.; van 't Noordende, J.; Kolkman, M. Training working memory in kindergarten children: Effects on working memory and early numeracy: Effects on working memory and early numeracy. *Child Neuropsychology* **2014**, *20*, 23-37.
38. Caviola, S.; Mammarella, I.; Cornoldi, C.; Lucangeli, D. The involvement of working memory in children's exact and approximate mental addition. *Journal of Experimental Child Psychology* **2012**, *112*, 141-160.
39. Holmes, J.; Gathercole, S.; Dunning, D. Adaptive training leads to sustained enhancement of poor working memory in children. *Developmental Science* **2009**, *12*, F9-F15.
40. St Clair-Thompson, H.; Stevens, R.; Hunt, A.; Bolder, E. Improving children's working memory and classroom performance. *Educational Psychology* **2010**, *30*, 203-219.
41. Thorndike, R.; Hagen, E. *Measurement and evaluation in psychology and education (4th ed.)*; Wiley: New York, 1986.
42. Delis, D.; Kaplan, E.; Kramer, J. *The Delis–Kaplan executive function system*; The Psychological Corporation: San Antonio, 2001.
43. Ferjenčík, J.; Bobáková, M.; Kovalčíková, I.; Ropovik, I.; Slavkovská, M. Proces a vybrané výsledky slovenskej adaptácie Delis-Kaplanovej systému exekutívnych funkcií D-KEFS. [Process and selected results of Slovak adaptation of Delis-Kaplan system of executive functions D-KEFS]. *Československá Psychologie: Časopis Pro Psychologickou Teorii a Praxi* **2014**, *58*, 543-558.
44. Thorndike, R.; Hagen, E. *Test kognitívnych schopností. Príručka. Upravil Vonkomer, J. [Test of cognitive abilities. Administration manual. Adapted by Vonkomer, J.]*; Psychodiagnostika: Bratislava, 1997.
45. Von Aster, M.; Weinhold - Zulauf, M.; Horn, R. *Neuropsychologická batéria testov na spracovávanie čísiel a počítanie u detí (ZAREKI-R) [Neuropsychological Test Battery for Number Processing and Calculation in Children]*; Psychodiagnostika: Bratislava, 2006.
46. von Aster, M.; Shalev, R. Number development and developmental dyscalculia. *Developmental Medicine & Child Neurology* **2007**, *49*, 868-873.

47. Von Aster, M.; Weinhold, M. *Neuropsychologická batéria testov na spracovávanie čísiel a počítanie u detí. Príručka. [Neuropsychological Test Battery for Number Processing and Calculation in Children. Administration manual]*; Psychodiagnostika: Bratislava-Brno, 2008.
48. Ashman, A.; Conway, R. *Cognitive Strategies for Special Education*; Routledge, 2017.
49. Ashman, A.; Conway, R. *Cognitive strategies for special education: Process based instruction*; Routledge: London, UK, 2017.
50. Brown, A.; Campione, J. Psychological theory and the study of learning disabilities. *American Psychologist* **1986**, *41*, 1059-1068.
51. Cross, C.; Woods, T.; Schweingruber, H. *Mathematics learning in early childhood: paths toward excellence and equity*; National Academies Press: Washington, DC, 2009.
52. Stein, M.; Smith, M.; Henningsen, M.; Silver, E. *Implementing standards-based mathematics instruction: a casebook for professional development*; 2nd ed.; Teachers College Press: New York, 2009.
53. Bruner, J. *The process of education*; Harvard University Press: Oxford, England, 1960.
54. Clements, D.; Sarama, J.; Germeroth, C. Learning executive function and early mathematics: Directions of causal relations. *Early Childhood Research Quarterly* **2016**, *36*, 79-90.
55. Iseman, J.; Naglieri, J. A Cognitive Strategy Instruction to Improve Math Calculation for Children With ADHD and LD: A Randomized Controlled Study. *Journal of Learning Disabilities* **2011**, *44*, 184-195.
56. Naglieri, J.; Gottling, S. Mathematics Instruction and PASS Cognitive Processes. *Journal of Learning Disabilities* **1997**, *30*, 513-520.
57. Ramani, G.; Jaeggi, S.; Daubert, E.; Buschkuehl, M. Domain-specific and domain-general training to improve kindergarten children's mathematics. *Journal of Numerical Cognition* **2017**, *3*, 468-495.
58. Rupley, W.; Capraro, R.; Capraro, M. Theorizing an Integration of Reading and Mathematics: Solving Mathematical Word Problems in the Elementary Grades. *LEARNing Landscapes* **2011**, *5*, 227-250.
59. Corte, E.; Depaepe, F.; Op 't Eynde, P.; Verschaffel, L. Students' self-regulation of emotions in mathematics: an analysis of meta-emotional knowledge and skills. *ZDM* **2011**, *43*, 483-495.
60. Jacob, R.; Parkinson, J. The Potential for School-Based Interventions That Target Executive Function to Improve Academic Achievement. *Review of Educational Research* **2015**, *85*, 512-552.
61. Čerešníková, M. Akú úlohu zohráva materinský jazyk pri diagnostike komunikačnej kompetencie dieťaťa? *Školský psychológ /Školní psycholog* **2017**, *18*, 127-133.
62. McDonald, P.; Berg, D. Identifying the nature of impairments in executive functioning and working memory of children with severe difficulties in arithmetic. *Child Neuropsychology* **2018**, *24*, 1047-1062.
63. Orbach, L.; Herzog, M.; Fritz, A. State- and trait-math anxiety and their relation to math performance in children: The role of core executive functions. *Cognition* **2020**, *200*.
64. Pizzie, R.; Raman, N.; Kraemer, D. Math anxiety and executive function: Neural influences of task switching on arithmetic processing. *Cognitive, Affective, & Behavioral Neuroscience* **2020**, *20*, 309-325.
65. Hackman, D.; Gallop, R.; Evans, G.; Farah, M. Socioeconomic status and executive function: developmental trajectories and mediation. *Developmental Science* **2015**, *18*, 686-702.
66. Blakey, E.; Matthews, D.; Cragg, L.; Buck, J.; Cameron, D.; Higgins, B.; Pepper, L.; Ridley, E.; Sullivan, E.; Carroll, D. The Role of Executive Functions in Socioeconomic Attainment Gaps: Results From a Randomized Controlled Trial. *Child Development* **2020**, *91*, 1594-1614.

67. Ardila, A.; Rosselli, M.; Matute, E.; Guajardo, S. The Influence of the Parents' Educational Level on the Development of Executive Functions. *Developmental Neuropsychology* **2005**, *28*, 539-560.
68. Li-Grining, C. Effortful control among low-income preschoolers in three cities: Stability, change, and individual differences. *Developmental Psychology* **2007**, *43*, 208-221.
69. Noble, K.; Norman, M.; Farah, M. Neurocognitive correlates of socioeconomic status in kindergarten children. *Developmental Science* **2005**, *8*, 74-87.
70. Naglieri, J.; Johnson, D. Effectiveness of a Cognitive Strategy Intervention in Improving Arithmetic Computation Based on the PASS Theory. *Journal of Learning Disabilities* **2000**, *33*, 591-597.
71. Liégeios, J. *Rómovia, Cigáni, kočovníci [Roma, Gypsies, nomads]*; Charis: Bratislava, 1997.
72. Resing, W.; Elliott, J.; Vogelaar, B. Assessing potential for learning in school children. *Oxford Research Encyclopedia of Education* 2020.
73. Demo, H.; Garzetti, M.; Santi, G.; Tarini, G. Learning Mathematics in an Inclusive and Open Environment: An Interdisciplinary Approach. *Education Sciences* **2021**, *11.*