ROLE OF EXTRACURRICULAR ACTIVITIES IN DEVELOPING THE MOTOR AND MENTAL SKILLS OF PRIMARY SCHOOL STUDENTS

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Abstract. *The study aims to highlight the development of motor and mental skills in primary school children who perform extracurricular sports activities and those who are not engaged in such activities. The research included 270 students (boys and girls) aged 6-11 and was conducted between 30 September 2019 and 8 March 2020 at the "Alexandru Costescu" Middle School in Bucharest. The results were recorded and statistically processed with the help of IBM SPSS Statistics Version 20. In the statistical analysis, the parametric Paired Samples t Test (for repeated measurements of the same group) and Independent Samples t Test (for two independent groups) were used. Statistical processing and data analysis based on the Paired Samples t Test emphasised significant differences in the assessed test indicators (speed run, endurance run, long jump, Raven's Test and Attention Test), while the Independent Samples t Test results showed significant progress only in motor skill tests (with $p < 0.001$ and < 0.05) except the insignificant difference in the endurance run test for first graders, and insignificant progress in mental skill tests (except Raven's Test for the preparatory and first grades and Attention Test for the preparatory grade). In conclusion, it has been found that the motor skill levels of primary school children engaged in extracurricular sports activities are better than those of students who do not play sports, but in terms of attention and intelligence levels, this finding is not generalised for all grades.*

Keywords: *motor ability, mental ability, improvement, extracurricular activities.*

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Introduction

Motor ability is a term that refers to the movement performance of any human being, regardless of age. According to Nicu (2002), it represents the totality of innate and acquired motor, morphological and functional attributes through which an individual can perform exercises and efforts that are variable in structure and dosage. Motor ability emphasises the possibilities of human evolution and progress and differs in the course of life from one person to another, depending on the effort provided, the characteristics of movements and the individual specific features. Humans permanently need good motor ability, which grows in parallel with mental ability. Both are developed and maintained through practical and verbal activities that diversify and improve over time. The diversification of movements depends on each person's effort and pleasure to exercise but especially mental ability, which is defined as the concurrent effectiveness of informational, interpretative and regulatory actional processes

(Epuran et al., 2008) that translate into facts, actions and information produced during activities. Since attention is a mental phenomenon that regulates the improvement of memory, thinking, imagination and even volition, motor skill levels dependent on each individual's ability to focus attention. Sports activities are the result of the work performed by the nervous and musculoskeletal systems, the organs and other systems that ensure proper functioning of the body. Sports activities require attentional focus in order to observe certain aspects and perform specific movements in a particular way. Neumann (2019) believes that an external focus can be beneficial to athletes because it "could draw attention away from negative cues associated with physical exertion" (p. 11) and positively reinforce outcomes of the exercise (e.g., completion of a repetition or set). Attention is a complex mental phenomenon with the help of which the participant perceives and selects stimuli, directs and maintains mental activity towards a group of objects or phenomena for a certain period of time (Georgescu, 1999) and ensures the fulfilment of cognitive and practical learning activities. Exercise-based activities involving different forms of movement promote children's cognitive and motor development, and "the impact of aerobic exercise on children's executive function needs to be placed within the larger context of the action-cognition interaction that persists across development" (Best, 2010, p. 348). Executive function is considered to be higher-order cognition, and this statement indicates that aerobic exercise not only has a limited effect on lower-level automatic perceptual or cognitive processes, but also has an impact on the complex cognitive skills that enable people to behave in an adaptive and goal-oriented manner (McMorris & Graydon, 1996). "The provision of rigorous information from a scientific point of view can determine the direction of training, improvement, respectively action of the parents of the 21st century" (Șițoiu & Pânișoară, 2021, p. 29), but especially teachers' action in the direction of training the young generation.

Along with the sports activities provided in the school curriculum, extracurricular activities contribute to the improvement of motor and mental skills. Mental ability is influenced by the ability to focus attention and, in this regard, numerous studies emphasise its importance in the formation of human behaviour. Aslan et al. (2020) conducted a research on 320 participants (150 girls and 170 boys aged 12-14) using the D2 Attention Test (adapted from Toker) and found that "the attention levels of primary school students doing sports were better than those who were not doing sports" (p. 122). The above authors recommend that all primary school students should be involved in sports activities to raise their attention levels, given that, while the concentration performance and selective attention levels of children who did sports increased, their special learning difficulty decreased. Ibis and Aktug (2018) conducted a study on 920 voluntary participants (506 who played sports and 414 who were not engaged in sports activities) to examine the difference between their attention deficit (AD) and academic success through the D2 Attention Test; analysis of the results using the Independent *t* Test highlighted a significant difference between the parameters of academic success and attention deficit levels in children participating in sports activities compared to those who were not playing sports. These authors also claim that "sport and physical activity are important factors in the treatment of AD" (Ibis & Aktug, 2018, p. 109) and possibly in educating children's attention levels. Chen et al. (2021) believe that "facilitating an eight-week training program during the semester contributes to optimal performance in focused attention, sustained attention, and selective attention" (p. 9) in schoolboys and girls. The

results obtained by Reigal et al. (2019) in a research including 119 children aged 10-12, who were administered the same D2 Attention Test, showed that "the simple RT [reaction time] was related in a significant way with physical fitness, while the complex RT was related significantly to attentional capacity and physical fitness" (p. 1).

All activities, just as the practical sports activity, are based on or determined by three components that underpin the decision-making process: attention, anticipation and memory, which have been explored in the context of decision-making in sport. Afonso et al. (2012) emphasise that the attention-anticipation-memory triad helps to understand the factors underlying decision-making in sport. Harris et al. (2018) conducted a study on 116 participants assigned to three groups (two intervention groups and one control group), who were pre- and post-tested using the D2 Attention Test. These authors found that the group of participants who had performed 6 minutes of daily coordinated bilateral physical activity for four weeks showed significant increases in processing speed, focused attention, concentration performance and attention span compared to the control group.

Problem statement

Motor and mental skills ensure proper development and functioning of the body, and knowing their levels and possibilities of progress is a factor that must be taken into account in the training process of the young generation, as it represents the pillar of the future society.

Research purpose

The study aims to highlight the development of motor and mental skills in primary school children and the progress that can be achieved through extracurricular activities.

Hypotheses

The research is based on the following two hypotheses:

H1: School and extracurricular activities lead to improvements in the motor and mental behaviour of primary education children.

H2: There are significant differences between the improvements achieved in the motor and mental behaviour of primary school children who perform extracurricular activities and those who are not engaged in such activities.

Methodology

Participants and Procedure

Participants were 270 primary education children (boys and girls) aged 6-11 from the "Alexandru Costescu" Middle School in Bucharest. Out of the 270 participants, 135 were in the five experiment groups with 27 students for each grade: preparatory, first, second, third and fourth grades, and 135 participants were in the five control groups with 27 students for each grade: preparatory, first, second, third and fourth grades. Only children enrolled in extracurricular activities with parental consent were admitted to the experimental classrooms. To participate in the study, the consent of parents and children was obtained for both the

experiment and control groups. Students in the experimental classrooms performed extracurricular sports activities twice a week for 40-60 minutes, besides those provided in the curriculum. Between 30 September 2019 and 8 March 2020, so over 17 weeks, students in the experimental groups participated in both practical sports activities that took place outside the school schedule on the sports ground and cultural activities that were carried out in the school's spaces specially designed for this purpose. As part of extracurricular activities, students performed sports activities that included sports games, dynamic games, application routes, sports competitions, dancing to music and generally movement activities, while cultural and relational activities included reading, watching movies, staging short sketches, etc. Between 30 September 2019 and 8 March 2020, primary school students had two holidays: one from 28 October to 3 November 2019 and the second from 23 December 2019 to 12 January 2020. During this period, all students in the experimental and control groups were on holiday (starting with 11 March 2020, schools went online because of the COVID-19 pandemic).

The research methods used were: documentation, observation, experiment, mathematical statistics.

The assessment was performed in two stages, namely: an initial assessment that took place from 30 September to 6 October 2019 and a final assessment that was conducted between 2 and 8 March 2020.

Motor ability was assessed using the following tests: 25 m speed run (which was timed using an electronic stopwatch with 100 times – each student ran the distance twice and the best time was recorded), endurance run (measured by recording with a stopwatch how long a student could run) and standing long jump (each student jumped twice and the best value was recorded).

As regards mental ability, the Deduction Test (Albu, 2019) was used for attentional skills, while intelligence levels were assessed by Raven's Progressive Matrices calibrated for the Romanian population by Zaharnic et al. (1974) (see Raven - Standard I - Romania). Table 1 shows the results and age categories according to Zaharnic et al. (1974).

Table 1. *Raven's Progressive Matrices - percentile and age categories (Romania)*

Percentile	Results				
	6 years old	7 years old	8 years old	9 years old	10 years old
100	23	26	28	28	33
90	20	24	26	27	29
80	18	21	24	24	28
70	17	19	22	23	26
60	16	17	20	22	25
50	15	16	18	21	24
40	15	15	17	19	22
30	14	14	16	17	20
20	12	13	15	16	17
10	11	12	14	15	16

The interpretation took into account the percentile value (starting from the raw scores obtained by the participants). The results are classified into five levels (according to the source mentioned above): *Level 1 - superior intelligence* for children who were in the 95th

percentile or above; *Level 2 - above average intelligence* for children whose performance was between the 75th and the 94th percentiles and which included: Level 2+ (students whose performance was between the 90th and the 94 percentiles) and Level 2 (students whose performance was between the 75the and the 89th percentiles); *Level 3 - average intelligence* for children whose performance was between the 25th and the 74the percentiles and which included: Level III+ (students whose performance was between the 50th and the 74th percentiles) and Level III (students whose performance was between the 25th and the 49th percentiles). Raven's Test contains five sets of 12 images each. They are presented as a matrice and are increasingly difficult. The student identifies the missing elements from the presented pictures.

The Deduction Test (Albu, 2019) consists in deducing an image which is presented as four drawings on four cards. Each drawing brings more and more details, with the fourth being complete. Students have to guess what that drawing represents, using the information obtained from each drawing. The drawing is changed every 5 seconds, and the time needed for the deduction is recorded. The application and interpretation of the two tests was conducted in the Psycho-Pedagogical Counselling Office (in our school), in the presence and with the help of the school counsellor.

Results

Statistical data processing highlighted values of the analysed indicators for the 10 groups of students (divided into experimental and control classrooms) that can be found in Table 2 (for the preparatory grade), Table 3 (for first graders), Table 4 (for second graders), Table 5 (for third graders) and Table 6 (for fourth graders). Results were recorded and statistically processed with the help of IBM SPSS Statistics Version 20.

Depending on the nature of the group and the recorded data, qualitative analysis was based on the parametric Paired Samples *t* Test (for repeated measurements of the same group) and the parametric Independent Samples *t* Test (for independent groups).

Motor and mental skill results for the experiment and control groups, preparatory grade

Statistical processing results for the two preparatory classrooms, experiment and control, are shown in Table 2, where the Paired Samples *t* Test column reveals significant differences in all measured functional indicators (speed run, endurance run, long jump, Raven, and attention). The effect size values associated with the differences between the two assessments were medium to very good for the experiment group (0.75 for Raven, 0.62 for long jump and 0.58 for speed run) and medium to small for the control group (0.36 for Raven, 0.45 for long jump and 0.25 for speed run).

A larger effect size can be observed in all tests for the experiment group compared to the effect size obtained by the control group. Regarding the differences between groups, which are shown in the Independent Samples *t* Test column, significant differences can be noted between the final values of the following measured parameters: 25 m speed run ($t = -4.44$, $p < 0.001$, $r = 0.65$), Raven ($t = 3.30$, $p = 0.002$, $r = 0.54$), attention ($t = -3.40$, $p < 0.001$, $r = 0.55$), endurance run ($t = 2.23$, $p = 0.030$, $r = 0.40$) and long jump ($t = 2.05$, $p = 0.045$, $r = 0.37$).

Table 2. *Statistical results obtained by the preparatory classrooms in the five tests*

					Paired Samples *t* Test					Independent Samples *t* Test			
Test	Cl	S	M	Stdev	*t*	df	Sig (*p*)	*R*		*t*	df	Sig (*p*)	*R*
25 m Sr	E	I	6.37	0.08	19.05	26	< **0.001**	0.58	IE-IC	-0.28	26	0.779	-
		F	6.21	0.09									
	C	I	6.38	0.09	8.71	26	< **0.001**	0.25	FE-FC	-4.44	26	< **0.001**	0.65
		F	6.33	0.09									
Er	E	I	116.8	19.56	-7.21	26	< **0.001**	0.40	IE-IC	0.91	26	0.366	-
		F	134.1	19.79									
	C	I	112.6	13.61	-11.20	26	< **0.001**	0.39	FE-FC	2.23	26	**0.030**	0.40
		F	124.1	12.53									
Lj	E	I	0.66	0.07	-11.92	26	< **0.001**	0.62	IE-IC	0.09	26	0.926	-
		F	0.77	0.06									
	C	I	0.66	0.07	-7.00	26	< **0.001**	0.45	FE-FC	2.05	26	**0.045**	0.37
		F	0.73	0.06									
Raven	E	I	73.77	9.29	-7.06	26	< **0.001**	0.75	IE-IC	1.73	26	0.089	-
		F	93.03	7.16									
	C	I	69.44	9.08	-6.58	26	< **0.001**	0.36	FE-FC	3.30	26	**0.002**	0.54
		F	76.22	7.95									
Attention	E	I	17.22	1.76	3.99	26	< **0.001**	0.21	IE-IC	-3.03	26	**0.004**	0.51
		F	16.44	1.80									
	C	I	18.59	1.55	2.96	26	**0.006**	0.17	FE-FC	-3.40	26	< **0.001**	0.55
		F	18.03	1.62									

Legend: Sr = speed run, Er = endurance run, Lj = long jump, Cl = classroom, E = experiment (group), C = control (group), S = stage, I = initial, F = final, M = mean, Stdev = standard deviation, Sig = statistical significance level, R = effect size, Df = degrees of freedom, IE = initial experiment (group), FE = final experiment (group), IC = initial control (group), FC = final control (group).

Motor and mental skill results for the experiment and control groups, first grade

Table 3. *Statistical results obtained by first-grade students in the five tests*

					Paired Samples *t* Test					Independent Samples *t* Test			
Test	Cl	S	M	Stdev	*t*	df	Sig (*p*)	*R*		*t*	df	Sig (*p*)	*R*
25 m Sr	E	I	6.32	0.09	16.80	26	**0.001**	0.46	IE-IC	0.59	26	0.552	-
		F	6.16	0.10									
	C	I	6.31	0.82	0.20	26	0.840	-	FE-FC	-3.74	26	< **0.001**	0.59
		F	6.26	0.96									
Er	E	I	189.0	17.69	-10.97	26	**0.001**	0.54	IE-IC	-0.75	26	0.451	-
		F	213.6	20.44									
	C	I	192.5	15.56	-15.48	26	**0.001**	0.40	FE-FC	1.60	26	0.114	-
		F	205.9	14.38									
Lj	E	I	1.10	0.59	-0.09	26	0.927	-	IE-IC	-0.39	26	0.693	-
		F	1.12	0.95									
	C	I	1.02	0.05	-7.92	26	**0.001**	0.44	FE-FC	2.09	26	**0.041**	0.37
		F	1.07	0.05									
Raven	E	I	76.40	9.27	-7.38	26	**0.001**	0.33	IE-IC	1.97	26	0.054	-
		F	82.74	8.77									
	C	I	72.55	4.14	-18.66	26	**0.001**	0.52	FE-FC	2.70	26	**0.009**	0.46
		F	77.7	4.11									
Attention	E	I	15.66	1.14	5.85	26	**0.001**	0.38	IE-IC	-0.12	26	0.898	-
		F	14.70	1.17									
	C	I	15.70	0.95	4.43	26	**0.001**	0.31	FE-FC	-1.46	26	0.149	-
		F	15.11	0.84									

Legend: Sr = speed run, Er = endurance run, Lj = long jump, Cl = classroom, E = experiment (group), C = control (group), S = stage, I = initial, F = final, M = mean, Stdev = standard deviation, Sig = statistical significance level, R = effect size, Df = degrees of freedom, IE = initial experiment (group), FE = final experiment (group), IC = initial control (group), FC = final control (group).

Statistical processing results for the two first-grade classrooms, experiment and control, are shown in Table 3, where the Paired Samples *t* Test column highlights significant differences in all measured functional indicators (speed run, endurance run, long jump, Raven, and attention). The effect size values associated with the differences between the two assessments were medium or medium to strong for the experiment group (0.46 for 25 m speed run, 0.54 for endurance run, 0.33 for Raven, and 0.38 for attention). A similar range of the effect size was revealed for the control group (0.40 for endurance run, 0.44 for stnding long jump, 0.52 for Raven, and 0.31 for attention). Regarding the differences between the two groups, which are shown in the Independent Samples *t* Test column, significant statistical differences can be noted between the final values of the following measured parameters: 25 m speed run (t = -3.74, p < 0.001, r = 0.59), standing long jump (t = 2.09, p = 0.041, r = 0.37) and Raven (t = 2.70, p = 0.009, r = 0.46).

Motor and mental skill results for the experiment and control groups, second grade

Statistical processing results for the two second-grade classrooms are shown in Table 4. The Paired Samples *t* Test column (for the experiment and control groups) highlights significant differences (in the expected directions) for most of the measured functional indicators (speed run, endurance run, long jump and Raven), except for the attention scores achieved by the control group.

Table 4. *Statistical results obtained by second-grade students in the five tests*

					Paired Samples *t* Test				Independent Samples *t* Test				
Test	Cl	S	M	Stdev	*t*	df	*p*	*R*		*t*	df	*p*	*R*
25 m Sr	E	I	6.27	0.12	5.38	26	< **0.001**	0.55	IE-IC	0.00	26	1.000	-
		F	5.86	0.41									
	C	I	6.27	0.12	6.94	26	< **0.001**	0.46	FE-FC	-2.87	26	< **0.006**	0.49
		F	6.11	0.17									
Er	E	I	197.1	15.40	-13.07	26	< **0.001**	0.73	IE-IC	-0.79	26	0.428	-
		F	227.7	13.07									
	C	I	200.5	15.24	-8.94	26	< **0.001**	0.37	FE-FC	4.59	26	< **0.001**	0.69
		F	211.7	12.70									
Lj	E	I	1.02	0.03	-2.75	26	**0.005**	0.85	IE-IC	0.38	26	0.701	-
		F	1.13	0.03									
	C	I	1.02	0.28	0.92	26	0.360	-	FE-FC	5.89	26	< **0.001**	0.75
		F	1.09	0.25									
Raven	E	I	81.92	8.90	-3.58	26	< **0.001**	0.14	IE-IC	0.20	26	0.836	-
		F	84.55	9.10									
	C	I	81.44	8.12	-5.49	26	< **0.001**	0.15	FE-FC	0.22	26	0.827	-
		F	84.03	8.22									
Attention	E	I	15.14	1.16	5.00	26	< **0.001**	0.23	IE-IC	1.32	26	0.193	-
		F	14.59	1.13									
	C	I	14.66	1.49	0.70	26	0.490	-	FE-FC	0.41	26	0.679	-
		F	14.44	1.310									

Legend: Sr = speed run, Er = endurance run, Lj = long jump, Cl = classroom, E = experiment (group), C = control (group), S = stage, I = initial, F = final, M = mean, Stdev = standard deviation, Sig = statistical significance level, R = effect size, Df = degrees of freedom, IE = initial experiment (group), FE = final experiment (group), IC = initial control (group), FC = final control (group).

The effect size values associated with the differences between the two assessments were medium to strong for the experiment group (0.55 for speed run, 0.73 for endurance run and 0.85 for standing long jump) and medium to small for the experiment group (0.14 for Raven,

and 0.23 for attention) and the control group (0.46 for speed run, 0.37 for endurance run, 0.12 for standing long jump, 0.10 for Raven, and 0.07 for attention). A larger effect size can be observed in three of the five tests for the experiment group compared to the effect size obtained by the control group. Regarding the differences between the two groups, which are shown in the Independent Samples *t* Test column, statistical differences can be noted between the final values of the following measured parameters: 25 m speed run (t = -2.87, p = 0.006, r = 0.49), endurance run (t = 4.59, $p < 0.001$, r = 0.69) and long jump (t = 5.89, $p < 0.001$, r = 0.75).

Motor and mental skill results for the experiment and control groups, third grade

Statistical processing results for the two third-grade classrooms are shown in Table 5. The Paired Samples *t* Test column for the experiment and control groups reveals significant differences for all variables, except the 25 m speed run test (control group).

Table 5. *Statistical results obtained by third-grade students in the five tests*

					Paired Samples *t* Test					Independent Samples *t* Test			
Test	Cl	S	M	Stdev	*t*	Df	Sig (*p*)	*R*		*t*	Df	Sig (*p*)	*R*
25 m Sr	E	I	5.98	0.421	4.20	26	< **0.001**	0.25	IE-IC	0.00	26	1.000	-
		F	5.75	0.412									
	C	I	5.98	0.421	0.32	26	**0.748**	-	FE-FC	-1.52	26	0.133	-
		F	5.94	0.472									
Er	E	I	209.7	17.41	-9.08	26	< **0.001**	0.61	IE-IC	0.91	26	0.366	-
		F	233.5	13.04									
	C	I	210.9	16.58	-12.68	26	< **0.001**	0.33	FE-FC	2.23	26	**0.030**	0.40
		F	221.9	14.43									
Lj	E	I	1.08	0.036	-2.92	26	**0.005**	0.35	IE-IC	0.00	26	1.000	-
		F	1.11	0.038									
	C	I	1.08	0.036	-4.23	26	< **0.001**	0.46	FE-FC	4.63	26	< **0.001**	0.67
		F	1.12	0.032									
Raven	E	I	82.77	10.13	-6.72	26	< **0.001**	0.18	IE-IC	1.13	26	0.262	-
		F	86.59	10.63									
	C	I	80.25	5.53	-7.47	26	< **0.001**	0.41	FE-FC	0.54	26	0.589	-
		F	85.33	5.615									
Attention	E	I	14.37	1.043	6.13	26	< **0.001**	0.28	IE-IC	0.38	26	0.704	-
		F	13.74	1.095									
	C	I	14.25	1.095	4.13	26	< **0.001**	0.23	FE-FC	0.85	26	0.905	-
		F	13.70	1.17									

Legend: Sr = speed run, Er = endurance run, Lj = long jump, Cl = classroom, E = experiment (group), C = control (group), S = stage, I = initial, F = final, M = mean, Stdev = standard deviation, Sig = statistical significance level, R = effect size, Df = degrees of freedom, IE = initial experiment (group), FE = final experiment (group), IC = initial control (group), FC = final control (group).

The effect size values associated with the differences between the two assessments were: 0.25 for speed run, 0.61 for endurance run, 0.35 for standing long jump, 0.18 for Raven, and 0.28 for attention, and in the case of the control group, 0.33 for endurance run, 0.46 for standing long jump, 0.41 for Raven, and 0.23 for attention, with greater differences for the experiment group. Regarding the differences between groups, which are shown in the Independent Samples *t* Test column, statistical differences can be noted between the final values of the following measured parameters: endurance run (t = 2.234, p = 0.030, r = 0.40) and long jump (t = 4.638, $p < 0.001$, r = 0.67).

Motor and mental skill results for the experiment and control groups, fourth grade

Statistical processing results for the two fourth-grade classrooms are shown in Table 6. The Paired Samples *t* Test column reveals a significant difference for the experiment group for 25 m speed run, endurance run, Raven, and attention. The effect size values associated with the differences between the two assessments were: 0.21 for speed run, 0.68 for endurance run, 0.29 for Raven, and 0.43 for attention) The Paired Samples *t* Test column also reveals a significant difference for the control group for endurance run, long jump, Raven, and attention. The effect size values associated with the differences between the two assessments were 0.33 for speed run, 0.72 for long jump, 0.25 for Raven, and 0.26 for attention. Analysis of the final results highlights a larger effect size in four of the five tests for the experiment group compared the effect size obtained by the control group. Regarding the differences between groups, which are shown in the Independent Samples *t* Test column, significant statistical differences can be noted between the final values of the following measured parameters: endurance run ($t = 4.048$, $p < 0.001$, $r = 0.62$) and long jump ($t = 3.309$, $p < 0.002$, $r = 0.54$).

Table 6. *Statistical results obtained by fourth-grade students in the five tests*

					Paired Samples *t* Test					Independent Samples *t* Test			
Test	Cl	S	M	Stdev	*t*	Df	Sig (*p*)	*R*		*t*	Df	Sig (*p*)	*R*
25 m Sr	E	I	5.80	0.40	8.13	26	< **0.001**	0.21	IE-IC	-0.01	26	0.987	-
		F	5.62	0.41									
	C	I	5.80	0.41	0.70	26	0.485	-	FE-FC	-0.95	26	0.347	-
		F	5.72	0.41									
Er	E	I	227.7	13.07	-12.68	26	< **0.001**	0.68	IE-IC	-0.54	26	0.586	-
		F	252.5	13.43									
	C	I	229.7	13.74	-8.87	26	< **0.001**	0.33	FE-FC	4.04	26	< **0.001**	0.62
		F	238.8	11.35									
Lj	E	I	1.125	0.03	-0.07	26	0.937	-	IE-IC	0.31	26	0.757	-
		F	1.126	0.05									
	C	I	1.122	0.03	-5.30	26	< **0.001**	0.72	FE-FC	3.30	26	< **0.002**	0.54
		F	1.174	0.04									
Raven	E	I	83.03	7.40	-7.65	26	< **0.001**	0.29	IE-IC	-0.74	26	0.461	-
		F	87.48	7.01									
	C	I	84.51	7.25	-7.64	26	< **0.001**	0.25	FE-FC	-0.27	26	0.786	-
		F	87.96	5.93									
Attention	E	I	13.22	0.80	5.03	26	< **0.001**	0.43	IE-IC	1.63	26	0.109	-
		F	12.48	0.75									
	C	I	12.88	0.69	3.30	26	< **0.001**	0.26	FE-FC	0.16	26	0.870	-
		F	12.44	0.89									

Legend: Sr = speed run, Er = endurance run, Lj = long jump, Cl = classroom, E = experiment (group), C = control (group), S = stage, I = initial, F = final, M = mean, Stdev = standard deviation, Sig = statistical significance level, R = effect size, Df = degrees of freedom, IE = initial experiment (group), FE = final experiment (group), IC = initial control (group), FC = final control (group).

Discussion and Conclusion

The performance progress for the five experimental and five control groups is shown in Table 7, which includes the statistical results of significance levels [Sig (*p*)] calculated using the Paired Samples *t* Test and Independent Samples *t* Test.

Table 7 highlights the values of significance levels [Sig (*p*)] recorded in the Paired Samples *t* Test, indicating the students' progress from the initial to the final assessment of the five tests for the 10 classrooms. The *p* value analysis reveals significant differences with values between < 0.001 and < 0.006 in all tests for both the experiment and control classrooms. Only one exception is recorded for second-grade students in the control group, where the *p* value is < 0.490 in the Attention Test, meaning that it is not significant.

These improvements are the result of daily compulsory activities performed by children, but also the result of their optional extracurricular activities, which validates the research hypothesis that *school and extracurricular activities lead to improvements in the motor and mental behaviour of primary education children*. Results in this direction are also presented by other researchers: for example, Haapala et al. (2017) believe that "promoting a physically more active lifestyle may benefit the development of reading skills in boys during the first school years" (p. 588) as well as throughout life. Student guidance and support in practising extracurricular activities are indicated in order to ensure good physical health obtained through own efforts (Andrieieva & Sainchuk, 2014), but also work based on individual skills. According to Dappa et al. (2021), "regularly engaging in structured PA [physical activity] constitutes a promising way to promote motor skills and support motor development over the long term" (p. 1), while Sutapa et al. (2021) state that children who perform training three times a week for 12 weeks benefit from significant improvements in motor skill areas.

Table 7. *Statistical results of significance levels [Sig (p)] for the five experimental and five control groups in the five tests*

Grade and classroom		Paired Samples *t* Test - statistical significance level Sig (*p*)					Independent Samples *t* Test - statistical significance level Sig (*p*)				
		Sr	Er	Lj	Raven	Attention	Sr	Er	Lj	Raven	Attention
1	Prep iE-C	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**	0.779	0.366	0.926	0.089	**0.004**
	Prep fE-C	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.006**	**< 0.001**	**0.030**	**0.045**	**0.002**	**< 0.001**
2	1st iE-C	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**	0.552	0.451	0.693	0.054	0.898
	1st fE-C	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**	0.114	**0.041**	**0.009**	0.149
3	2nd iE-C	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**	1.000	0.428	0.701	0.836	0.193
	2nd fE-C	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**	0.491	**0.006**	**< 0.001**	**< 0.001**	0.827	0.679
4	3rd iE-C	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**	1.000	0.366	1.000	0.262	0.704
	3rd fE-C	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**	0.133	**0.030**	**< 0.001**	0.589	0.905
5	4th iE-C	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**	0.987	0.586	0.757	0.461	0.109
	4th fE-C	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**	**< 0.001**	0.347	**< 0.001**	**0.002**	0.786	0.870

Legend: Prep = preparatory, iE-C = initial experiment-control, fE-C = final experiment-control, Sr = speed run, Er = endurance run, Lj = long jump.

The same Table 7 shows the values of significance levels [Sig (*p*)] recorded in the Independent Samples *t* Test, indicating the comparative progress made by the experimental and control classrooms from the initial to the final assessment of the five tests. The *p* value analysis reveals significant differences with values between < 0.001 and < 0.045 only in the final assessment for speed run (preparatory, first and second grades), endurance run (preparatory, second, third and fourth grades), long jump (all grades), Raven's Test (preparatory and first grades) and Attention Test (preparatory grade). These significant improvements only for certain grades and certain tests are the result of the optional activities

performed by children, which only partially validates the research hypothesis that *there are significant differences between the improvements achieved in the motor and mental behaviour of primary school children who perform extracurricular activities and those who are not engaged in such activities*. Several studies have highlighted the influence of exercise on motor ability, pointing out that children's motor skills improve but attention improvement is only visible in the first two years, without being maintained in the third school year (Ericsson, 2008), and that there is "limited information regarding school-based programmes, the effects of structured exercise programmes independently or in combination with cognitive-based therapies, and the long-term benefits of exercises in alleviating behavioural problems in these children" (Jeyanthi et al., 2019). The fact that there were no significant differences in the Attention Test between the experimental and control classrooms (except for the preparatory grade) makes us think of how the extracurricular activities were conducted, in the sense that no special emphasis was placed on careful participation in the activities carried out but rather on participation in very diverse activities. Doyle et al. (1995) even draw attention to the fact that "intervention should be aimed at assisting children to develop strategies to promote attention within the various environments where they are required to participate", while Libertus and Hauf (2017) emphasise "that motor skills are important for a child's healthy development across domains and that early motor delays may be predictive or elevated risk for developmental disorders or mental health problems later in life" (p. 3).

In our opinion, the extracurricular programme was much too diversified without pursuing well-defined objectives for the development of cognitive ability, but one should take into account that the beneficial effects of physical activity on cognitive performance might be particularly large for children in the course of time (Gapin et al., 2011). The study conducted by Greeff et al. (2018) shows that physical activity has positive effects on executive functions, attention and academic performance in preadolescent children. The above authors state that "largest effects are expected for interventions that aim for continuous regular physical activity over several weeks" (Greeff et al., 2018, p. 501). Our research has revealed that the effect sizes associated with the differences between the two assessments are larger for experimental classrooms and smaller for control classrooms.

In conclusion, the values calculated using the Paired Samples *t* Test for the five tests performed by primary school children indicate that school and extracurricular activities produce progress, which is materialised in significant differences between the initial and final assessments of motor and mental skills (with p values ranging from < 0.001 to < 0.006). On the other hand, the values calculated using the Independent Samples *t* Test produce significant progress only in motor skill tests (with $p < 0.001$ and < 0.045), except the insignificant difference in endurance run for first graders, and insignificant progress in mental skill tests, except Raven's Test for the preparatory and first grades and Attention Test for the preparatory grade.

It is very important for future research to provide programmes with well-defined activities focused on the fulfilment of precise goals.

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