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THE IMPACT OF THE PANDEMIC PERIOD ON STUDENTS' PHYSICAL ENDURANCE: A LONGITUDINAL STUDY ON MOTOR PARAMETERS

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Abstract. *Background.* The COVID–19 pandemic had a significant impact on various aspects of daily life, including children's physical activity levels. The restrictions imposed during this period led to a considerable decrease in movement and physical exercise among students, which may be correlated with stagnation or even regression in motor development and overall physical fitness.
Objectives. The aim of this study was to assess the evolution of students' physical endurance in lower secondary education by analyzing specific motor parameters measured over three consecutive school years: 2019–2020 (pre-pandemic period), 2020–2021 (pandemic period), and 2021–2022 (recovery period).
Methodology. A group of 25 students (11 girls and 14 boys) was evaluated using four motor tests: 25-meter sprint, sit-ups, back extensions from a prone position, and standing long jump. Each parameter was recorded at the beginning and end of each school year. The Friedman test and Dunn-Bonferroni post-hoc analysis were used to evaluate statistical differences between the three time points.
Results. Most motor parameters showed statistically significant decreases in the 2020–2021 school year compared to the pre-pandemic period. In 2021–2022, notable improvements were observed, particularly in sprint performance and long jump. Running speed and explosive strength declined during the pandemic but showed a positive recovery trend in the following year, without fully reaching initial values. Trunk strength followed a more constant trajectory, yet also improved post-pandemic.
Conclusions. The results highlight a significant decrease in students' motor capacity during the pandemic. In the future, it is necessary to develop and implement a structured educational program in the coming school years to support students in regaining and improving their physical endurance.

Keywords: motor capacity, physical endurance, students, pandemic, longitudinal study.

Introduction

The COVID–19 pandemic caused unprecedented effects across all dimensions of social, economic, and educational life. One of the most deeply affected domains was physical education and motor activity among students. The sudden transition to online learning, restrictions imposed by authorities, and social isolation led to a drastic decrease in physical activity levels among children and adolescents, negatively impacting their effort capacity.
Several international studies have addressed the same phenomenon. For example, Dunton et al. (2020) highlight that children's physical activity levels decreased substantially during lockdown periods, particularly moderate to vigorous activity. Similarly, López-Bueno et al. (2020) emphasize that confinement led to a notable reduction in physical activity and a simultaneous increase in

sedentary behavior among youth populations. Moreover, Xiang et al. (2020) show that children and adolescents engaged less in outdoor activities and more in screen-based behaviors, which negatively influenced their physical and mental health. These findings reinforce the importance of investigating the pandemic's impact at the local level and contextualizing results within broader global trends.

In Romania, the lack of access to sports fields and gyms, combined with a deficient digital infrastructure for online physical education, amplified the negative effects of the pandemic on students' motor capacity. Although fewer in number, national studies confirmed this trend, showing a decline in performance in speed and endurance motor tests, correlated with the reduced physical activity levels during the pandemic.

Maintaining an adequate level of physical activity among children is essential, and global health guidelines recommend at least 60 minutes of daily physical activity for this age group. This study aims to analyze the evolution of motor capacity in middle school students from 2019 to 2022, with a focus on the changes that occurred during the pandemic.

Objectives

– To evaluate the impact of the COVID-19 pandemic on students' motor capacity;
– To compare motor performances over three consecutive school years;
– To identify statistically significant changes between years;
– To propose educational measures to improve effort capacity.

Methodology

Twenty-five students (14 boys and 11 girls) from middle school were evaluated over three consecutive school years. The measured parameters were: 25 m sprint (speed), abdominal crunches (abdominal strength), back extensions (back strength), and standing long jump (explosive strength). Tests were conducted at the beginning and end of each school year. Statistical analysis included the Shapiro-Wilk test, Friedman test, and Dunn-Bonferroni post-hoc test, with significance set at $p<0.05$.

Results and Statistical Interpretation

Table 1 – *Comparison of motor parameters, 5th grade*

Parameter/Measurement		2019–2020	2020–2021	2021–2022
T.I. – 25 m sprint	**Mean ± SD**	6.1 ± 0.25	6.33 ± 0.25	6.53 ± 0.25
	Median (IQR)	6.06 (5.9–6.3)	6.29 (6.14–6.51)	6.52 (6.32–6.73)
	p*	**<0.001**		
T.F. – 25 m sprint	**Mean ± SD**	5.87 ± 0.18	6.07 ± 0.17	6.28 ± 0.19
	Median (IQR)	6.06 (5.9–6.3)	6.29 (6.14-6.51)	6.52 (6.32–6.73)
	p*	**<0.001**		
T.I. – Trunk raise lying supine	**Mean ± SD**	8.2 ± 2.18	8.88 ± 2.14	10.16 ± 1.52
	Median (IQR)	8 (7–9.5)	9 (7–10)	10 (9–12)
	p*	**<0.001**		

T.F. – Trunk raise lying supine	**Mean ± SD**	10.16 ± 2.46	10.88 ± 2.58	12.48 ± 2.02
	Median (IQR)	10 (8–12)	11 (8.5–13)	12 (11–14)
	p*	**0.014**		
T.I. – Trunk Extension Face Lie	**Mean ± SD**	9.72 ± 2.05	10.28 ± 2.07	10.76 ± 1.16
	Median (IQR)	10 (7.5–11.5)	10 (8–12)	11 (9.5–12)
	p*	0.444		
T.F. – Trunk Extension Face Lie	**Mean ± SD**	11.8 ± 1.78	12.6 ± 1.84	12.92 ± 1.38
	Median (IQR)	12 (10.5–13)	13 (11–14)	13 (11.5–14)
	p*	0.134		
T.I. – Long jump from the spot	**Mean ± SD**	1.16 ± 0.04	1.21 ± 0.05	1.27 ± 0.05
	Median (IQR)	1.15 (1.15–1.2)	1.2 (1.15–1.25)	1.25 (1.23–1.3)
	p*	**<0.001**		
T.F. – Long jump from the spot	**Mean ± SD**	1.21 ± 0.04	1.25 ± 0.05	1.32 ± 0.05
	Median (IQR)	1.2 (1.2–1.25)	1.25 (1.2–1.3)	1.3 (1.28–1.35)
	p*	**<0.001**		

***Related-Samples Friedman's Two-Way Analysis of Variance by Ranks Test**

The data in the table represent the evolution of measured parameters among 5th-grade students. The distribution of investigated parameters was non-parametric according to the Shapiro-Wilk test ($p<0.05$). According to the Friedman tests, most parameters analyzed showed significant differences between intervals ($p<0.05$), and Dunn-Bonferroni post-hoc tests showed:

– Initial and final values for 25 m sprint were significantly higher in 2021–2022 compared to 2019–2020 and 2020–2021 ($p<0.001$);

– Initial values for abdominal crunches were significantly higher in 2021–2022 compared to previous years ($p<0.001$);

– Final values for abdominal crunches were also significantly higher in 2021–2022 compared to 2019–2020 ($p=0.022$);

– Jump distances were significantly better in 2021–2022 than in both previous years ($p<0.001$ and $p=0.002$).

Conclusions

The statistical analysis confirms a significant impact of the pandemic on students' motor capacity, with a general performance decline in 2020–2021 followed by partial recovery in 2021–2022. The need for structured intervention becomes evident given the statistically significant differences across years, which may have long-term consequences on students' health and physical development**.**

Authors' Contributions

All authors have equally contributed to this study.

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