

MOTOR SKILL LEVEL OF STUDENTS AT RISK OF EDUCATIONAL EXCLUSION IN MUREȘ COUNTY, ROMANIA

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Abstract. *In recent years, preventing school dropout has become a topic of national interest because the number of young people at risk of educational exclusion has considerably increased. That is why we turn our attention to this vulnerable category, in both educational and social terms. The students included in this research represent the main target group in the project “Sustainable social and educational integration through sports activities” (PNP001). The project is designed for students with social and educational integration difficulties and aims to identify directions and solutions to reduce school dropout by involving them in various sports activities. The students are enrolled in two educational units in Mureș County, namely Ogra Middle School (70 students) and Sărățeni Middle School (49 students). In terms of gender, there are 65 boys (average age: 13 years ± 1.26) and 54 girls (average age: 12 years ± 1.15), therefore a total number of 119 students. In order to identify the level of students’ motor skills, we used assessment tests recognised in the field of interest: 4 x 10 m Shuttle run, Standing long jump, t-Test, Stork Test, Flexibility Test and Ruffier Test. By knowing the level of students’ motor performance, we will identify the pattern of their motor skills in relation to gender, age and residence area, and participation in various sports activities is aimed at achieving complementarity between their motor and social development.*

Keywords: *motor assessment, school dropout, education unit.*

Introduction

The issue related to children’s involvement in various forms of physical activity is intensely debated (Braneț, 2017) with the purpose of both improving their quality of life through harmonious physical development and optimising their psychological components and motor skills. Motor activities contribute to educating students for and through movement, which leads to the full development of personality (Macovei et al., 2014) and the factors that modulate it during childhood and adolescence (Gómez Mármol et al., 2018), with multiple beneficial effects on adult life through permanent adaptation to the constantly changing society (Manzano-Sánchez & Valero-Valenzuela, 2019).

Motor skill performance is positively associated with an active lifestyle. Motor skill level can be a causal factor for children’s involvement in physical activity (Williams et al., 2008) by facilitating their participation in various such programmes, with favourable repercussions on their fitness levels during adulthood or old age (Bardid et al., 2015).

The programmes aimed at developing motor skills can improve the level of motivation to participate in physical activity (Tucker et al., 2017).

Participation in physical activity programmes has many visible benefits not only at the biological or motor level but also in social terms (Janssen & Leblanc, 2010; Macovei et al., 2012; Sánchez-Miguel et al., 2020), given that it contributes to personal development (Cómez-Mármol et al., 2017) by providing opportunities for students to socialise with friends (Tian et al., 2021).

Moreover, “there is international enthusiasm for the idea that sport can contribute to ‘social inclusion’ strategies” (Kelly, 2011, p. 126). D’Angelo et al. (2021) also state that “social inclusion is broadly recognized as a priority at an international level” (p. 1).

Participants in sports programmes can be integrated both educationally and socially by implementing appropriate strategies, because they “would otherwise be excluded due to their linguistic, cultural, economic or social conditions” (Martiniello & Madonna, 2021, p. 590).

Sport is associated with positive effects on social inclusion and pro-social behaviours (D’Angelo et al., 2021), the acquisition of life skills such as cooperation and discipline (Côté et al., 2008) or the development of community cohesion (Platts, 2018).

Methodology

The research was conducted on a group of 119 students from Mureş County. The target group consisted of children who met the following inclusion criteria: students aged 11-15, enrolled in middle school and having a form of vulnerability associated with the requirements of the PNP 001 project, which indicates the eligibility criteria for the research sample. Two educational units, namely Ogra Middle School (70 students) and Sărăţeni Middle School (49 students), were included in the study. In terms of gender, there were 65 boys (13 years \pm 1.26) and 54 girls (12 years \pm 1.15) enrolled in the two aforesaid schools.

Participants were informed about the conditions for inclusion in the target group and that the anonymity of their data would be protected. The assessments were conducted during the lessons dedicated to sports activities provided in the aforementioned project.

Motor skill performance was assessed by the following tests: 4 x 10 m Shuttle run (for execution speed, coordination speed and ability); Standing long jump (for leg power); *t*-Test (for agility); Stork Test (for balance); Flexibility Test (for suppleness); Ruffier Test (for aerobic endurance).

The results were interpreted using the scales proposed by: Tudor (2013) - Standing long jump; Sharkey and Gaskill (2006) - Stork Test; Tudor (2013) - Flexibility Test; Cordun (2009) - Ruffier Test. All these tests are unanimously recognised in the literature.

Results

The recorded results were processed and analysed using the descriptive statistics feature of SPSS software to identify the motor skill level of middle school students in Mureş County, Romania. The result analysis aimed at identifying the level of motor skills in relation to students’ gender, residence area and age. Thus, the results are interpreted by age group, separately for boys (Table 1) and girls (Table 2).

- Boys – 11 years

In motor tests, the average scores obtained were: 12.32 seconds for 4 x 10 m Shuttle run, 139.46 cm for Standing long jump (low leg power), 14.02 seconds for *t*-Test, 3.01 seconds for Stork Test (low balance ability) and 1.28 cm for Flexibility Test (low suppleness). The average score for Ruffier Test is 11.08 points (low aerobic endurance, meaning insufficient adaptation to exercise).

- Boys – 12 years

In motor tests, the average scores obtained were: 11.97 seconds for 4 x 10 m Shuttle run, 146.5 cm for Standing long jump (low leg power), 14.47 seconds for *t*-Test, 11.15 seconds for Stork Test (low balance ability) and 2.14 cm for Flexibility Test (low suppleness). The average score for Ruffier Test is 11.30 points (insufficient adaptation to exercise).

- Boys – 13 years

In motor tests, the average scores obtained were: 11.82 seconds for 4 x 10 m Shuttle run, 161.84 cm for Standing long jump (low leg power), 12.99 seconds for *t*-Test, 5.43 seconds for Stork Test (low balance ability) and 2.69 cm for Flexibility Test (low suppleness). The average score for Ruffier Test is 12.94 points (insufficient adaptation to exercise).

- Boys – 14 years

In motor tests, the average scores obtained were: 11.34 seconds for 4 x 10 m Shuttle run, 177.2 cm for Standing long jump (low leg power), 12.72 seconds for *t*-Test, 5.58 seconds for Stork Test (low balance ability) and 2.12 cm for Flexibility Test (low suppleness). The average score for Ruffier Test is 11.93 points (insufficient adaptation to exercise).

- Boys – 15 years

In motor tests, the average scores obtained were: 11.28 seconds for 4 x 10 m Shuttle run, 180.6 cm for Standing long jump (low leg power), 12.36 seconds for *t*-Test, 5.82 seconds for Stork Test (low balance ability) and 2.33 cm for Flexibility Test (low suppleness). The average score for Ruffier Test is 8.54 points (moderate adaptation to exercise).

Table 1. *Results obtained in assessment tests by age group – Boys*

Statistical indicators		4 x 10 m Shuttle run (seconds and tenths)	Standing long jump (cm)	<i>t</i> -Test (seconds and tenths)	Stork Test (seconds and tenths)	Flexibility Test (cm)	Ruffier Test (points)
Boys 11 years	Arithmetic mean	12.32	139.46	14.02	3.01	-1.28	11.08
	Median	12.3	140	14.04	2.29	0	10.5
	Standard deviation	1.30	21.80	1.72	1.60	1.70	3.78
	Coefficient of variation	10.57	15.63	12.33	53.3	-132.55	34.12
	Minimum	10.56	100	11.34	1.45	-4	7
	Maximum	14.7	182	18	5.52	0	17.2
	Range	4.14	82	6.66	4.07	4	10.2
Boys 12 years	Arithmetic mean	11.97	146.5	14.47	11.15	2.14	11.30
	Median	11.75	149.5	14.04	14.96	2	10.1
	Standard deviation	1.04	21.95	2.37	6.37	3.80	4.70
	Coefficient of variation	8.76	14.98	16.38	57.14	177.55	41.59
	Minimum	10.72	100	11.94	4.16	-3	5.8
	Maximum	14.4	178	20.08	17.3	8	22.6
	Range	3.68	78	8.14	13.14	11	16.8
Boys 13 years	Arithmetic mean	11.82	161.84	12.99	5.43	2.69	12.94
	Median	11.42	165	13.23	4.65	-2	12.5
	Standard deviation	1.54	30.09	1.64	2.28	7.45	5.08
	Coefficient of variation	13.09	18.59	12.62	41.94	276.86	39.28

	Minimum	9.96	110	9.78	3.3	-4	6.4
	Maximum	15.3	209	16	8.96	17	20.8
	Range	5.34	99	6.22	5.66	21	14.4
Boys	Arithmetic mean	11.34	177.2	12.72	5.58	2.12	11.93
14	Median	11.2	180	12.6	2.65	-1	9.6
years	Standard deviation	0.78	24.47	1.29	6.01	10.61	5.77
	Coefficient of variation	6.95	13.81	10.14	107.65	499.56	48.40
	Minimum	10.34	120	11	1.2	-8	7
	Maximum	13.8	220	16.08	16.8	25	24.4
	Range	3.46	100	5.08	15.6	33	17.4
Boys	Arithmetic mean	11.28	180.6	12.36	5.82	2.33	8.54
15	Median	11.48	175	12	5.82	3	7
years	Standard deviation	0.38	22.23	1.28	0.24	4.04	3.88
	Coefficient of variation	3.39	12.31	10.40	4.24	173.20	45.54
	Minimum	10.7	153	11.3	5.65	-2	4
	Maximum	11.64	210	14.52	6	6	14.1
	Range	0.94	57	3.22	0.35	8	10.1

- Girls – 11 years

In motor tests, the average scores obtained were: 12.84 seconds for 4 x 10 m Shuttle run, 137.64 cm for Standing long jump (low leg power), 15.13 seconds for *t*-Test, 2.89 seconds for Stork Test (low balance ability) and -3.7 cm for Flexibility Test (low suppleness). The average score for Ruffier Test is 13.3 points (insufficient adaptation to exercise).

- Girls – 12 years

In motor tests, the average scores obtained were: 12.79 seconds for 4 x 10 m Shuttle run, 135.85 cm for Standing long jump (low leg power), 14.41 seconds for *t*-Test, 3.09 seconds for Stork Test (low balance ability) and 1 cm for Flexibility Test (low suppleness). The average score for Ruffier Test is 11.06 points (insufficient adaptation to exercise).

- Girls – 13 years

In motor tests, the average scores obtained were: 12.57 seconds for 4 x 10 m Shuttle run, 143.57 cm for Standing long jump (low leg power), 13.97 seconds for *t*-Test, 5.34 seconds for Stork Test (low balance ability) and 2.33 cm for Flexibility Test (low suppleness). The average score for Ruffier Test is 11.43 points (insufficient adaptation to exercise).

- Girls – 14 years

In motor tests, the average scores obtained were: 13.35 seconds for 4 x 10 m Shuttle run, 137.6 cm for Standing long jump (low leg power), 15.09 seconds for *t*-Test, 3.9 seconds for Stork Test (low balance ability) and 1.66 cm for Flexibility Test (low suppleness). The average score for Ruffier Test is 12.1 points (insufficient adaptation to exercise).

- Girls – 15 years

In motor tests, the average scores obtained were: 12.66 seconds for 4 x 10 m Shuttle run, 131.25 cm for Standing long jump (low leg power), 14.50 seconds for *t*-Test, 1.53 seconds for Stork Test (low balance ability) and -10 cm for Flexibility Test (low suppleness). The average score for Ruffier Test is 11.75 points (insufficient adaptation to exercise).

Table 2. Results obtained in assessment tests by age group – Girls

Statistical indicators		4 x 10 m Shuttle run (seconds and tenths)	Standing long jump (cm)	t-Test (seconds and tenths)	Stork Test (seconds and tenths)	Flexibility Test (cm)	Ruffier Test (points)
Girls 11 years	Arithmetic mean	12.84	137.64	15.13	2.89	-3.7	13.3
	Median	12.77	136.5	15.14	2.86	-3.5	14.8
	Standard deviation	0.77	18.13	0.89	1.01	4.29	4.50
	Coefficient of variation	6.07	13.17	5.93	34.91	-116.10	33.88
	Minimum	11.72	115	13.12	1.91	-13	7
	Maximum	14.64	170	16.58	3.95	2	20.8
	Range	2.92	55	3.46	2.04	15	13.8
Girls 12 years	Arithmetic mean	12.79	135.85	14.42	3.09	1	11.06
	Median	12.6	130	14.9	2.5	0	10
	Standard deviation	0.64	22.53	1.30	1.70	4.06	3.93
	Coefficient of variation	5.00	16.58	9.05	55.15	406.20	35.52
	Minimum	12	110	11.08	1.5	-6	7
	Maximum	14.32	170	15.8	6.51	6	17.8
	Range	2.32	60	4.72	5.01	12	10.8
Girls 13 years	Arithmetic mean	12.57	143.57	13.97	5.34	2.33	11.43
	Median	12.2	145	14.4	3.635	2.5	8.8
	Standard deviation	1.01	17.58	1.34	5.64	7.55	5.01
	Coefficient of variation	8.04	12.25	9.63	105.50	323.75	43.85
	Minimum	11.2	110	11.9	1.2	-10	7
	Maximum	14.58	180	15.8	18.5	12	20.2
	Range	3.38	70	3.9	17.3	22	13.2
Girls 14 years	Arithmetic mean	13.35	137.6	15.09	3.9	1.66	12.1
	Median	13.3	150	15.23	3.9	-1	14.2
	Standard deviation	0.47	22.10	0.98	2.96	5.50	4.46
	Coefficient of variation	3.52	16.06	6.53	76.14	330.45	36.94
	Minimum	12.78	110	13.68	1.8	-2	7
	Maximum	14.08	160	16.34	6	8	16.6
	Range	1.3	50	2.66	4.2	10	9.6
Girls 15 years	Arithmetic mean	12.66	131.25	14.5	1.53	-10	11.75
	Median	12.99	127.5	15.05	1.53	-10	10.9
	Standard deviation	1.03	21.74	2.20	0.04	7.07	5.17
	Coefficient of variation	8.14	16.56	15.18	2.77	-70.71	44.00
	Minimum	11.16	110	11.48	1.5	-15	7
	Maximum	13.5	160	16.42	1.56	-5	18.2
	Range	2.34	50	4.94	0.06	10	11.2

- *Mureş – boys (average age: 13 years ± 1.26)*

4 x 10 m Shuttle run: the arithmetic mean is 11.79 seconds (± 1.21), and the median is 11.5 seconds; the coefficient of variation indicates a group with high homogeneity (10.32%).

Standing long jump: the arithmetic mean is 159.48 cm (± 28.71), and the median is 160 cm; the coefficient of variation indicates a group with moderate homogeneity (18%). The interpreted values demonstrate a low level of power for the assessed students.

t-Test: the arithmetic mean is 13.36 seconds (± 1.82), and the median is 12.98 seconds; the coefficient of variation indicates a group with high homogeneity (13.66%).

Stork Test: the arithmetic mean is 6.04 seconds (± 4.93), and the median 4.4 seconds; the coefficient of variation indicates a group with very low homogeneity (81.57%). The results show a low ability to maintain balance for middle school boys in Mureş County, Romania.

Flexibility Test: the arithmetic mean is 1.71 cm (± 6.72), and the median is 0 cm; the coefficient of variation indicates a group with non-existent homogeneity. The results obtained show low values of suppleness for the assessed students.

Ruffier Test: the arithmetic mean is 11.67 points (± 4.87), and the median is 10.55 points; the coefficient of variation indicates a group with very low homogeneity (41.71%). The results obtained at group level show insufficient adaptation to exercise.

- *Mureş – girls (average age: 12 years ± 1.15)*

4 x 10 m Shuttle run: the arithmetic mean is 12.79 seconds (± 0.81), and the median is 12.74 seconds; the coefficient of variation indicates a group with high homogeneity (6.34%).

Standing long jump: the arithmetic mean is 138.27 cm (± 19.46), and the median is 140 cm; the coefficient of variation indicates a group with high homogeneity (14.07%). The interpreted values demonstrate a low level of power in the assessed students.

t-Test: the arithmetic mean is 14.56 seconds (± 1.30), and the median is 14.9 seconds; the coefficient of variation indicates a group with high homogeneity (8.99%).

Stork Test: the arithmetic mean is 3.77 seconds (± 3.61), and the median is 2.51 seconds; the coefficient of variation indicates a group with very low homogeneity (95.86%). The results show a low ability to maintain balance for middle school girls in Mureş County, Romania.

Flexibility Test: the arithmetic mean is -1.35 cm (± 6.03), and the median is -1 cm; the coefficient of variation indicates a group with non-existent homogeneity. The results obtained show low values of suppleness for the assessed girl students.

Ruffier Test: the arithmetic mean is 11.93 points (± 4.45), and the median is 10.8 points; the coefficient of variation indicates a group with very low homogeneity (37.32%). The results obtained at group level show insufficient adaptation to exercise.

Table 3. Results obtained in assessment tests by residence area – Boys and girls

Statistical indicators	4 x 10 m Shuttle run (seconds and tenths)	Standing long jump (cm)	<i>t</i> -Test (seconds and tenths)	Stork Test (seconds and tenths)	Flexibility Test (cm)	Ruffier Test (points)
Boys						
Arithmetic mean	11.79922	159.4844	13.3684	6.046923	1.710526	11.6781
Median	11.5	160	12.98	4.405	0	10.55
Standard deviation	1.218084	28.71701	1.82710	4.932704	6.72192	4.87098
Coefficient of variation	10.32343	18.00616	13.6673	81.57378	392.9738	41.7103
Minimum	9.96	100	9.78	1.2	-8	4
Maximum	15.3	220	20.08	17.3	25	24.4
Range	5.34	120	10.3	16.1	33	20.4
Girls						
Arithmetic mean	12.79255	138.2745	14.5680	3.775652	-1.35714	11.9352
Median	12.74	140	14.9	2.51	-1	10.8
Standard deviation	0.81199	19.46903	1.30971	3.619716	6.038238	4.45514
Coefficient of variation	6.347365	14.07998	8.99031	95.86995	-444.923	37.3275
Minimum	11.16	110	11.08	1.2	-15	7
Maximum	14.64	180	16.58	18.5	12	20.8
Range	3.48	70	5.5	17.3	27	13.8

Discussion

Analysis of the motor characteristics of students from different development regions of Romania

Ruffier Test: For boys in grade 5, Cojocaru et al. (2015) mentioned a score of 6.92 points, which indicates good adaptation to exercise, while Tudor et al. (2020) studied a sample of boys aged 10-16 at risk of educational and social exclusion in rural areas from Western Romania, and the score obtained was 12.25 points (insufficient adaptation to exercise); in the present study, the score for boys aged 11 years is 11.08 points, which also reveals insufficient adaptation to exercise.

Ruffier Test: For girls in grade 5, Cojocaru et al. (2015) mentioned a score of 6.99 points, which indicates good adaptation to exercise, while Tudor et al. (2020) studied a sample of girls aged 10-16 at risk of educational and social exclusion in rural areas from Western Romania, and the score obtained was 11.61 points (insufficient adaptation to exercise); in the present study, the score for girls aged 10 years is 13.3 points, which also reveals insufficient adaptation to exercise.

Regarding the Ruffier Test by development region, Table 4 highlights a comparative analysis between the results achieved by boys and girls at risk of educational and social exclusion in rural areas from Western Romania, as shown in a previous study conducted by Tudor et al. (2020), and the results achieved by boys and girls at risk of educational and social exclusion in rural areas from Central Romania, according to the present study.

Table 4. *Comparative results between Western and Central Romania – Ruffier Test*

Age	Tudor et al. (2020) Western Romania	Rating scale	Present study	Rating scale
Boys				
11 years	17.23	poor adaptation to exercise	11.08	insufficient adaptation to exercise
12 years	10.77	insufficient adaptation to exercise	11.30	insufficient adaptation to exercise
13 years	10.75	insufficient adaptation to exercise	12.94	insufficient adaptation to exercise
14 years	11.8	insufficient adaptation to exercise	11.93	insufficient adaptation to exercise
15 years	11.55	insufficient adaptation to exercise	8.54	insufficient adaptation to exercise
Girls				
11 years	11.38	insufficient adaptation to exercise	13.3	insufficient adaptation to exercise
12 years	11.34	insufficient adaptation to exercise	11.06	insufficient adaptation to exercise
13 years	11.74	insufficient adaptation to exercise	11.43	insufficient adaptation to exercise
14 years	11.43	insufficient adaptation to exercise	12.1	insufficient adaptation to exercise
15 years	13.4	insufficient adaptation to exercise	11.75	insufficient adaptation to exercise

Standing long jump: Cojocaru et al. (2015) made a comparison between boys in grade 5 and boys at risk of educational and social exclusion in Mureş County, finding average scores of 140.48 cm and 139.46 cm, respectively, at the age of 11, which indicates low leg power. Morina et al. (2020) mentioned the value 167.8 cm for boys aged 13, 14 and 15 years in Kosovo and the value 157.4 cm for boys of the same age in Montenegro. At national level, the value found by Cojocaru et al. (2015) for Romanian boys in grade 5 was 142.16 cm.

Cojocaru et al. (2015) highlighted a value of 141.68 cm for girl students in grade 5 compared to girls at risk of educational and social exclusion in Mureş County, who recorded

an average value of 137.64 cm at the age of 11, which indicates low leg power. Morina et al. (2020) mentioned the value 137.9 cm for girls aged 13, 14 and 15 years in Kosovo and the value 137.7 cm for girls of the same age in Montenegro. At national level, the value found by Cojocaru et al. (2015) for Romanian girls in grade 5 was 135.85 cm.

The comparative analysis of the two tests shows that the level of adaptation to exercise in the case of students at risk of educational and social exclusion is lower than the values mentioned in previous studies. There is an exception regarding girl students from Mureş County, whose score for Standing long jump is higher than the score obtained by Romanian girls in the study conducted by Cojocaru et al. (2015).

Moreover, we believe that low levels of motor skills can be a limiting factor in the process of integrating students into the educational or social environment because of their inability to perform certain required motor tasks.

Conclusion

According to Lander et al. (2017), “physical activity levels decline significantly during adolescence and are consistently lower in girls” (p. 2498). Bardid et al. (2015) also believe that childhood competence levels in many countries are lower than desired, which is confirmed by the results obtained for all assessment tests used in the present research.

Participants with better-developed motor skills tend to be more physically active than those with less-developed motor skills (Williams et al., 2008), which is true for both urban and rural areas (Arévalo et al., 2020). This possible relationship between motor skills and participation in various physical activity programmes could be important for the social insertion of individuals. This statement can be explained by the fact that there are children who avoid physical activity if they become aware of their low level of motor skills. In contrast, children with higher motor skill levels have a tendency to participate in any kind of physical activity. The most important thing is that the physical education teacher encourages the participation of students in any type of physical activity regardless of their motor skill level. Moreover, it is important to monitor motor behaviour during childhood (Bardid et al., 2015) in order to identify optimal strategies that contribute to the motor development and educational integration of children. In team sports, cooperation between participants facilitates the social integration process (Martiniello & Madonna, 2021).

To increase student involvement in sports activities, teachers should create complex strategies and methodologies or age-appropriate competitions (Branet, 2014) but also solutions for the training of specialists at different levels, including the motor one (Stănescu, 2014), which plays a crucial role in the educational setting (Pérez-González et al., 2019).

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Authors' Contribution

All authors have equally contributed to this study and should be considered as main authors.

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