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INFLUENCE OF GENDER ON MOTRICITY IN ADOLESCENTS

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ABSTRACT. ***Introduction***: Educating motricity during adolescence is of great relevance, as it determines an improvement in physical effort capacity, experiencing new motor sensations, and enriching knowledge. ***Objective***: The study aimed to evaluate the motor capacity of a group of 139 adolescents (78 girls and 61 boys), with a mean age of 16.5 ± 0.5 years, by conducting a series of physical trials to identify possible gender-based differences. ***Methods***: We applied six physical trials to assess the level of motor performance indicators: standing long jump, push-ups, torso raises from the supine position in 30 seconds, torso extensions from the prone position on a gymnastics bench in 30 seconds, shuttle run – 5 × 10 m, and resistance running (800 m for girls and 1000 m for boys). ***Results***: Data analysis has shown a significance threshold (Sig) < 0.05 for all six dependent variables included in the research. Significant gender differences were noted in upper limb power (mean difference = 2.760), abdominal muscle power (mean difference = 3.658), and back muscle power (mean difference = 2.659). ***Conclusion***: The study has found statistically significant differences between girls and boys in terms of motricity during adolescence, and the information obtained may serve as a valuable point of reference for future research.

Keywords: motricity; physical trials; adolescents; differences; gender.

INTRODUCTION

Exercise capacity, or human biological potential, is assessed according to the level of manifestation of motor abilities, skills, and competencies. It is well known that fitness has a significant influence on motor performance, which is

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particularly important during adolescence. Indeed, in addition to enhancing exercise capacity, young people have the opportunity to experience new motor sensations and improve their knowledge regarding this area.

The essential aspects to consider in order to achieve the desired effects on motor performance include an accurate dosage of exercises throughout a routine, the observance of the required intensity and workload, and the adjustment of exercises to the individual characteristics of adolescents (Pinho et al., 2024).

We can also enhance the motor capacity of adolescents by implementing a HIIT-based exercise routine during school Physical Education classes, as proven by a study that Jovanovic et al. (2024) carried out in Serbia. Similarly, it was reported that strength and endurance exercises performed during school Physical Education classes led to higher motor performances among Spanish teenagers (Pérez-Ramírez et al., 2024).

Physical activities or exercises implemented during school classes are the most effective and, therefore, should be given more time in the daily schedules of teenagers. When conducted under the supervision of a qualified instructor, physical activity improves motor capacity, leads to the development of altruistic and prosocial behaviours among young people, and highlights the significant role of Physical Education teachers, who can thus become positive role models (Flores-Piñero et al., 2024).

In another study, Bento et al. (2022) underlined the importance of moderate to vigorous physical exercise in better motor performance. The authors recommended regular exercise as part of young people's lifestyles. It is also worth noting the study conducted by Pryimakov et al. (2023), which optimised the motor capacity of Ukrainian adolescents by including CrossFit exercises within Physical Education classes.

Faigenbaum et al. (2023) also explored the need to improve motor capacity among teenagers. They investigated this topic in the context of mitigating the risk of developing various diseases associated with sedentary behaviour. Moreover, Farías-Valenzuela et al. (2022) examined the impact of physical exercise on motor capacity among adolescents with intellectual disabilities. They found that physical exercise, in addition to increasing exercise capacity in individuals with such conditions, also had other beneficial effects that contributed to improving their quality of life.

In another study conducted by Wang (2021), data showed that boys displayed higher levels of motor capacity than girls during adolescence; this fact was proven by the results obtained in school physical fitness tests (standing long jump, sprint running, resistance running, and abdominal muscle strength).

We aimed to assess the motor capacity of 139 adolescents (78 girls and 61 boys), aged 16.5 ± 0.5 years, using physical trials designed to identify potential gender-based differences.

There is gender-based differences regarding the level of motor indices.

MATERIAL AND METHODS

The study was conducted in September 2024 at "Emil Racoviță National College" in Iași. The research participants, 139 adolescents (78 girls and 61 boys), aged 16.5 ± 0.5 years, were students at this college.

The evaluation activities were scheduled over six days and were carried out by the students both in the specially equipped gymnasium and on the school's sports field, between 10:00 and 12:00. To avoid interference effects, the tests were organised as follows

- Day 1 – Standing long jump
- Day 2 – Push-ups
- Day 3 – Torso raises from the supine position
- Day 4 – Trunk extensions
- Day 5 – Sprint running
- Day 6 – Resistance running

Participants

Before the study began, both students and their legal guardians signed a voluntary participation agreement.

The study adheres to all ethical and deontological standards of scientific research, as outlined in the *Declaration of Helsinki*, and was approved by the Scientific Research Ethics Committee of "Alexandru Ioan Cuza" University of Iași, Faculty of Physical Education and Sports, under approval number 27/30.04.2024.

Procedure

The level of motor capacity (exercise capacity) of the adolescents participating in the research was assessed through physical tests designed to evaluate the strength of the main muscle groups, running speed, and cardiorespiratory endurance, as follows:

a. Lower limb strength – Standing long jump (cm):

– Standing with feet apart behind a line, the subject bends their knees while swinging their arms backwards, then propels the trunk forward, performing

a powerful leg impulse and jumping forward, accompanied by an arm swing. Landing is made in a squat position.

The jump distance was measured with a measuring tape, recording the number of centimetres from the starting line to the heels.

Each subject performed two jumps, and the best result was recorded.

b. Upper limb strength – Push-ups:

– From the prone position, on hands and toes, the subject bends the arms at the elbow joint and returns to the starting position.

The number of correctly executed repetitions was recorded.

c. Abdominal muscle strength – Torso raises from the supine position for 30 seconds:

– From the supine position, hands placed behind the neck, knees bent at 90°, feet on the ground: torso raise followed by return to the supine position.

The number of repetitions performed within the allotted time was recorded.

d. Back muscle strength – Trunk extensions from the prone position on a bench for 30 seconds:

– From the prone position, pelvis supported on a transverse gym bench, hands behind the neck, legs fixed: trunk extension and lowering until reaching bench level.

The number of extensions performed within the time limit was recorded.

e. Running speed – 5 × 10 m shuttle run:

– The participant stands behind the starting line. At the signal, they run back and forth as fast as possible, crossing the opposite line (10 m away) with both feet each time.

The test was performed with a stopwatch, and the time was recorded in seconds and hundredths of a second.

f. Cardiorespiratory endurance – Resistance running (800 m for girls; 1000 m for boys):

– Standing start, running together over the indicated distance.

The time obtained by each participant was recorded in minutes and seconds.

Statistical analysis

The data obtained from the applied tests were entered into the IBM SPSS Statistics 20 software for processing and analysis using several statistical tools, as follows:

- The Kolmogorov-Smirnov test, used to verify the normality of the data distribution in the study, as this test is recommended for the size of the evaluated group (Table 1).
- The Independent *Samples t*-Test, used to identify possible differences between the mean values obtained by boys compared to girls concerning motor performance indices, as well as to determine the statistical significance of these values (Table 2).
- Welch's test, which was considered when the condition of homogeneity of variances was not met.

RESULTS

Table 1. Results of the **Kolmogorov-Smirnov** test for motor indices

Variables	Gender	Statistic	df	Sig.
Lower limb strength	Male	.083	61	**.200***
	Female	.081	78	**.200***
Abdominal strength	Male	.134	61	.008
	Female	.175	78	.000
Back strength	Male	.136	61	.007
	Female	.152	78	.000
Upper limb strength	Male	.308	61	.000
	Female	.169	78	.000
Movement speed	Male	.224	61	.000
	Female	.133	78	.002
Endurance	Male	.151	61	.001
	Female	.097	78	**.064**

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction
Sources: Ivaşcu & Ungurean (2025).

The results of the Kolmogorov-Smirnov test for verifying the normality of the data distribution show that the "Lower limb strength" variable has a normal distribution ($p > 0.05$) for both genders ($p = 0.200$). In contrast, the variable "Endurance" has a normal distribution only in the group of girls ($p = 0.064$). The other variables deviate from the normal distribution in both groups of subjects.

Table 2. Independent *Samples t*-Test results

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
Variable		F	Sig.	t	df	Sig. 2-tailed	Mean Diff.	Std. Error Diff.	Lower	Upper
Lower limb strength	Equal variances assumed	16.882	.000	18.065	137	.000	.295	.016	.262	.327
	Equal variances not assumed			19.340	122.747	.000	.295	.015	.264	.325
Abdominal strength	Equal variances assumed	2.975	.087	9.438	137	.000	3.658	.388	2.891	4.424
	Equal variances not assumed			9.800	136.401	.000	3.658	.373	2.920	4.396
Back strength	Equal variances assumed	.073	.787	7.002	137	.000	2.659	.380	1.908	3.410
	Equal variances not assumed			7.094	134.299	.000	2.659	.375	1.918	3.401
Upper limb strength	Equal variances assumed	31.774	.000	13.222	137	.000	2.760	.209	2.347	3.173
	Equal variances not assumed			14.202	120.404	.000	2.760	.194	2.375	3.145
Movement speed	Equal variances assumed	165.824	.000	-7.323	137	.000	-1.282	.1750	-1.628	-.9359
	Equal variances not assumed			-8.269	78.802	.000	-1.282	.1550	-1.590	-.9734
Endurance	Equal variances assumed	45.691	.000	5.383	137	.000	.0791	.0147	.0500	.1081
	Equal variances not assumed			5.827	114.453	.000	.0791	.0135	.0522	.1060

Sources: Ivașcu & Ungurean (2025).

The analysis of the data obtained shows that the significance threshold (Sig.) is < 0.05, which highlights the gender-based differences in the analysed motor performance indices.

The results of the Student's *t*-test for the following variables are presented below:

• Abdominal strength – the variances of this variable in the two groups are equal ($p = 0.087$); the means of the variable in the two groups differ significantly (MA = 23.61 for boys and MA = 19.95 for girls); $t(137) = 9.438$, $p < 0.05$, mean difference = 3.658. The difference between the means of boys and girls falls within the interval 2.891–4.424, with a 95% confidence level.

• Back strength – the variances are equal ($p = 0.787$); the mean values differ between genders (MA = 25.67 for boys and MA = 23.01 for girls); $t(137) = 7.002$, $p < 0.05$, mean difference = 2.659. The difference between the means of boys and girls ranges between 1.908 and 3.410, with a 95% confidence level.

According to Levene's test, the variances of certain variables in the two groups are not equal ($p = 0.000$). Therefore, for these variables, the results of Welch's test were considered, as it is recommended in such situations.

The variables failing to meet the condition of equal variances are as follows:

• Lower limb strength – variances are not equal ($p < 0.05$); the mean values of the variable in the two groups differ slightly (MA = 1.87 for boys and MA = 1.58 for girls); $t(122.74) = 19.340$, $p < 0.05$, mean difference = 0.295. The difference between the means of boys and girls ranges within the interval 0.264–0.325, with a 95% confidence level.

• Upper limb strength – gender-based variances are not equal ($p < 0.05$); the mean values differ significantly (MA = 9.31 for boys and MA = 6.55 for girls); $t(120.404) = 14.202$, $p < 0.05$, mean difference = 2.760. The difference between the means of boys and girls lies within the interval 2.375–3.145, with a 95% confidence level.

• Running speed – variances in the two groups are not equal ($p < 0.05$); the mean values differ slightly (MA = 19.3985 for boys and MA = 20.6806 for girls); $t(78.802) = –8.269$, $p < 0.05$, mean difference = –1.2821. The difference between the means of boys and girls ranges within the interval -1.5907 to –0.97348, with a 95% confidence level.

• Endurance – gender-based variances are not equal ($p < 0.05$); the mean values in the two groups differ slightly (MA = 4.5148 for boys and MA = 4.4356 for girls); $t(114.453) = 5.827$, $p < 0.05$, mean difference = 0.07911. The difference between the means of boys and girls falls within the interval 0.05222–0.10601, with a 95% confidence level.

DISCUSSION

In this study, the assessment of adolescents' motor capacity (MC) level revealed differences between boys and girls, which are attributed to both gender-specific characteristics at the age of 16.5 ± 0.5 years and the degree of interest in physical exercise (PE).

In this context, it is worth highlighting the study conducted in Spain by Aixa-Requena et al. (2025), which also reported gender-based differences in tests assessing several components of MC, such as the 20-meter shuttle run, as a measure of endurance. In addition, a recent study by Sheng et al. (2025) has found higher scores among boys in motor performance indices. The authors explain that girls obtained considerably lower results than boys in physical trials, on the one hand due to gender-specific traits and, on the other hand, to their lower motivation and reluctance to step out of their comfort zone.

Several schools in Switzerland implemented a project that allowed students to use gyms and sports equipment whenever their schedule allowed it, as reported in a study by Ferrari et al. (2025), with the goal of improving the MC of teenagers. Their research, aimed at evaluating adolescents' MC to point out the effects of this initiative, revealed gender differences in motor performance levels, with higher scores recorded among boys. This outcome was justified by the fact that boys took advantage of this opportunity far more than girls, thereby improving their exercise capacity.

Gender-based differences in MC among adolescents were also reported by the study carried out by Mayolas-Pi et al. (2025), which reported lower scores among girls compared to boys in physical trials.

Similar findings were obtained in Portugal by Moreira et al. (2024), who noted that boys scored higher than girls in motor performance indices following physical trials. According to the authors, this is due to the greater time invested by boys (5–7 days per week) in Physical Education, whereas girls did not exceed 2–3 sessions per week. Furthermore, girls were not satisfied with the content of school Physical Education curricula, arguing that the activities did not match their interests.

Moreover, Fernández-Galván et al. (2024), in a study conducted in Spain, found that girls outperformed boys in the sit-and-reach flexibility test. Boys, however, scored higher in the standing long jump and sprint tests; these findings are similar to those of the present study. The fact that adolescent girls are more prone to sedentary behaviour may be one of the factors accounting for gender differences in motor performance indices (Melguizo–Ibáñez et al., 2023). Also carried out in Spain, this study highlights the need to adapt physical education programs to students' preferences and characteristics as a means of encouraging participation and increasing adolescents' interest in physical exercise overall.

In China, the research study by Liu et al. (2023) reported that boys of normal weight achieved higher scores than girls within the same category in physical trials (standing long jump, sprint, pull-ups, and resistance running over 1000 m). Nonetheless, girls outperformed boys in the sit-and-reach flexibility test. The authors also emphasised that underweight girls obtained better motor test results compared to underweight boys.

Gender differences in MC were also identified by Escolar-Llamazares et al. (2023), who noted that boys were more physically active, primarily to lose weight, whereas adolescent girls tended to rely less on exercise and more on dietary control to maintain their desired weight. Although statistics indicate that teenage participation in physical activity has improved in China, interest levels still differ by gender (He et al., 2022). Girls tend to be less enthusiastic about the effects of physical exercise on their bodies. At the same time, boys proved greater consistency and determination in maintaining their exercise habits, primarily to improve their physical appearance, as noted by the authors.

Yuan et al. (2022) investigated the effects of physical exercise (PE) on specific non-cognitive abilities. They reported no significant differences between boys and girls regarding the time allocated to PE or the values obtained in several tests that assessed motor capacity (MC). Furthermore, unlike boys, girls consider PE an excellent opportunity to adjust to the school schedule, considering its role in encouraging interpersonal relationships and improving physical fitness. In addition, Pan et al. (2022) pointed out, in their study on the association between PE and the time devoted to other extracurricular activities, that boys are more prone to engaging in various physical exercises more often than girls. The interest in physical appearance, developed through specially designed exercise routines, falls within boys' sphere of interest, as they view this activity as a means of combating stress and enhancing their MC levels.

Vásquez-Gómez et al. (2021) conducted a study in Chile to assess the cardiorespiratory capacity of adolescents, including both males and females. Boys scored higher than girls, as they covered a longer distance in the endurance test, thus demonstrating a superior exercise capacity. Along the same line, we note the study by Luque-Casado et al. (2021), which pinpointed gender-based differences in the level of motor performance indices, which were again higher among boys. According to the study's findings, boys exhibit greater interest and motivation toward engaging in PE, factors that contribute to their better performance compared with girls in physical tests.

In the study conducted by Mascherini et al. (2022) on a sample of 1,915 Italian adolescents, aimed at identifying the level of manifestation of motor abilities (speed running, cardiorespiratory endurance, agility, limb strength, and joint mobility), gender differences were likewise highlighted; they were mainly attributed to biological sex characteristics. Compared to the average values recorded among European adolescents of the same age, Italian teenagers achieved better results in speed and strength trials but lower results in endurance and flexibility assessments.

Kandrac et al. (2021) carried out a study to determine the level of MC among Slovak adolescents. Based on the results obtained in several physical

trials (resistance running, standing long jump, push-ups, joint mobility, and running speed), it was found that boys scored better than girls in endurance, muscle strength, and sprint performance.

In another study, Ballarin et al. (2022) evaluated muscle strength and cardiorespiratory endurance among Italian adolescents. The results revealed differences between girls and boys in both strength and endurance indices.

CONCLUSIONS

The results of the physical trials we administered demonstrate that, during adolescence, gender influences motor capacity (MC), as statistically significant differences were found between boys and girls in terms of motor performance indices.

Studies have shown that, in general, boys outperform girls of the same age in both exercise capacity and physical development. The value of motor performance indices is higher in boys, partly due to gender-specific characteristics, partly because they tend to engage more actively in physical exercise, primarily to improve their physical appearance. On the contrary, girls often prefer to follow various diets, even at the risk of negatively affecting their general health.

At the same time, it is essential to raise awareness among adolescents regarding the beneficial effects of improving MC on the human body, with the ultimate goal of reducing gender disparities.

Given that the enhancement of MC among young people is a current and relevant topic, the information and data obtained through this study may serve as a valuable reference point for future research.

AUTHOR CONTRIBUTIONS

Both authors contributed equally. Both authors were involved in the conceptualisation, design, and application of the working methodology, as well as the software development, validation, writing, and preparation of the original draft. Both authors have read and agreed to the published version of the manuscript.

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