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A STUDY ON THE IMPACT OF SPECIAL EDUCATIONAL NEEDS ON BALANCE AND GENERAL COORDINATION IN MIDDLE SCHOOL CHILDREN IN MAINSTREAM EDUCATION

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ABSTRACT. The difficulties to integrate children with special educational needs (SEN) who attend physical education and sports classes in mainstream education endanger the achievement of school physical education objectives, with long-term effects, lack of movement leading to posture deficiencies, worsening of general health, low self-esteem, and deficient morpho-functional parameters. As more and more parents choose mainstream education for students with SEN, the need to identify solutions that help to integrate these children, including physical education classes too, becomes acute. The purpose of this study is to analyze whether there are differences between the results obtained by middle school children, with or without SEN, from the mainstream education system, in tests on static balance and general coordination. The study, which was conducted between April and June 2025, at the "Grigore Ghica Voievod" Secondary School in Suceava, involved 111 students (44 girls and 67 boys), of whom 19 had SEN (8 girls and 11 boys). The Flamingo Test was used for static balance, and the Matorin Test for general coordination. From the analysis of the results obtained, differences were observed between the two groups, with children without SEN recording higher motor parameters. The results obtained have confirmed previous research showing that special educational requirements affect balance and general coordination.

Keywords: special educational needs; static balance; general coordination.

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INTRODUCTION

Recent studies have drawn attention to the difficulties of integrating children with special educational needs (SEN) into mainstream education (Mag, 2023) in Romania. In particular, integration problems also occur in children with SEN who attend physical education and sports classes in mainstream education. Integration problems endanger the achievement of school physical education objectives, with long-term effects, i.e. lack of movement leading to poor posture, worsening of general health, low self-esteem, and deficient morpho-functional parameters (Dante et al., 2020).

The term Special Educational Needs (SEN) first appeared in Great Britain in the Warnock Report (1978). The concept was adopted by UNESCO in the 1990's and referred to the additional educational needs of certain categories of people in difficulty.

In June 1994, the Salamanca Declaration on Special Education, adopted after the UNESCO World Conference, affirmed the right to education, in an inclusive educational system, for every child with SEN, without discrimination and on an equal basis with other children.

Approximately 25 years after the Salamanca Declaration (UNESCO, 1994), there is a increasing trend towards educating students with SEN in mainstream schools (European Agency for Special Needs and Inclusive Education, 2018). In Europe, 4.4% of all students have confirmed SEN, and almost a third of them were educated together with their peers without SEN (Tommetten et al., 2021). In the USA, students with SEN represent 14.5% of all students attending public schools, and in the UK, 13% of students with SEN study in mainstream schools.

As in Romania there is a growing trend of educating students with SEN in mainstream schools too, the need to identify solutions that help to integrate these children, including in physical education classes, is acute. The subject is of great relevance in most states that have adopted the principles of the Salamanca Declaration, a significant increase in the presence of scientific publications on inclusion in physical education being reported in the last 10 years, mainly from countries such as the USA, Brazil and Spain (Marín-Suelves & Ramón-Llin, 2020). In order to diversify the range of solutions for integrating children with SEN in physical education and sports classes in mainstream education, we resolved to analyze whether *SEN of middle school students can influence the results in motor tests*. Static balance and general coordination were tested.

Therefore, we believe that this research will contribute to strengthening the scientific basis in the field and will provide useful information for the integration of children with SEN in physical education classes within mainstream education.

MATERIAL AND METHODS

Participants

The study was conducted between April and June 2025, at the "Grigore Ghica Voievod" Secondary School in Suceava.

The research subjects are secondary school students, enrolled at this school, with and without SEN, attending mainstream education.

The assessment of motor parameters was carried out on all secondary school students (grades V - VIII), i.e. 111 students (44 girls and 67 boys), of which 19 with SEN (8 girls and 11 boys).

The research subjects are of different ethnicities and religious denominations. They, together with their parents or legal guardians, gave their consent to participate in the research.

The testing of motor parameters was carried out according to the methodology, in the gym at the "Grigore Ghica Voievod" Secondary School in Suceava, during physical education classes, with the joint participation of students with and without SEN.

Procedure

a. Static balance – it was assessed using the Flamingo Test

The Flamingo Test is a component of the Eurofit battery of tests designed to assess balance and fitness. This test focuses specifically on assessing an individual's ability to maintain balance on one leg, imitating the stance of a flamingo bird.

It is widely used due to its simplicity, low cost, and applicability for mass testing across different age groups and populations.

The test is part of a broader set of assessments within the Eurofit battery, which includes other measures of fitness such as flexibility, strength, and endurance.

The Flamingo Test is often used in educational and sports settings to assess balance and postural stability.

Description:

The Flamingo Test requires the participant to stand on one leg, bending the free leg back and holding the leg with the hand on the same side, resembling the position of a flamingo. The objective is to maintain this position for as long as possible without losing balance (Barabas *et al.*, 1996).

b. General coordination – it was assessed using the Matorin Test

The Matorin Test is a method used to assess general coordination in students, focusing specifically on motor skills. This test is part of a broader effort to assess motor coordination, which is crucial for physical education and the overall development of students.

The Matorin Test, along with other coordination assessments, provides information about students' physical capabilities and their potential impact on academic performance.

Description:

A circle with a diameter of 40 cm is drawn on the ground. The athlete is then placed inside the circle, with the soles on either side of the diameter. The subject performs a vertical take-off, with a twist around the longitudinal axis of the body. The test is performed twice, to the left and to the right. The number of degrees is measured. If the athlete lands outside the circle, the test can be repeated only once.

Data analysis

Statistical analysis of the collected data was performed using SPSS V.26.0.

The Levene Test shows us that the variances of the Static Balance variable are not equal in the two groups (Sig. = 0.039), which is why under these circumstances we will consider the results of the Welch Test.

In the case of the Total Coordination variable, we will consider the results of the Independent-Samples T Test, because the Levene Test showed us that in this case the variances of the dependent variable in the two groups are equal (Sig. = 0.177).

We must also note that for all the variables analyzed, the significance threshold (Sig.) is < 0.05, which demonstrates that there are differences in the motor indices analyzed, depending on the SEN.

RESULTS

To test the hypothesis "The SEN of middle school students can influence the results in motor tests" we used the Kolmogorov-Smirnov statistical test to verify the normality of the data distribution for each group of subjects (Table 1) – descriptive statistics generated information regarding the mean value of the motor indices tested, both in subjects with SEN and those without SEN (Table 2), the Independent-Samples T Test was applied to identify possible differences

between the means obtained by subjects with SEN compared to those without SEN, while the Welch Test was used when the condition of homogeneity of variances was not met (Table 3).

Table 1. Kolmogorov-Smirnov test values for motor tests

		Kolmogorov-Smirnov			Shapiro-Wilk		
	Special Educational Needs	**Statistic**	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Static	without SEN	.111	92	.007	.973	92	.050
balance	with SEN	.169	19	**.158**	.944	19	.309
Total	without SEN	.110	92	.008	.959	92	.006
coordination	with SEN	.244	19	.004	.771	19	.000

The results of the test for normality of data distribution demonstrate that the Static Balance variable has a normal distribution (Sig. > 0.05) in the group of subjects with SEN (p = 0.158). The other variables have values that are different from the normal distribution in both groups of subjects.

Table 2. Mean values of motor indices in subjects with and without SEN

	Special Educational Needs	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
Static balance	with SEN	19	**22.42**	2.545	.584
	without SEN	92	**16.89**	3.921	.409
Total	with SEN	19	**433.16**	87.816	20.146
coordination	without SEN	92	**600.76**	95.359	9.942

From the analysis of the data presented in Table 2, we can observe differences between the averages obtained in the motor indices of the group of subjects with SEN, compared to the group of subjects without SEN.

Next, we will present the results of the Independent-Samples T Test. We decided to apply this test, even though the Kolmogorov-Smirnov test showed that the condition of normality of the distribution of the analyzed data was not fully respected, because the Independent-Samples T Test is sufficiently robust as to the violation of this condition. Also, the Welch Test is sufficiently robust as to the violation of the condition of normality of the distribution of the analyzed data.

Table 3. Independent Samples Test results for motor indices, function of SEN

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Static balance	Equal variances assumed	4.343	.039	5.885	109	.000	5.530	.940	3.667	7.392
	Equal variances not assumed			**7.757**	**38.149**	**.000**	**5.530**	**.713**	**4.087**	**6.973**
Total coordination	Equal variances assumed	1.849	.177	**-7.064**	**109**	**.000**	**-167.603**	**23.727**	**-214.628**	**-120.578**
	Equal variances not assumed			-7.460	27.512	.000	-167.603	22.466	-213.659	-121.547

The Levene Test shows us that the variances of the Static Balance variable are not equal in the two groups (Sig. = 0.039), which is why under these circumstances we will consider the results of the Welch Test.

In the case of the Total Coordination variable, we will consider the results of the Independent-Samples T Test, because the Levene Test showed us that in this case the variances of the dependent variable in the two groups are equal (Sig. = 0.177).

We must also note that for all the variables analyzed, the significance threshold (Sig.) is < 0.05, which demonstrates that there are differences in the motor indices analyzed, depending on the SEN.

Static balance: we used the Welch Test because the variances are not equal (Sig < 0.05), the means of the variable in the two groups are different (MA = 16.89 for ss. without SEN and MA = 22.42 for ss with SEN), *t* value (38.149) = 7.757, Sig. < 0.05, **diff. of means = 5.530**, the difference in the mean between subjects with SEN and those without SEN is in the range of 4.087 – 6.973, with a confidence level of 95%.

Total Coordination: we used the Independent-Samples T Test because the variances are equal (Sig. = 0.177), the means of the variable in the two groups are different (MA = 600.76 for without CES and MA = 433.16 for with CES), t value (109) = -7.064, Sig. < 0.05, **diff. means = -167.603**, the difference in the mean between subjects with SEN and those without SEN is in the range -214.628 – -120.578, with a confidence level of 95%.

From the analysis of the results obtained in the research we conducted, differences between the two groups can be observed with regard to motor indices, an aspect that demonstrates that hypothesis was accepted.

DISCUSSION

Special Educational Needs (SEN) have a significant impact on static balance and general coordination, as shown by various studies focusing on children with various disabilities. These studies highlight the challenges that children with SEN encounter in maintaining balance and coordination, as well as potential interventions that can improve these skills. Research highlights the importance of personalized physical education programs and specific training exercises to improve balance and coordination in children with disabilities.

A study shows that students with SEN display notable postural dysfunctions. Children with SEN show poorer balance in various conditions compared to their peers, indicating a significant impact on their static balance skills (Nunzi et al., 2018).

Intellectual disabilities contribute to poorer balance skills as well, which can delay motor development and limit functional levels. Psychomotor education programs have been shown to improve static balance in children with intellectual disabilities (Fotiadou *et al.*, 2017).

Visual impairments affect balance due to the critical role of vision in maintaining posture and executing motor skills. Children with visual impairments often experience reduced physical activity due to their fear of falling, which can further impair their balance and coordination (Metgud & Honap, 2016).

Physical activation programs have been proven to be effective in improving both static and dynamic balance in students with SEN. These programs, which focus on proprioceptive stimulation, have demonstrated significant improvements in balance among students with a variety of disabilities, including intellectual, visual, and hearing impairments (Parvu et al., 2023).

Dynamic neuromuscular stabilization exercises have been beneficial for students with intellectual disabilities, leading to significant improvements in both static and dynamic balance (Dehghani et al., 2023).

Special balance training programs have demonstrated improvements in balance performance among students with SEN, suggesting that such programs can be integrated into the physical education curriculum to improve balance capabilities (Çankaya et al., 2015).

In spite of the benefits of specific interventions, some challenges still remain in addressing balance and coordination problems in children with

disabilities. For example, children with SEN may not exhibit balance problems under normal conditions, but experience difficulties in new or unsupervised situations, indicating the need for more nuanced interventions (Geuze, 2005).

The relationship between static balance and fundamental motor skills in children with visual impairments is complex, with studies that show no significant correlation, suggesting that other factors may influence the development of motor skills in these children (Metgud & Honap, 2016).

Although interventions such as core motor activation and psychomotor education programs have proven to be promising in improving balance and coordination in children with special educational needs, the efficiency of these programs may vary depending on the type and severity of the disability. In addition to this, the small sample sizes and short durations of some studies suggest that further research is needed to generalize findings and optimize intervention strategies. Understanding the specific needs and challenges of each disability is paramount for developing effective educational and training programs that can improve balance and coordination in children with special educational needs.

CONCLUSIONS

The analysis of the results obtained in the motor tests showed statistically significant differences between the group of students with SEN and that of students without SEN. Our results are also supported by the technical literature in the field.

This study also highlights the need for strategies that bring children with SEN closer to physical activities. The benefits of physical activity on the health of children with SEN are presented in more and more studies, and physical education classes represent a good opportunity to step up in order to increase the quality of life of the children with SEN enrolled in the mainstream education system.

The involvement of teachers, parents and social support are indicated as beneficial psychosocial resources for the integration of children with SEN in the physical education class in mainstream education.

AUTHOR CONTRIBUTIONS

Author 1 and author 2 contributed to the design and implementation of the research, to the analysis of the results and to the writing of the manuscript. All authors have read and agreed to the published version of the manuscript.

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