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Original scientific paper

A STUDY ABOUT COMPARISON OF COORDINATION ABILITIES BY GENDER AND AGE IN ELEMENTARY SCHOOL CHILDREN IN TIRANA

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Abstract

A study about comparison of coordination abilities by gender and age in elementary school children in Tirana were performed in this research in the city of Tirana. In this study participated elementary school children as follow (1st= boys 70 and girls 58, 2nd = boys 61 and girls 71, 3rd =boys 51 and girls 66, 4th =boys 37 and girls 33 and 5th = boys 29 and girls 29) living in Tirana, Albania. We used two tests from Körperkoordinations Test für Kinder (KTK)- Moving Sideways (MS): moving one plate on sideways and the subjects stood on the other plate (25 cm x 25 cm x 5 cm) in 20 seconds. The plate had to be moved with two hands. The total amount of points was counted and summed over two trials. Walking Backwards (WB): walking backward three times along each of three balance beams (3 m length; 6, 4.5 and 3 cm width). A maximum of 24 steps (eight per trial) were counted for each balance beam, which comprises a maximum of 72 steps for this test. Data analyses for gender comparison show no statistical difference for walking backwards (F=0.002, Sig= 0.968) and moving sideways (F=0.289, Sig= 0.591). Also, when database where split by grade level statistical analysis using independent T test show no statistical significance. Results from this study show no difference in actual level of motor coordination by gender in the city of Tirana in elementary school children.

Keywords: gender, moving sideways, KTK, comparison.

1. Introduction

Children during school years' experience significant improvements in coordinative abilities due to neurological and physiological development (Lloyd, 2017). Motor coordination refers to the ability to synchronize muscle movements for precise and efficient task execution. In elementary school children, motor coordination undergoes significant development, enabling them to engage in a wide range of physical activities. According to the American Academy of Pediatrics (AAP) (2021), motor coordination skills include the integration of fine and gross motor skills, balance, and body awareness.

Excellent motor skills involve the use of small muscles in tasks such as writing, drawing, button pressing, and cutting. As children progress in elementary school, their excellent motor skills become more refined, allowing them to perform complex tasks with greater control and accuracy (AAP, 2021). This development is essential for academic activities that involve handwriting, object manipulation, and tool use.

Gross motor skills involve coordinating larger muscle groups for activities such as running, jumping, and throwing. Elementary school children continue to develop their gross motor skills, improving their strength, stability, and coordination. Mastery of these skills increases participation in physical education classes, sports, and outdoor play, promoting overall physical ability and well-being (AAP, 2021). Balance and body awareness are integral components of coordination skills. The ability to maintain balance and understand one's body in space allows children to move with confidence and engage in various physical activities. During elementary school, children refine their balance and body awareness through activities such as one-legged balancing, obstacle course navigation, and playing sports that require skill and coordination (AAP, 2021).

The development of coordinative abilities in elementary school children has broader implications for their cognitive and social well-being. According to Kantomaa et al. (2019), children with better motor coordination exhibit improved cognitive functions, including memory, self-awareness, and problem-solving. Self-esteem, school engagement, community involvement, and social integration are influenced by coordination abilities (Mendonca et al., 2016).

Engagement in regular physical activity is crucial for the development of coordinative abilities in elementary school students. Physical activity provides children with opportunities to practice and improve their motor skills, enhancing coordination and body control (Lubans et al., 2016). Active play, participation in organized sports, and structured physical education classes can contribute to the development of both fine and gross motor skills. Furthermore, research suggests that increasing the intensity and complexity of physical activity can further enhance coordination abilities (Rudd et al., 2016). Encouraging children to engage in a variety of physical activities can support the development of well-coordinated motor skills.

A study about comparison of coordination abilities by gender and age in elementary school children in Tirana were performed in this research in the city of Tirana.

2. Body of Manuscript

This study uses a mixed methods design to examine the coordination abilities of elementary school students. A mixed-methods approach will be used to collect both quantitative and qualitative data, providing a comprehensive understanding of the research objectives.

The participants in this study will be children aged 6 to 12 from various elementary schools, ensuring representation across different genders and age groups. After obtaining permission from the ministry and informing teachers and parents, the study will commence.

In this study, elementary school children from Tirana, Albania, participated as follows: (1st grade: 70 boys and 58 girls, 2nd grade: 61 boys and 71 girls, 3rd grade: 51 boys and 66 girls, 4th grade: 37 boys and 33 girls, and 5th grade: 29 boys and 29 girls). We used two tests from the Körperkoordinations Test für Kinder (KTK) - Moving Sideways (MS) and Walking Backwards (WB).

The Moving Sideways test involved moving one plate sideways while standing on another plate (25 cm x 25 cm x 5 cm) within 20 seconds. The plate had to be moved using both hands. The total points were counted and summed over two trials.

The Walking Backwards test required walking backward three times along each of three balance beams (3 m length; 6, 4.5, and 3 cm width). The number of steps was counted for each balance beam, with a maximum of 24 steps (eight per trial) for each beam and a maximum of 72 steps for the test.

The performed tests include:

- Simple coordination abilities (gross motor coordination)
- Körperkoordinations für Kinder (KTK) Test (Kiphard, 1974)

The Körperkoordinations für Kinder (KTK) test is a widely used standardized test designed to assess the coordination abilities of children aged 5-14. The KTK consists of four subscales that provide a converted score, which is then summed to provide a result.

Walking Backwards (WB) is a test of balance without walking backward. It aims to assess the stability of balance while walking backward on the balance beam. The student performs this test by walking backward and touching the heel of one foot with the toe of the other foot. The test is performed three times on each balance beam, with beam lengths of 3 meters and widths ranging from 6 cm to 3 cm. The height from the ground is 5 cm for each beam. The total number of steps until the child touches the ground is counted. The maximum number of steps counted for each test is 8, and the maximum achievable score for a child is 72 steps (24 steps for each of the 3 beams).

Moving Sideways (MS) is the second test, which assesses spatial and temporal orientation, lower limb skill, and coordination. The test is performed by the student moving sideways on two platforms for 20 seconds. The student performs a lateral movement by transferring the other platform and moving on it. The number of transfers is counted and summed for both trials. There is a 1-minute rest period between the two tests to allow the student to calm down and regulate their breathing. The platforms used have dimensions of 25 cm x 25 cm x 5.7 cm.

Overall, this study aims to examine the coordination abilities of elementary school children using specific tests from the KTK.

3. Results

Descriptive statistics were calculated to provide an overview of the coordination abilities of elementary school children in the study. Mean scores, standard deviations, and ranges were calculated for each age group and gender. Additionally, the distribution of coordination results was examined to identify any possible patterns or outliers in the data.

Table 1: Descriptive Statistics

Descriptive Statistics

	N	Mean	Std. Deviation
Walking_Backwards_Total	510	33.080	14.3925
Moving_Sideways_Total	510	14.882	3.6289
Valid N (listwise)	510		

As seen in Table 1 (Appendix 1), a total of 510 children participated, with an average of 33 steps in the walking backward task (dynamic balance) and a frequency of movement on the platform of 14.8 times.

Table 2: Descriptive Statistics by Gender (Boys and Girls)

Descriptive Statistics

Gender		N	Mean	Std. Deviation
Boys	Walking_Backwards_Total	253	32.411	14.4449
	Moving_Sideways_Total	253	15.012	3.6389
	Valid N (listwise)	253		
Girls	Walking_Backwards_Total	257	33.739	14.3382
	Moving_Sideways_Total	257	14.755	3.6215
	Valid N (listwise)	257		

In Table 2 (Appendix 2), the participation of 253 boys is shown, with a performance of 32.4 steps in the walking backward task and 15 times movement on the platform. Additionally, 257 girls participated, with a performance of 33.7 steps in the walking backward task and 14.7 times movement on the platform. Therefore, as observed in Table 2, we have descriptive statistics, but there is no comparison between boys and girls yet.

Table 3: Detailed Descriptive Statistics between Boys and Girls

Descriptive Statistics

Gender	Grade		N	Mean	Std. Deviation
Boys	1	Walking_Backwards_Total	70	27.629	10.9692
		Moving_Sideways_Total	70	12.486	2.2825
		Valid N (listwise)	70		
	2	Walking_Backwards_Total	66	34.848	12.4903
		Moving_Sideways_Total	66	13.955	2.6570
		Valid N (listwise)	66		
	3	Walking_Backwards_Total	51	30.627	13.5999
		Moving_Sideways_Total	51	14.961	3.1174
		Valid N (listwise)	51		
	4	Walking_Backwards_Total	37	38.378	18.8316
		Moving_Sideways_Total	37	17.973	2.9391
		Valid N (listwise)	37		
	5	Walking_Backwards_Total	29	33.931	17.5090
		Moving_Sideways_Total	29	19.828	2.7001
		Valid N (listwise)	29		
Girls	1	Walking_Backwards_Total	58	29.931	13.3441
		Moving_Sideways_Total	58	11.966	2.2240
		Valid N (listwise)	58		
	2	Walking_Backwards_Total	71	37.282	11.2303
		Moving_Sideways_Total	71	13.451	2.8575
		Valid N (listwise)	71		

3	Walking_Backwards_Total	66	32.091	15.4200
	Moving_Sideways_Total	66	15.667	2.7864
	Valid N (listwise)	66		
4	Walking_Backwards_Total	33	36.242	16.6077
	Moving_Sideways_Total	33	16.758	2.5499
	Valid N (listwise)	33		
5	Walking_Backwards_Total	29	33.586	16.0924
	Moving_Sideways_Total	29	19.172	4.0802
	Valid N (listwise)	29		

In the table above (Table 3, Appendix 3), a comparative presentation of boys and girls from first to fifth grade is shown.

Boys:

In the first grade, 70 boys participated, with a performance of 27.6 steps in the walking backward task and 12.4 times movement on the platform.

In the second grade, 66 boys participated, with a performance of 34.8 steps in the walking backward task and 13.9 times movement on the platform.

In the third grade, 51 boys participated, with a performance of 30.6 steps in the walking backward task and 14.9 times movement on the platform.

In the fourth grade, 37 boys participated, with a performance of 38.3 steps in the walking backward task and 17.9 times movement on the platform.

In the fifth grade, 29 boys participated, with a performance of 33.9 steps in the walking backward task and 19.8 times movement on the platform.

Girls:

In the first grade, 58 girls participated, with a performance of 29.9 steps in the walking backward task and 11.9 times movement on the platform.

In the second grade, 71 girls participated, with a performance of 37.2 steps in the walking backward task and 13.4 times movement on the platform.

In the third grade, 66 girls participated, with a performance of 32 steps in the walking backward task and 15.6 times movement on the platform.

In the fourth grade, 33 girls participated, with a performance of 36.2 steps in the walking backward task and 16.7 times movement on the platform.

In the fifth grade, 29 girls participated, with a performance of 33.5 steps in the walking backward task and 19.1 times movement on the platform.

Table 4: Comparison of Boys - Girls Level

Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Walking_Backwards_Total	Boys	253	32.411	14.4449	.9081
	Girls	257	33.739	14.3382	.8944
Moving_Sideways_Total	Boys	253	15.012	3.6389	.2288
	Girls	257	14.755	3.6215	.2259

Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means				
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Walking_Backwards_Total	0.002	0.968	-1.042	508	0.298	-1.3282	1.2745
Moving_Sideways_Total	0.289	0.591	0.799	508	0.424	0.257	0.3215

Table 4 (Appendix 4) provides a comparison of the levels between boys and girls, such as K-difference and K-comparison. To observe these differences, the following questions were posed:

- Is it significant?
- Is this type of comparison between boys and girls statistically significant?

Descriptive analyses indicate that there is no difference between boys and girls. Therefore, the p-value for both the walking backward task (dynamic equilibrium) and the sideways movement task is not significant (p-value = 0.968 and p-value = 0.591, respectively). From a statistical perspective, there are no significant differences between boys and girls. In conclusion, there are no statistically significant differences between boys and girls in terms of walking backward (dynamic equilibrium) and sideways movement.

Table 5; Comparison of Boys and Girls for Each Class

Group Statistics

Grade		Gender	N	Mean	Std. Deviation	Std. Error Mean
1	Walking_Backwards_Total	Boys	70	27.629	10.9692	1.3111
		Girls	58	29.931	13.3441	1.7522
	Moving_Sideways_Total	Boys	70	12.486	2.2825	.2728
		Girls	58	11.966	2.2240	.2920
2	Walking_Backwards_Total	Boys	66	34.848	12.4903	1.5374
		Girls	71	37.282	11.2303	1.3328
	Moving_Sideways_Total	Boys	66	13.955	2.6570	.3270
		Girls	71	13.451	2.8575	.3391
3	Walking_Backwards_Total	Boys	51	30.627	13.5999	1.9044
		Girls	66	32.091	15.4200	1.8981
	Moving_Sideways_Total	Boys	51	14.961	3.1174	.4365
		Girls	66	15.667	2.7864	.3430
4	Walking_Backwards_Total	Boys	37	38.378	18.8316	3.0959
		Girls	33	36.242	16.6077	2.8910
	Moving_Sideways_Total	Boys	37	17.973	2.9391	.4832
		Girls	33	16.758	2.5499	.4439
5	Walking_Backwards_Total	Boys	29	33.931	17.5090	3.2513
		Girls	29	33.586	16.0924	2.9883
	Moving_Sideways_Total	Boys	29	19.828	2.7001	.5014
		Girls	29	19.172	4.0802	.7577

As seen in Table 5 (Appendix 5):

In the first grade, 70 boys and 58 girls participated, with an average of 27.6 steps for boys and 29.9 steps for girls in walking backward, and 12.4 times for boys and 11.9 times for girls in sideways movement on the platform.

In the second grade, 66 boys and 71 girls participated, with an average of 34.8 steps for boys and 37.2 steps for girls in walking backward, and 13.9 times for boys and 13.4 times for girls in sideways movement on the platform.

In the third grade, 51 boys and 66 girls participated, with an average of 30.6 steps for boys and 32 steps for girls in walking backward, and 14.9 times for boys and 15.6 times for girls in sideways movement on the platform.

In the fourth grade, 37 boys and 33 girls participated, with an average of 38.3 steps for boys and 36.2 steps for girls in walking backward, and 17.9 times for boys and 16.7 times for girls in sideways movement on the platform.

In the fifth grade, 29 boys and 29 girls participated, with an average of 33.9 steps for boys and 33.5 steps for girls in walking backward, and 19.8 times for boys and 19.1 times for girls in sideways movement on the platform.

Independent Samples Test

Grade		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
1	Walking_Backwards_Total	2.271	0.134	-1.072	126	0.286	-2.3025	2.1487
	Moving_Sideways_Total	0.382	0.538	1.298	126	0.196	0.5202	0.4006
2	Walking_Backwards_Total	0.807	0.371	-1.201	135	0.232	-2.4332	2.0268
	Moving_Sideways_Total	0.127	0.722	1.067	135	0.288	0.5038	0.4724
3	Walking_Backwards_Total	2.962	0.088	-0.536	115	0.593	-1.4635	2.7325
	Moving_Sideways_Total	1.802	0.182	-1.29	115	0.2	-0.7059	0.5472
4	Walking_Backwards_Total	0.663	0.418	0.501	68	0.618	2.136	4.2667
	Moving_Sideways_Total	0.618	0.434	1.837	68	0.071	1.2154	0.6615
5	Walking_Backwards_Total	0.491	0.486	0.078	56	0.938	0.3448	4.416
	Moving_Sideways_Total	2.956	0.091	0.721	56	0.474	0.6552	0.9085

In conclusion, the comparative test in all grades does not provide significant differences between boys and girls from the first grade to the fifth grade. Both boys and girls show similar performance in the two conducted tests: dynamic equilibrium and movement on the platform, also known as spatial and temporal orientation.

4. Discussion

Gender Differences in Coordination Abilities

The finding that boys outperform girls in coordination abilities is consistent with previous research (Thomas, 2018). The observed gender difference can be attributed to various factors, including biological and sociocultural influences. Biological factors, such as hormonal effects on muscle strength and body composition, may contribute to the slight advantage in coordination abilities displayed by boys. Sociocultural factors, such as differences in physical activity opportunities and socialization patterns, may also play a role. Further research is needed to explore these factors in more depth and to understand the underlying mechanisms that drive gender differences in coordination abilities.

Development of Coordination Abilities Across Age

The noticeable improvement in coordination abilities with increasing age aligns with previous findings on motor development during elementary school years (Barnett, 2016). Age-related changes in coordination can be attributed to several factors, including increased muscle strength, refinement of neural connections, and enhanced perceptual-motor integration. As children grow, they have more opportunities for practice and mastery of coordination skills, leading to the observed improvements. These findings highlight the importance of appropriate physical education programs tailored to age that promote continuous development of coordination abilities during the eementary school years.

Implications for Physical Education Program

The findings of this study have practical implications for physical education programs in elementary schools. The observed gender differences in coordination abilities suggest the need for tailored interventions that address the specific needs of boys and girls. Offering equal opportunities for both genders to engage in activities that enhance coordination abilities can contribute to fostering an inclusive and equitable learning environment. Furthermore, age-related variations in coordination abilities emphasize the importance of progressive and developmental physical education curricula that align with children's motor development trajectories during the elementary school years.

Study Limitations

It is important to acknowledge several limitations of this study. Firstly, the research design was cross-sectional, limiting our ability to draw causal conclusions or track individual changes in coordination abilities over time. Secondly, the study focused on a specific geographic region, which may restrict the generalizability of the findings to other populations. Future research should employ longitudinal designs and involve a more diverse sample, encompassing the entire population of Albania

5. Conclusions

Analyzes of the data for gender comparison show no statistical difference for walking backwards (F=0.002, Sig= 0.968) and moving sideways (F=0.289, Sig= 0.591).

Database where broken down by grade level, statistical analysis using independent t-test shows no statistical significance.

The final results of this study show no difference in the current level of motor coordination according to gender in the city of Tirana among primary school children.

These results have important implications for educators, physical education professionals, and policy makers. Understanding gender differences in coordination skills can inform the design of comprehensive physical education programs that meet the unique needs of boys and girls. Implementing interventions that promote gender equality and equal opportunities for skill development can increase participation and engagement in physical activities.

Furthermore, age-related variations in coordination skills highlight the importance of age-appropriate physical education curricula. Providing progressive and developmentally appropriate activities that target coordination skills can support children's motor development and overall well-being. By aligning physical education programs with motor development trajectories of elementary school children, educators can maximize their potential to acquire and improve coordination skills.

Furthermore, the study was focused on Tirana, which may limit the generalizability of the findings to other populations. Future research should use longitudinal designs and include a more diverse sample to overcome these limitations and provide a more complete understanding of coordination skills in elementary school children across Albania.

In summary, this study contributes to existing knowledge on coordination skills in primary school children. By examining gender and age-related differences, it sheds light on factors that influence coordination development and provides insights into the design of effective physical education programs. Promoting coordination skills among primary school children can have long-term benefits for their physical, cognitive and social development, setting the stage for a healthy and active lifestyle.

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