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DEVELOPPING THE ENDURANCE MOTOR QUALITY THROUGH POSSESSION GAMES IN STUDENTS OF THE HIGH SCHOOL FOOTBALL TEAM

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Abstract

The aim of the study is to develop the motor quality of endurance in the students who are members of the high school football team by applying a training program based on possession games.

The researched subjects are students of the "Mircea Eliade" High School, the experimental group and of the "Vasile Alecsandri" High School, the control group, 12 for each team. To evaluate the subjects, we applied the following specific tests: long run; shuttle run 10x30 meters; number of passes in one minute. To perform the statistical analysis of the data, we used the IBM SPSS Statistics software package, version 28. For all the chosen statistical tests, we chose a significance threshold $\alpha = 0.05$.

The differences found between the initial and final tests for both groups under research support the idea of consistent accumulations in terms of the development of endurance motor quality. On considering the recorded results, it can be observed that through the use of possession games, the statistical analysis showed superior performance of the students in the experimental group compared to the students in the control group ($p<0.05$).

Introduction

Most students are not attracted to physical training, much less wanting to actively participate. This finding should convince teachers to integrate the ball as often as possible into physical exercises. This increases interest and engages students in the phases of ball motion to replicate the reality of a soccer match. [8]

Endurance is the first quality to improve. This notion of endurance is particularly well defined by Zatsiorsky who describes it as the ability to carry out, over a prolonged period, an activity of a given intensity without losing efficiency. Then comes power through its two components, which are strength and speed. [3]

Whoever practices the game of football at the high school team level needs a specific endurance based on the application of game situations. (1) A game-based exercise, such as the possession drill, is able to comprehensively exercise the specific endurance required for the student's athletic performance. With this method, the specific endurance capacities required by the game of soccer are comprehensively trained. [8,12]

The distinctive value of resistance training based on possession games lies above all in continuous confrontation with the opponent, which causes a singular improvement of the functions of all systems involved, which would never be achieved through ordinary training. [1,9]

The game-based training method, i.e. game-integrated resistance training, represents the most comprehensive training method because it exercises all the skills needed to play football at the same time. [5,6,2]

For the development of endurance it is advisable to set up training situations that must imperatively refer to the following control parameters: the intensity of the action; the duration of the action; the recovery time; the quality of recovery; the amount of actions. Possession games provide all these. [11,7] Possession games are games played on a limited surface training the ability of players to interact regardless of their role and position in the team. [14]

Training consists of a combination of activities through which we try to achieve an improvement in performance and postpone the moment of fatigue. In practice, training manifests itself as a systematic and rational repetition of certain movements and behaviors with the aim of obtaining an improvement in performance. [13]

Material- Method

The aim of the work is to develop the motor quality and endurance of the students who make up the representative high school football team by applying a training program based on possession games.

The researched subjects were students at the "Mircea Eliade" High School, the experimental group and at the "Vasile Alecsandri" High School, the control group, 12 for each team. The experimental research took place on the fields of the high schools, under similar training conditions. The training program was applied in the 2023-2024 school year, during the 5 modules, excluding holidays. The research was divided into the following stages: stage 1- the initial assessment; stage 2- application of the training program based on possession games for the experimental group, while the control group used a program specific to athletics; stage 3- the final assessment; stage 4 - interpretation of results and conclusions.

To evaluate the subjects, we applied the following tests specific to the educational cycle:

1. Long run - subjects will be placed at a start line marked by the examiner and will be subjected to a run test lasting for 4 minutes. During these 4 minutes, the examiner will quantify the distance run by the subject.

2. Shuttle run 10x30 m - the test is performed with a standing start, the student is placed behind the starting line. After the sound signal, the student goes to the marked line that is 30 m away, he crosses it with both feet and returns to the line he started from. We count the time elapsed from the first movement to the moment it completes the 30-meter movement 10 times. The result is recorded in minutes and seconds.

3. Number of passes – the student faces the wall, at a distance of 3 meters and waits for the teacher's signal. After receiving the signal, they must send the ball consecutively (for one minute) into the wall. The ball is hit only behind the 3-meter line. A reception of the ball can also be used if appropriate. The valid result is given by the number of executions in one minute.

The following research methods were used: the specialized literature analysis, the observation, the experiment, measurement and testing methods, the statistical-mathematical method, the graphical method and tabular representation methods. [4] For the statistical analysis we used IBM SPSS Statistics, version 28. The paper is meant to compare the results obtained in the physical tests of the two groups of students who took the two tests (initial and final). Thus, we created a database with numerical information obtained from student testing. For all the statistical tests used, we chose a significance threshold $\alpha = 0.05$.

In order to determine if there are statistically significant differences between the mean values of the scores obtained by the students in the initial testing compared to the final testing, we used the t-test for paired samples.

The results of the experimental group were compared with the results of the control group using the t-test for two independent samples. Levene's test was required to check the equality of variances for two groups.

The Pearson correlation coefficient (r) tested whether or not there was a relationship between two data series.

Results

Control group

Table 1. Descriptive Statistics– control group

	Minimum		Maximum		Mean		Std. Deviation		Variance	
	Initial testing	Final testing	Initial testing	Final testing	Initial testing	Final testing	Initial testing	Final testing	Initial testing	Final testing
Long run (meters)	650	660	750	760	707.81	719.06	24.219	23.539	586.56	554.06
Shuttle run 10x30m (min)	1.14	1.08	1.40	1.35	1.2756	1.2131	0.0802	0.0789	0.0006	0.0006
Number of passes (executions)	25	34	32	43	28.44	37.56	1.931	2.632	3.729	6.929

In the case of the control group, we determined in the initial testing for the long run an average value of 707.81 m with a standard deviation of 24.219 m, for the 10x30m shuttle run an average value of 1.2756 min with a standard deviation of 0.0802 min, the number of passes (executions) an average value of 28.44 with a standard deviation of 1.931.

On analyzing the results obtained at the final test by the control group, we determined for the long run an average value of 719.06 m with a standard deviation of 23.539 m (increase of 1.59%), for the 10x30m shuttle run an average value of 1.2131 min with a standard deviation of 0.0789 min (decrease of 4.90%), the number of passes (executions) an average value of 37.56 with a standard deviation of 2.632 (32.07% increase).

Table 2. Paired Samples Statistics

		Mean	Std. Deviation	Std. Error Mean
Pair 1	Long run (meters) I.T.	707.81	24.219	6.055
	Long run (meters) F.T.	719.06	23.539	5.885
Pair 2	Shuttle run 10x30m (min) I.T.	1.2756	0.08016	0.02004
	Shuttle run 10x30m (min) F.T.	1.2131	0.07889	0.01972
Pair 3	Number of passes (executions) I.T.	28.44	1.931	.483
	Number of passes (executions) F.T.	37.56	2.632	.658

Table 3. Paired Samples Correlations

		Correlation	Sig.
Pair 1	Long run (meters) I.T. & Long run (meters) F.T.	0.990	0.000
Pair 2	Shuttle run 10x30m (min) I.T. & Shuttle run 10x30m (min) F.T.	0.989	0.000
Pair 3	Number of passes (executions) I.T.& Number of passes (executions) F.T.	0.617	0.011

Analyzing the results of the students in the control group, the Pearson correlation test showed that there were very strong positive correlations between the values of the initial testing and those of the final testing in all physical tests: long run ($r = 0.990$, $p < 0.001$), shuttle run 10x30m ($r = 0.989$, $p < 0.001$), number of passes (executions) ($r = 0.671$, $p = 0.011 < 0.05$).

Table 4. Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Long run (meters) **I**.T – Long run (meters) **F.T.**	-11.250	3.416	0.854	-13.070	0-9.430	-13.175	15	0.000
Pair 2	Shuttle run 10x30m (min) **I**.T – Shuttle run 10x30m (min) **F.T.**	0.06250	0.01183	0.00296	0.05620	0.06880	21.129	15	0.000
Pair 3	Number of passes (executions) **I.T.** – Number of passes (executions) **F.T.**	-9.125	2.094	0.523	-10.241	-8.009	-17.434	15	0.000

After performing the t-test to assess the difference between the means of two paired samples to compare the results obtained by the control group at the initial testing with the results obtained at the final testing, we found there was a statistically significant difference for all samples: long run ($t = -13.175$, $p < 0.001$), shuttle run 10x30m ($t = 21.129$, $p < 0.001$), the number of passes ($t = -17.434$, $p < 0.001$).

Experimental group

Table 5. Descriptive Statistics –experimental group

	Minimum		Maximum		Mean		Std. Deviation		Variance	
	Initial testing	Final testing	Initial testing	Final testing	Initial testing	Final testing	Initial testing	Final testing	Initial testing	Final testing
Long run (meters)	660	685	750	775	694.69	721.87	20.613	19.990	424.90	399.59
Shuttle run 10x30m (min)	1.20	1.05	1.40	1.25	1.2906	1.1250	0.0712	0.0577	0.0505	0.0033
Number of passes (executions)	23	36	32	44	27.13	40.13	3.074	2.604	9.450	6.783

In the case of the experimental group, at the initial test we obtained for the long run an average value of 694.69 m with a standard deviation of 20.613 m, for the 10x30m shuttle run an average value of 1.2906 min with a standard deviation of 0.0712 min, for the number of passes (executions) a mean value of 27.13 with a standard deviation of 3.074.

Analyzing the results obtained at the final testing by the experimental group, we determined for the long run an average value of 721.87 m with a standard deviation of 20.613 m (increase of 3.91%), for the 10x30m shuttle run an average value of 1.1250 min with a standard deviation of 0.0577 min (decrease of 12.83%), for the number of passes (executions) an average value of 40.13 with a standard deviation of 2.604 (47.92% increase).

Table 6. Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
Long run (meters) I.T.	694.69	16	20.613	5.153

Pair 1	Long run (meters) F.T.	721.88	16	19.990	4.997
Pair 2	Shuttle run 10x30m (min) I.T.	1.2906	16	0.07122	0.01781
	Shuttle run 10x30m (min) F.T.	1.1250	16	0.05774	0.01443
Pair 3	Number of passes (executions) I.T.	27.13	16	3.074	0.769
	Number of passes (executions) F.T.	40.13	16	2.604	0.651

Table 7. Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Long run (meters) I.T. & Long run (meters) F.T.	16	0.984	0.000
Pair 2	Shuttle run 10x30m (min) I.T. & Shuttle run 10x30m (min) F.T.	16	0.669	0.005
Pair 3	Number of passes (executions) I.T.& Number of passes (executions) F.T.	16	0.789	0.000

The Pearson correlation test showed that there were very strong positive correlations between the values from the initial testing and those of the final testing in all physical tests of the experimental group: long run ($r = 0.984$, $p < 0.001$), shuttle run 10x30m ($r = 0.669$, $p = 0.005 < 0.05$), number of passes (executions) ($r = 0.789$, $p < 0.001$).

Table 8. Paired Samples Test

Paired Differences	t	df

		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			Sig. (2-tailed)
Pair 1	Long run (meters) **I**.T – Long run (meters) **F.T.**	-27.188	3.637	0.909	-29.126	-25.249	-29.899	15	0.000
Pair 2	Shuttle run 10x30m (min) **I**.T – Shuttle run 10x30m (min) **F.T.**	0.16562	0.05391	0.01348	0.13690	0.19435	12.289	15	0.000
Pair 3	Number of passes (executions) **I**.T**.** – Number of passes (executions) **F.T.**	-13.000	1.897	0.474	-14.011	-11.989	-27.406	15	0.000

After performing the t-test for two paired samples to compare the results obtained by the experimental group at the initial testing with the results obtained at the final testing, it turned out that there was a statistically significant difference for all samples: long run ($t = -29.899$, $p < 0.001$), the 10x30m shuttle run ($t = 12.289$, $p < 0.001$), the number of passes ($t = -27.406$, $p < 0.001$).

Comparison between the experimental group – control group

The independent samples t-test compares the results obtained by the experimental group with those obtained by the control group on the three physical tests for the initial testing and the final testing.

Table 9. Group Statistics

	Group	Mean	Std. Deviation	Std. Error Mean
Long run (meters) I.T.	Control group	707.81	24.219	6.055
	Experimental group	694.69	20.613	5.153
Long run (meters) F.T.	Control group	719.06	23.539	5.885
	Experimental group	721.88	19.990	4.997
Shuttle run 10x30m (min) I.T.	Control group	1.2756	0.08016	0.02004
	Experimental group	1.2906	0.07122	0.01781
Shuttle run 10x30m (min) F.T.	Control group	1.2131	0.07889	0.01972
	Experimental group	1.1250	0.05774	0.01443

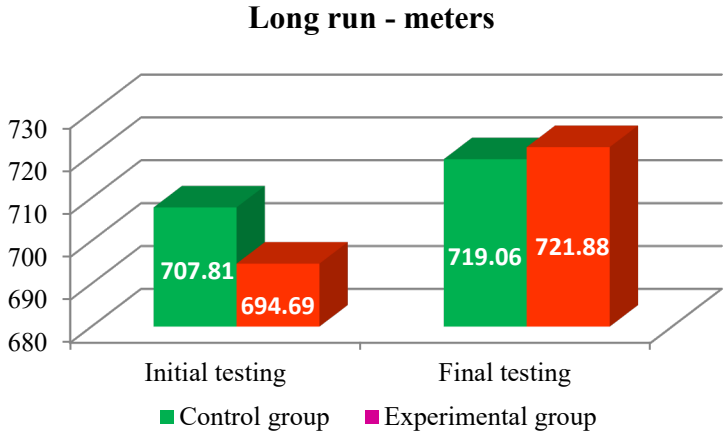
Number of passes (executions) I.T.	Control group	28.44	1.931	0.483
	Experimental group	27.13	3.074	0.769
Number of passes (executions) F.T.	Control group	37.56	2.632	0.658
	Experimental group	40.13	2.604	0.651

Table 10. 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	95% Confidence Interval of the Difference	
									Lower	Upper
Long run (meters) I.T..	Equal variances assumed	1.161	0.290	1.651	30	0.109	13.125	7.951	-3.113	29.363
	Equal variances not assumed			1.651	29.253	0.109	13.125	7.951	-3.130	29.380
Long run (meters) F.T.	Equal variances assumed	0.682	0.416	-0.364	30	0.718	-2.813	7.720	-18.579	12.954
	Equal variances not assumed			-0.364	29.233	0.718	-2.813	7.720	-18.597	12.972
Shuttle run 10x30m (min) I.T.	Equal variances assumed	0.303	0.586	0.560	30	0.580	-0.01500	0.02681	-0.06975	0.03975
	Equal variances not assumed			0.560	29.590	0.580	-0.01500	0.02681	-0.06978	0.03978
Shuttle run 10x30m (min) F.T.	Equal variances assumed	1.426	0.242	-3.606	30	0.001	0.08812	0.02444	0.03821	0.13804
	Equal variances not assumed			-3.606	27.487	0.001	0.08812	0.02444	0.03802	0.13823
Number of passes	Equal variances assumed	6.269	0.018	1.446	30	0.159	1.313	0.908	-0.541	3.166

(executions) I.T.	Equal variances not assumed			1.446	25.243	0.160	1.313	0.908	-0.0556	3.181
Number of passes (executions) F.T.	Equal variances assumed	0.009	0.923	-2.768	30	0.010	-2.563	0.926	-4.453	-0.672
	Equal variances not assumed			-2.768	29.997	0.010	-2.563	0.926	-4.453	-0.672

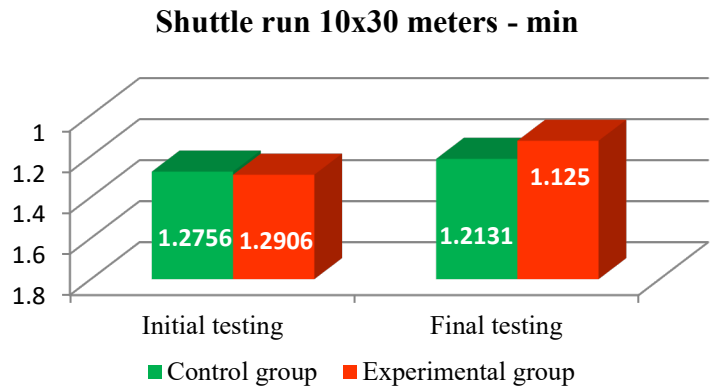
Test – Long run



Graph 1. Arithmetic mean for test one, initial and final testing

For the initial testing for the long run assessment, the Levene test indicated the equality of the variances of the two groups: F = 1.161 and p = 0.109 > α = 0.05. Because t = 1.651 and Sig.(2-tailed) or p = 0.109 > α = 0.05 or taking into account the fact that the limits of the confidence interval for the difference between the means of the two groups (95% CI for the mean difference: (-3.113, 29,363)) contain the zero value, it resulted that there were no significant differences between the average values recorded for the two groups (control and experimental). Even if the differences were not significant, they exist. The difference between the means was 13.125 m, and the mean value of the experimental
group was 1.85% lower than the mean of the control group. The variances were also equal in the case of the final testing (F = 0.682, p = 0.416 > α = 0.05). The differences were statistically significant at the final testing (t = -0.364, p = 0.020 < α = 0.05, 95% CI (-18.579, 12.954)). The difference between the means was -2.813, with the value of the experimental group recording a better result.

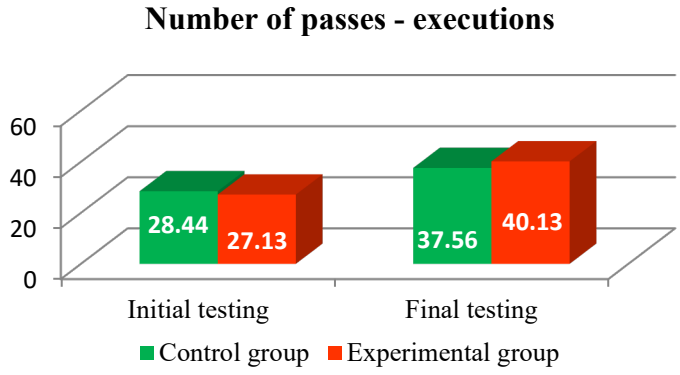
Test – Shuttle run 10x30 meters



Graph.2 Arithmetic mean for test two, initial and final testing

In the test - Shuttle run 10x30m we found that the variances were not equal in the initial test ($F = 0.303$, $p = 0.580 > \alpha = 0.05$), but they were equal in the final test ($F = 1.426$, $p = 0.242 > \alpha = 0.05$). The differences were not statistically significant at the initial testing ($t = 0.560$, $p = 0.580 > \alpha = 0.05$, 95% CI (-0.06975, 0.03975)) but at the final testing they were significantly different($t = -1.426$, $p = 0.024 < \alpha = 0.05$, 95% CI (0.03821, 0.13804)). The differences between the means were -0.01500 min at initial testing and 0.08812 min at the final testing. At the initial testing, the higher mean value appeared in the control group, and at the final testing, the higher value appeared in the case of the experimental group.

Test – Number of passes



Graph.3 Arithmetic mean for test three, initial and final testing

For the number of passes test we found that the variances were not equal in the initial testing ($F = 6.269$, $p = 0.018 < \alpha = 0.05$), but they were equal in the final testing ($F = 0.009$, $p = 0.923 > \alpha = 0.05$). The differences were not statistically significant at the initial testing ($t = 1.446$, $p = 0.160 > \alpha = 0.05$, 95% CI (-0.0556, 3.181)). Statistically significant differences were obtained at the final testing ($t = -2.768$, $p = 0.010 < \alpha = 0.05$, 95% CI (-4.453, -0.672)). The differences between means were 1.313 at the initial testing with the higher mean value occurring in the control group and 2.563 at the final testing, the higher value occurring in the case of the experimental group.

Conclusion

The conducted research allowed us to issue conclusions regarding the application of the training program in the overall sports lesson. The differences found between the initial and final tests for both groups under research support the idea of consistent accumulations in terms of the development of motor quality and endurance. From the perspective of the recorded results, it can be observed that through the use of possession games, the statistical analysis showed superior performance of the students in the experimental group compared to the students in the control group ($p<0.05$). Thus, we can say that the training during a school year improved the level of motor quality and endurance in the students who made up the high school football team, which allowed the actions in the game to be carried out with increased freshness, an aspect also emphasized by the positive highlighted correlations.

Thus, possession games, in addition to improving physical fitness, are a great way to get players used to playing in a time and space crisis. The positions of teammates, opponents and the speed of the ball change, which prevents the exercise from becoming boring and unchallenging. This helps keep players focused and engaged throughout the training session.

The drawback of the research is related to the fact that the number of students participating in the research was limited, but this did not depend on us as long as the matches of the high school football team were held in the 5vs5 format and the number of students in the team was limited to 12. The ability to develop endurance in correlation with technical-tactical and even ethical-moral training [10] makes the method of possession games an appealing proposition for students as well as for teachers.

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