

**STUDY ON THE USE OF INTEGRATED TRAINING IN THE  
DEVELOPMENT OF GAME-SPECIFIC RESISTANCE IN U16  
FOOTBALL**

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**Abstract:**

The study aimed to find universally valid solutions to the integrated training approach from the perspective of achieving optimal specific endurance goals in the game of football at U16 junior level. The study aims at identifying, creating and adapting specific technical-tactical means for the game of football that can simultaneously satisfy physical objectives, in particular specific resistance, and technical-tactical objectives. The monitoring of the players under investigation with specialized equipment - „Catapult On”, the latest generation with GPS, was the main evaluation method, which was used as a solid basis for this research.

**Introduction**

Starting strictly from a theoretical point of view, I can say that in the efforts made in the game of football we find all the forms of manifestation of resistance from the perspective of classifying them according to the known criteria found in most of the specialized books studied.

Thus, we find general and specific endurance if we look from the perspective of the criterion "the share of participation in the effort of the muscle groups and the major organic functions", anaerobic, mixed and aerobic endurance in terms of the classification criterion "energy sources, intensity and duration of effort", endurance in constant and variable-intensity exercise if we look at it from the point of view of the criterion 'nature of the exercise' and, of course, endurance in strength, speed and, above all, skill if we classify it according to the criterion 'mode of combination with other motor qualities'. [5, 6]

Starting from this reality, the approach to the subject therefore concerns the identification, adaptation or creation of specific means to cover these types of effort and at the same time using all the methodical procedures for their development specified in specialist books, precisely to give the study a general character. [2,6]

Therefore, the means used in this research will cover both the methodical procedures based on volume variation and those based on intensity variation, but especially those based on the "interval methodical procedure". I conclude that this paper addresses a topic that is not only topical but also quite complex, but only from a general perspective taking into account the realities regarding the number of players included in the study and the limited time of the study. [2, 10]

Without claiming to be a relevant study, the paper aims to highlight another type of approach to the development of specific endurance but also to create the general framework for new studies, from this perspective of multi elementary or even multidisciplinary approach to common aspects of performance sport [3,4,5].

### **Material and method**

Monitoring of the players under investigation with specialised, state-of-the-art GPS equipment was the main monitoring method, which was used as a solid foundation for this research. In terms of evaluating the volume of effort, „Catapult On" gave me objectivity and full confidence that the results and conclusions of the research would at least be accurate and sustainable. Regular heart rate measurement of the athletes in the study, both by the classical method and assisted by specific heart rate measurement equipment, provided me with preliminary real-time data on the correctness of the choice of means used during the research. [1,8,9]

In terms of general physical capacity, the athletes were assessed following initial testing using three tests „6x 20+20 Test", „Beep Test" and „2000m Test" , all with a scoring system based on the values recorded.

Measuring with the „Catapult On" of each individual exercise, through private testing, gave me the overall picture of the volume and intensity of effort for each individual exercise. All that remained then was to structure them, according to the data collected, in order to combine the exercises according to the technical, tactical and physical objectives set for each individual training session. [6,7]

The training plan was structured in such a way that the total volume of effort was close on average, but also in intensity for both groups, both within each training session and during each week. After the warm-up that was executed jointly, group A executed the exercises on the synthetic field of the LPS Suceava campus, while group B followed the classic training program on the athletics track near the field. The whole programme was carried out between January and March 2023.

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<b>Nr</b>	<b>Group A exercises</b>	<b>Volume</b>	<b>Group B exercises</b>	<b>Volume</b>
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<b>Total minimum volume/antr.</b>	<b>1750m</b>	<b>Total minimum volume/antr.</b>	<b>2000m</b>
<b>Maximum total volume/antr.</b>	<b>6850m</b>	<b>Maximum total volume/antr.</b>	<b>6000m</b>
<b>Average total volume/antr.</b>	<b>3783,33m</b>	<b>Average total volume/antr.</b>	<b>3788m</b>

In this research we used 30 exercises, structured in four main categories:

- Analytical exercises to develop individual technique;
- Technical-tactical analytical exercises;
- Global technical-tactical exercises;
- Exercises to develop speed, strength or agility endurance;

Exercises were chosen so that the intensity and total volume of the effort was as close as possible to the exercises performed by the control group, which followed the classical programme for the development of resistance specific to the game of football.

## Results

**Table no.1 - COMPARISON OF RESULTS 6 x 20 + 20m TEST - GROUP A**

Nr	N. P.	Inițial Test					Note	Final Test					Dif. %	Dif. Note
		T. 1	T. 2	Dif. +/-	%	Not		T. 1.	T. 2.	Dif. +/-	%	No		
1.	B. M	6. 83	6. 89	+0. 06	0. 87	<b>9</b>	6. 80	6. 83	+0. 03	0. 44	<b>10</b>	-	<b>0.43</b>	<b>+1</b>
2.	B. N.	7. 05	7. 31	+0. 26	3. 68	<b>6</b>	7. 06	7. 14	+0. 08	1. 13	<b>8</b>	-	<b>2.55</b>	<b>+2</b>
3.	C. H.	8. 49	8. 77	+0. 28	3. 29	<b>6</b>	8. 09	8. 19	+0. 10	1. 23	<b>8</b>	-	<b>2.06</b>	<b>+2</b>
4.	D. L.	7. 16	7. 59	+0. 43	6. 00	<b>4</b>	7. 14	7. 29	+0. 15	2. 10	<b>7</b>	-	<b>3.09</b>	<b>+3</b>
5.	I.F.	8. 18	8. 49	+0. 31	3. 78	<b>6</b>	7. 63	7. 82	+0. 19	2. 49	<b>7</b>	-	<b>1.29</b>	<b>+1</b>

6.	M.	8.	9.	+0.	6.	<b>3</b>	8.	8.	+0.	3.	<b>6</b>	-	<b>+3</b>
	C	62	21	59	84		12	44	32	94		<b>2.90</b>	
7.	P.	7.	8.	+0.	4.	<b>5</b>	7.	7.	+0.	3.	<b>6</b>	-	<b>+1</b>
	A.	68	05	37	81		63	87	24	14		<b>1.67</b>	
8.	P.	7.	7.	+0.	3.	<b>6</b>	6.	7.	+0.	1.	<b>8</b>	-	<b>+2</b>
	S.	01	26	25	56		93	06	15	87		<b>1.69</b>	
9.	S.	7.	7.	+0.	3.	<b>6</b>	7.	7.	+0.	0.	<b>9</b>	-	<b>+3</b>
	A.	37	65	28	79		16	21	05	69		<b>3.10</b>	
10.	S.	7.	7.	+0.	2.	<b>7</b>	7.	7.	+0.	0.	<b>9</b>	-	<b>+2</b>
	F.	13	34	21	94		10	16	06	84		<b>2.10</b>	
11.	T.	7.	7.	+0.	2.	<b>7</b>	7.	7.	+0.	2.	<b>7</b>	-	<b>0</b>
	R.	54	74	20	65		45	63	18	41		<b>0.24</b>	
12.	Ț.	7.	7.	+0.	2.	<b>7</b>	7.	7.	+0.	1.	<b>8</b>	-	<b>+1</b>
	Ș	14	29	15	10		14	23	09	26		<b>0.84</b>	
<b>Minim</b>		<b>8.</b>	<b>9.</b>	<b>+0.</b>	<b>6.</b>	<b>3</b>	<b>7.</b>	<b>7.</b>	<b>+0.</b>	<b>3.</b>	<b>6</b>	-	<b>0</b>
		<b>62</b>	<b>21</b>	<b>59</b>	<b>84</b>		<b>63</b>	<b>87</b>	<b>24</b>	<b>14</b>		<b>0.24</b>	
<b>Maxi</b>		<b>6.</b>	<b>6.</b>	<b>+0.</b>	<b>0.</b>	<b>9</b>	<b>6.</b>	<b>6.</b>	<b>+0.</b>	<b>0.</b>	<b>10</b>	-	<b>+3</b>
<b>m</b>		<b>83</b>	<b>89</b>	<b>06</b>	<b>87</b>		<b>80</b>	<b>83</b>	<b>03</b>	<b>44</b>		<b>3.09</b>	
<b>Media</b>		<b>7.</b>	<b>7.</b>	<b>+0.</b>	<b>3.</b>	<b>6</b>	<b>7.</b>	<b>7.</b>	<b>+0.</b>	<b>1.</b>	<b>7.7</b>	-	<b>1.7</b>
		<b>51</b>	<b>79</b>	<b>28</b>	<b>69</b>		<b>35</b>	<b>48</b>	<b>13</b>	<b>79</b>	<b>5</b>	<b>1.83</b>	<b>5</b>

Caption: N.P. - Initials of name and surname; T.1-Time recorded for run No.1;  
T.6 - Time recorded in run No.6. ; Diff.+/- - Difference between T.1 and T.2;  
% Difference between T.1 and T.2 in percent. Diff. Scores - Difference in scores  
between T.I. and T.F.

**Table no.2 - COMPARISON OF RESULTS OF "BIP TEST" - GROUP A**

Nr.	N.P.	Inițial Test			Final Test			Dif. +/-	Dif. Note
		Level	Time	Note	Nivel	Time	Note		
1.	B.M.	11	11.44	<b>8</b>	13	14.12	<b>10</b>	<b>+2.68</b>	<b>+2</b>
2.	B.N.	10	10.42	<b>7</b>	12	13.38	<b>9</b>	<b>+2.96</b>	<b>+2</b>
3.	C.H.	9	09.49	<b>6</b>	11	12.02	<b>8</b>	<b>+2.53</b>	<b>+2</b>
4.	D.L.	8	08.54	<b>5</b>	11	11.46	<b>8</b>	<b>+2.92</b>	<b>+3</b>
5.	I.F.	10	11.13	<b>7</b>	11	12.29	<b>8</b>	<b>+1.16</b>	<b>+1</b>
6.	M.C.	7	08.18	<b>4</b>	10	10.56	<b>7</b>	<b>+2.38</b>	<b>+3</b>
7.	P.A.	9	09.42	<b>6</b>	10	11.11	<b>7</b>	<b>+1.69</b>	<b>+1</b>

8.	P.S.	8	09.11	<b>5</b>	10	11.21	<b>7</b>	<b>+2.10</b>	<b>+2</b>
9.	S.A.	10	10.34	<b>7</b>	11	11.58	<b>8</b>	<b>+1.24</b>	<b>+1</b>
10.	S.F.	9	10.12	<b>6</b>	11	12.17	<b>8</b>	<b>+2.05</b>	<b>+2</b>
11.	T.R.	10	11.07	<b>7</b>	12	13.07	<b>9</b>	<b>+2.00</b>	<b>+2</b>
12.	Ț.Ș	9	10.27	<b>6</b>	11	12.29	<b>8</b>	<b>+2.02</b>	<b>+2</b>
<b>Minim</b>		<b>7</b>	<b>08.18</b>	<b>4</b>	<b>10</b>	<b>10.56</b>	<b>7</b>	<b>+1.16</b>	<b>+1</b>
<b>Maxim</b>		<b>11</b>	<b>11.44</b>	<b>8</b>	<b>13</b>	<b>14.12</b>	<b>10</b>	<b>+2.96</b>	<b>+3</b>
<b>Media</b>		<b>9.16</b>	<b>9.96</b>	<b>6.17</b>	<b>11.08</b>	<b>12.10</b>	<b>8.08</b>	<b>+1.66</b>	<b>+1.91</b>

Caption: N.P. - Initials of name and surname; T.1-Time recorded for run No.1;

T.6 - Time recorded in run No.6. ; Diff.+/- - Difference between T.1 and T.2;

% Difference between T.1 and T.2 in percent. Diff. Scores - Difference in scores between T.I. and T.F.

**Table no.3 - COMPARISON OF THE RESULTS OF THE 2000m TEST - GROUP A**

Nr.	N.P.	Test Inițial		Test Final		Dif. +/-	Dif. Note
		Time	Note	Time	Note		
1.	B.M.	07.38	<b>8</b>	7.34	<b>9</b>	<b>-0.04</b>	<b>+1</b>
2.	B.N.	07.43	<b>7</b>	7.38	<b>8</b>	<b>-0.05</b>	<b>+1</b>
3.	C.H.	07.54	<b>5</b>	7.43	<b>7</b>	<b>-0.11</b>	<b>+2</b>
4.	D.L.	07.58	<b>4</b>	7.44	<b>7</b>	<b>-0.14</b>	<b>+3</b>
5.	I.F.	07.47	<b>6</b>	7.43	<b>7</b>	<b>-0.04</b>	<b>+1</b>
6.	M.C.	07.50	<b>5</b>	7.46	<b>6</b>	<b>-0.04</b>	<b>+1</b>
7.	P.A.	07.48	<b>6</b>	7.41	<b>7</b>	<b>-0.07</b>	<b>+1</b>
8.	P.S.	07.52	<b>5</b>	7.42	<b>7</b>	<b>-0.10</b>	<b>+2</b>
9.	S.A.	07.48	<b>6</b>	7.38	<b>8</b>	<b>-0.10</b>	<b>+2</b>
10.	S.F.	07.51	<b>5</b>	7.39	<b>7</b>	<b>-0.12</b>	<b>+2</b>
11.	T.R.	07.41	<b>7</b>	7.25	<b>10</b>	<b>-0.16</b>	<b>+3</b>
12.	Ț.Ș	07.52	<b>5</b>	7.44	<b>7</b>	<b>-0.08</b>	<b>+2</b>

<b>Minim</b>	<b>07.58</b>	<b>4</b>	<b>7.46</b>	<b>6</b>	<b>-0.04</b>	<b>+1</b>
<b>Maxim</b>	<b>07.38</b>	<b>8</b>	<b>7.21</b>	<b>10</b>	<b>-0.16</b>	<b>+3</b>
<b>Media</b>	<b>7.485</b>	<b>5.75</b>	<b>7.40</b>	<b>7.5</b>	<b>-0.09</b>	<b>+1.75</b>

Caption: N.P. - Initials of name and surname; T.1-Time recorded for run No.1;  
T.6 - Time recorded in run No.6. ; Diff.+/- - Difference between T.1 and T.2;  
% Difference between T.1 and T.2 in percent. Diff. Scores - Difference in scores between T.I. and T.F.

The final evaluations and their comparison with the initial ones revealed a few points that I must highlight:

- through the test „6x20+20m" we noticed a decrease in the time difference between the first and the last run, on average in group A by -1.38 sec. and -1.15 sec. in group B, which shows us a better increase in resistance to uniform distance and high intensity efforts in the group that followed the integrated training programme.

- In the case of the „Bip" tests we found an average increase of +1.66 min. in group A and +1.33 min. in group B, which shows that integrated training facilitates a better resistance to exercise over the same distance but progressive in intensity.

- The „2000m" test showed a decrease in average time of -0.09 min. in group A and -0.14 min. in group B, which shows that

### **Conclusions**

The results obtained from monitoring the volume of effort in the overall technical-tactical exercises were mixed, ranging from very good to very poor, with the largest difference of 600 m in an exercise where the minimum distance covered was 1400 m and the maximum 2000 m. Basically in one exercise, in the form of a game with tactical tasks carried out over 10 minutes, I recorded this difference of 600 m, but which analysed from the perspective of the positions occupied by the two players involved caught my attention and made me use fewer exercises in this category towards the end of the research.

The results recorded at the end of the training programs, through the „6 x 20+20m Test" , „Beep Test" and „2000m Test" showed a quite significant increase in all athletes, from both groups participating in this study.

By means of the test , 6x20+20m" we noticed a decrease in the time difference between the first and the last run, on average in group A by -1.38 sec. and -1.15 sec. in group B, which shows a better increase in resistance to uniform distance and high intensity efforts in the group that followed the integrated training programme.

In the case of the „Bip" tests we found an average increase of +1.66 min. in group A and +1.33 min. in group B, which highlights that integrated training facilitates a better resistance to exercise over the same distance but progressive in intensity.

In the „2000m" test, we found an average time decrease of -0.09 min. in group A and -0.14 min. in group B, which shows us that in the case of long distance endurance, the classic running program is more efficient.

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