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## CONDITIONAL MOTOR CAPACITY - RESISTANCE AT PUPILS OF 13-14 AGES DURING THE PHYSICAL EDUCATION LESSON

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### Abstract

At the secondary school cycle, general motor ability of pupils in a continuous progress providing conditional motor capacity (speed, strength and endurance) and intermediate capacity and coordination development. Growth and physical development of the body at this age is in constant development that needs to be known in order to select the most effective ways and methods that can help the harmonious physical development, the favorable influence of health and stimulation of the intellectual activity.

*Purpose.* The realized research had as purpose the selection of the most efficient and attractive methods and means in order to improve the manifestation level of the conditional capacity - resistance.

*Materials and methods.* Physical education lessons conducted in the two elementary schools in Prahova County, consisted of the application of methods and means included in the school curriculum. The collected data from measurement and evaluation of the conditional expression capacity - resistance have been processed, analyzed and interpreted using research methods and research techniques as statistical and mathematical methods and graphical method and proper investigation methods (observation, experiment).

*Results.* Recognizing the development way of the research in both schools we saw a spirit of competition which eventually resulted in improving the expression of conditional capacity - resistance.

*Conclusions.* The calculus of the statistical indicators of the motor performances at the level of conditional capacity - resistance, after the final testing, for the sample under investigation, presents us with a significant increase of the arithmetic means of the motor performance, that are near the norm value for the mark 9, according to the National Evaluation System for the pupils for 7th grade. The progress of the recorded results by the boys from the rural environment and the girls from the urban area is more obvious than the ones of the boys from the urban area and the girls from the rural one. Designing and planning the scholar physical education activities allow reaching the instructive - educational targets of the secondary school physical education system and of forming the habit to independent practice physical exercise. Making this ascertaining study confirms the research hypothesis, in the sense of educating the conditional capacity - resistance, in relation with the manifestation level of the individual motor capacities/qualities.

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Respecting the instructive - educational process of the age and gender characteristics, of the geographical environment, allows the fulfillment of the educational purposes by completing and adapting the analytical curriculum according to the physical education domain. The preparation and organization of physical education lessons should take into account the number of children, the numeric report between girls and boys, the health state, level of physical development, the physical differences, the place where physical education is held in the daily class schedule, working conditions, the material equipment of the school.

*Key words:* motor capacity, resistance, pupil, lesson.

## Introduction

The systematic investigation of the instructive - educational process imposed the belief that the instructional design represents the sine qua non condition to ensure the effectiveness of the process and the essential element of any educational technology [Cârstea, 1993]. The conditional motor capacity resistance is situated in the group of the capacities directly dependent on general motor ability, based on the metabolic efficiency of muscle and other apparatus and systems (cardiovascular, respiratory, nervous system). The manifestation of the general motor ability is subject to the actual amount of energy in the muscles, of the devices that control the energetic wave (enzymes), speed, force of contraction and the number of motor units engaged in action [Mitra, Mogoş, 1980]. Resistance represents the individual's possibility to make an effort with a certain intensity, in a longer time as possible without the installation of fatigue [Demeter, 1979].

Running over long distances have as purpose the development of the general motor capacity – physical condition, general resistance or cardio-respiratory. In order to obtain certain high effect for this component of the general motor capacity, of the physical condition, physical exercises are made with the intensity of high or moderate effort (effort is aerobic and is developed in the conditions of the relative equilibrium between the need of O<sub>2</sub> and the input for O<sub>2</sub> - steady state), higher working time (15-20 minutes) that have as effect the progressive and slow increase of the cardiac frequency [Barbu, Stoica, 2000]. Due to the high energy consumption and of the apparition of fatigue, exercises through which resistance is developed, during the physical education lesson, are realized after the accomplishment of the other lesson homework, so at the end of the fundamental part [Finichiu, 2010].

Physical exercises present the following characteristics for the development of the resistance: the motor structure must be well know and acknowledged; the duration, the number of exercises (volume) must contribute to the apparition of fatigue (the volume will have values medium and high); the tempo for the accomplishment of the exercises (the effort's intensity) will be moderate; the breaks between the repetitions must not assure a total recovery of the effort capacity,

fact that can be seen by checking the pulse and the respiratory frequency that do not come back at their normal values from resting; the factors of progression for the improvement of the effort capacity are the effort's duration and break's duration (their shortening) between the series.

The conditional motor capacity - resistance is a motor capacity/quality slightly perfectible, as a consequence on the continuous and systematic practice of certain specific exercises that can be kept at a reached value for a long period of time. Resistance is the perfectible motor capacity that is kept for a long period of time. Establishing the research objectives helps us to determine if:

a program of methods and specific means used in the physical education can contribute to the development of cardio-respiratory resistance and of the local resistance.

establishing the research's conclusions highlights the relations between the study background and the sense of practical activity.

## Research hypotheses

The perception of the level of expression of conditional capacity - resistance may contribute to the selection of methods and means used in physical education lesson.

The value and potential of the training process can be improved if the instructive-educational process is directed towards achieving the objectives, the content, strategy and assessment of the motor and functional parameters specific to the education cycle.

## Research procedures and methods

The research was conducted during the instructive-educational process at a primary school in the urban environment (39 students - 22 girls and 17 boys) and a primary school in the rural environment, Prahova County (21 students - 9 girls and 12 boys) and comprised 60 students from the 7th grade, aged between 13 and 14, in the school year 2011-2012.

The assessment of the effectiveness of methods and means used in the lesson was achieved after the second test - May 2012. Conditional motor resistance capacity development in physical education lesson was created using the run with intervals used for the development of resistance in mixed regime (alternating running



effort with rest intervals), the repeated running method characterized by a high working duration and the method duration running whose characteristic is running without breaks, uniform or varied tempo, high duration, all adapted to the training level of students [Merică, 1969].

Testing consisted in applying the tasks from the national evaluation system at this age level: running on a 800 m distance - girls and 1000 m boys. For the good development of the experiment there were used proper investigation methods which includes - the observation method, the measurements and recordings method, the experimental method and methods to process and interpret the collected data - statistical mathematical method and the graphic one.

### Research results and their interpretation

Knowing very good the different phenomena studied in this paper, observing their general tendencies, but also the concentrated reflection,

### Results

expressive of the phenomena involved, it was realized through the use of the statistical-mathematical method, this proving to be a real help.

By using this method we could make a more precise picture of the polyvalent phenomena that are related to the development of the conditional motor capacity - resistance.

The statistical processing was based on calculating the following indicators [Dragnea, 1984]: arithmetic mean ( $X$  is the central tendency of values), median ( $M$ , the position that divides in two equal parts the string of data), the superior limit ( $X_{max}$ , the superior value of the string), the inferior limit ( $X_{min}$ , the inferior value of the string), amplitude ( $W$ , the difference between the maximum and minimum values), the standard deviation ( $S$ , represents the dispersion indicator, of the scattering level of the values) and the variability coefficient ( $Cv\%$ , the degree of homogeneity of the results from the research sample).

**Table 1.** Calculated statistical indicators - resistance run on a 1000 m distance

Boys subjects, n=29

Statistical Indicators	October testing 2011							May testing 2012						
	X	S	Cv%	M	X <sub>max</sub>	X <sub>min</sub>	W	X	S	Cv%	M	X <sub>max</sub>	X <sub>min</sub>	W
Boys 1000 m	<b>4,41</b>	2,65	22,12	4,52	4,28	5,03	0,35	<b>4,36</b>	2,88	23,42	4,50	4,25	4,58	0,33
Urban Boys	<b>4,43</b>	2,91	22,43	4,51	4,31	5,05	0,34	<b>4,38</b>	2,92	23,53	4,48	4,31	5,05	0,34
Rural Boys	<b>4,38</b>	2,45	21,75	4,56	4,28	5,02	0,36	<b>4,35</b>	2,85	22,98	4,45	4,25	4,58	0,36

n, number of boys subjects; X, the central tendency of values; S, the standard deviation, represents the dispersion indicator, of the scattering level of the values; Cv%, the variability coefficient, the degree of homogeneity of the results from the research sample; M, median the position that divides in two equal parts the string of data; X<sub>max</sub>, the superior value of the string; X<sub>min</sub>, the inferior value of the string; W, amplitude, the difference between the maximum and minimum values.

**Table 2.** Calculated statistical indicators - resistance run on a 800 m distance

Girls subjects, n=31

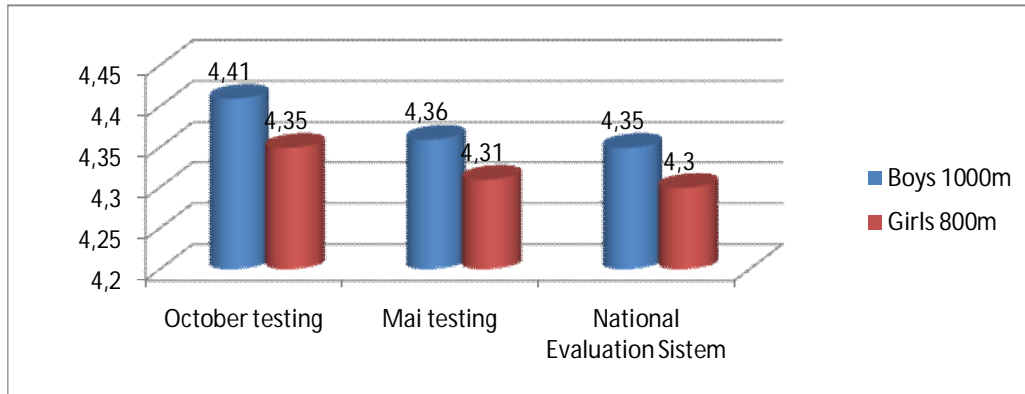
Statistical Indicators	October testing 2011							May testing 2012						
	X	S	Cv%	M	X <sub>max</sub>	X <sub>min</sub>	W	X	S	Cv%	M	X <sub>max</sub>	X <sub>min</sub>	W
Girls 800m	<b>4,35</b>	4,11	19,34	4,45	4,19	5,12	0,53	<b>4,31</b>	4,89	20,44	4,40	4,20	5,09	0,49
Urban Girls	<b>4,34</b>	4,32	18,74	4,44	4,19	5,09	0,50	<b>4,30</b>	5,09	20,46	4,40	4,20	5,09	0,49
Rural Girls	<b>4,36</b>	4,07	19,75	4,49	4,22	5,12	5,12	<b>4,33</b>	4,76	20,26	4,46	4,27	5,07	0,40

n, number of girls subjects; X, the central tendency of values; S, the standard deviation, represents the dispersion indicator, of the scattering level of the values; Cv%, the variability coefficient, the degree of homogeneity of the results from the research sample; M, median the position that divides in two equal parts the string of data; X<sub>max</sub>, the superior value of the string; X<sub>min</sub>, the inferior value of the string; W, amplitude, the difference between the maximum and minimum values.

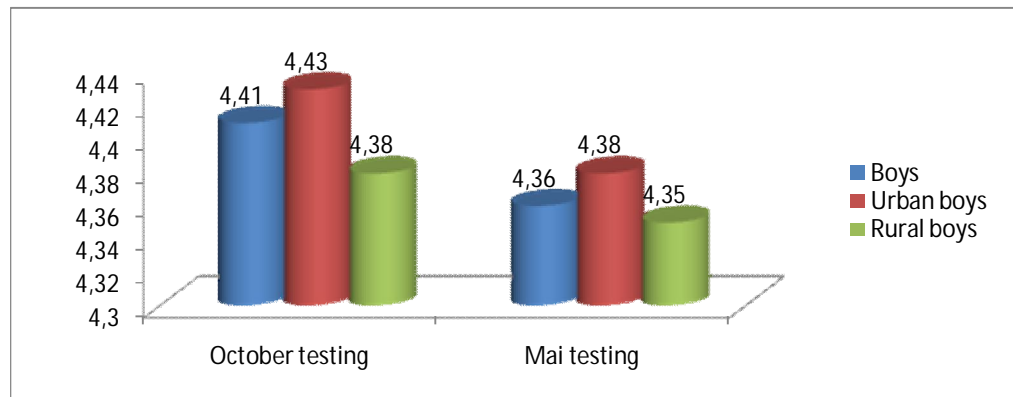
**Table 3.** The National Evaluation System for the 7th grade

Note	5	6	7	8	9	10
Boys	4'55"	4'50"	4'45"	4'40"	4'35"	4'30"
Girls	4'55"	4'50"	4'45"	4'40"	4'30"	4'20"

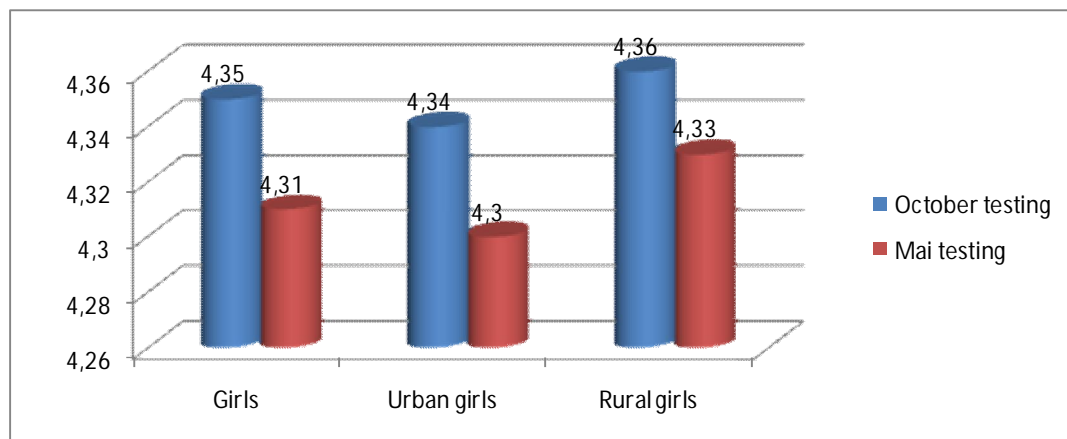
' = minute; " = secunde.



**Figure 1.** Graphical representation of arithmetic values compared to the National Evaluation System for note 9



**Figure 2.** Graphical representation of arithmetic values for boys - resistance run on a 1000 m distance



**Figure 3.** Graphical representation of arithmetic values for girls - resistance run on a 800 m distance



## Discussions

Knowing very good the different phenomena studied in this paper, observing their general tendencies, but also the concentrated reflection, expressive of the phenomena involved, it was realized through the use of the statistical-mathematical method, this proving to be a real help. By using this method we could make a more precise picture of the polyvalent phenomena that are related to the development of the conditional motor capacity - resistance. The statistical processing was based on calculating the following indicators [Dragnea, 1984]: arithmetic mean ( $\bar{X}$  is the central tendency of values), median ( $M$ , the position that divides in two equal parts the string of data), the superior limit ( $X_{\max}$ , the superior value of the string), the inferior limit ( $X_{\min}$ , the inferior value of the string), amplitude ( $W$ , the difference between the maximum and minimum values), the standard deviation ( $S$ , represents the dispersion indicator, of the scattering level of the values) and the variability coefficient ( $Cv\%$ , the degree of homogeneity of the results from the research sample).

### Boys

#### *Resistance run on a 1000 m distance*

By testing the manifestation level of the cardio-respiratory resistance through the duration run on 1000 m boys (Table 1, Figure 2) test, we can make the following interpretations:

The calculated arithmetic mean, after the first testing, is at the level of mark 8, according to the National Evaluation System (Table 3); after the second testing, the arithmetic mean is close to the mark 9. The highest value of the performance from the string of data is over the value of mark 10, both at the first and second testing; the lowest value from the string of data is weaker than the value of mark 5, both at the first and second testing. Amplitude and standard deviation show a normal distribution of the results. The calculated variability coefficient shows us a sample with a weak homogeneity. These results correspond with, Gheritoiu, (2005), Ivan, (2008), Monea, Popovici, and Monea (2006) results.

➤ Boys (Table 1, Figure 2) from the urban area recorded an arithmetic mean of 4,43 minutes at the first testing and 4,38 minutes at the second one; both are closer to the mark 8. The highest value of the performance from the string of data is close to the norm for mark 10, both at the first and second testing; the lowest value from the string of data is weaker than the value of mark 5, both at the first and second testing. Amplitude and standard deviation show a normal distribution of the results. The calculated variability coefficient shows us a sample with a weak homogeneity.

➤ Boys (Table 1, Figure 2) from the rural area recorded an arithmetic mean of 4,38 minutes at the first

testing, placed closer to the mark 8 and 4,35 minutes at the second testing, equal with the performance value for the mark 9. Amplitude and standard deviation show a normal distribution of the results. The calculated variability coefficient shows us a sample with a weak homogeneity.

### Girls

#### *Resistance run on a 800 m distance*

Calculating the statistical indicators (Table 2, Figure 3) according to the recorded results at the girls from the research allows us to make the following interpretations:

The calculated arithmetic mean after the first testing is between the performance values of marks 8 and 9, according to the National Evaluation System (Figure 1); after the second testing the arithmetic means is equal with the performance value for the mark 9. The highest value of the performance from the string of data is weaker than the value of mark 5, both at the first and second testing. Amplitude and standard deviation show a normal distribution of the results. The calculated variability coefficient shows us a sample with a medium homogeneity after the first testing and a weak one after the second testing. These results correspond with, Gheritoiu, (2005), Dumitru, (2006), Ivan, (2008), Monea, Popovici, and Monea (2006) results.

➤ The girls (Table 2, Figure 3) from the urban area recorded an arithmetic mean of 4,34 minutes at the first testing that is close to the mark 9 and of 4,30 minutes at the second testing, equal with the performance value for mark 10. The highest value of the performance from the string of data is over the value (for the first testing) or equal (for the second testing) with the performance value for mark 10; the lowest value from the string of data is weaker than the value of mark 5, both at the first and second testing. Amplitude and standard deviation show a normal distribution of the results. The calculated variability coefficient shows us a sample with a medium homogeneity after the first testing and a weak one after the second testing.

➤ The girls (Table 2, Figure 3) from the rural area recorded an arithmetic mean of 4,36 minutes at the first testing that is close to the mark 8 and of 4,33 minutes at the second testing, equal with the performance value for mark 9. The highest value of the performance from the string of data is close to the norm value for the mark 10 (after the first testing) and after the second one is close to the mark 9; the lowest value from the string of data is weaker than the value of mark 5, both at the first and second testing. Amplitude and standard deviation show a normal distribution of the results. The calculated variability coefficient shows us a sample with a medium homogeneity after the first testing and a weak one after the second testing.



## Conclusions

Calculating the statistical indicators of the motor performance at the level of conditional capacity - resistance, after the final testing, for the sample from the research, presents us a significant increase of the arithmetic means of the motor performances that are close to the norm value for the mark 9, according to the National Evaluation System for the 7th grade pupils.

The progress of the recorded results by the boys from the rural area and the girls from the urban area is more obvious than the one of the boys from the urban area and the girls from the rural area.

Respecting the age and gender characteristics in the instructive-educational process, of the geographical environment features, allow to accomplish the educational purposes by completing and adapting the analytical curriculum specific to the physical education.

Planning the physical education activity must be made according to the geographic environment characteristics, with the necessary of material and with the analytical curriculum of the domain.

The preparation and organization of physical education lessons should take into account the number of children, the numeric report between girls and boys, the health state, level of physical development, the physical differences, the place where physical education is held in the daily class schedule, working conditions, the material equipment of the school.

The study confirms the research hypothesis in the purposes of the education of conditional capacity - resistance in relation to the level of expression of individual motor capacity/qualities.

Designing and planning the physical education activity allow reaching the instructive-educational target of the secondary school physical education system and of training the habit of independent practice of physical exercise.

The use of specific means in a relatively low number, simple and practiced in time, contribute to the improvement of the manifestation level of the individual motor capacity, confirming the research hypothesis.

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